

BIOLOGICAL INVENTORY OF SABA



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CONTENTS

SUMMARY	5
INTRODUCTION.....	7
Project Background.....	7
Project Objective.....	7
Importance for Antillean Nature	7
METHODS.....	8
Literature Research	8
Fieldwork	8
Inventory of the flora.....	8
Inventory of the fauna.....	9
Reporting.....	9
GENERAL INFORMATION	10
Location of the island.....	10
Climate	10
Topography	13
Geological history	13
Economical development and land use.	16
BIOLOGICAL SURVEY	19
The Flora.....	19
The Vegetation.....	21
The Fauna.....	29
Mammals.....	29
Birds	30
Amphibians and Reptiles	36
Other Animals	38
THREATS.....	39
NATURE CONSERVATION AND MANAGEMENT.....	40
History and Present Situation.....	40
Research for Conservation Management	41
CONCLUSIONS.....	43
ACKNOWLEDGEMENTS	44
LITERATURE	45
APPENDIX I.....	50
Plants of Saba.....	50
APPENDIX II	67
Cyperaceae and Gramineae of Saba.....	67
APPENDIX III.....	70
The Animals of Saba.....	70
APPENDIX IV.....	86
Butterflies of Saba.....	86

SUMMARY

Saba is the smallest of the three Windward Islands in the Netherlands Antilles, with an area of 13 km². Saba is the northernmost island within the Lesser Antilles' inner curve. The island is actually the top of a dormant volcano. Typical of the island are the steep cliffs, deep ravines running radially and sheer cliff coasts. The highest top is the Mt. Scenery, commonly called "The Mountain". About 1200 people live on Saba in four villages all situated on the south-eastern half of the island. The northwestern half is not inhabited. Only a small part of the land area is used for agriculture or cattle breeding. In the south there is a stone crusher facility.

The climate is tropical and according to the system of Köppen it falls between a savanna- and monsoon climate, however the big differences in altitude cause a large variety of climatological conditions. Above 450 meters the rainfall and humidity gradually increase until they reach their maximum on the top of The Mountain. The top of The Mountain is nearly always veiled in clouds. The diversity of plants and plant-communities is caused by these variations in climatological conditions.

With 520 species the small island of Saba possesses practically the same number of species of wild plants as the much larger island of St. Maarten. The number of ferns is especially large. Saba has no island-endemic species among the plants. However the geographical distribution of six species and one variety is limited to only a few islands, and 4.6% of the species is endemic to the Lesser Antilles and the Virgin Islands. The Bryophyte flora consists of 48 leaf mosses and 31 liverwort species.

Expressing the differences in climatological conditions as the altitude increases, a series of plant communities are found, ranging from Croton thickets to (secondary) rainforest and elfin woodland. The **elfin woodland** is of a regionally rare type. The **palm brakes** and the **ravine rainforest** are practically undisturbed by human activities. They belong to the few virgin vegetations of the Netherlands Antilles. The **tree-fern brakes** are a special type of secondary vegetation, which develops under conditions of high humidity. The **secondary rainforest** zone was seriously disturbed in the past. There are still small cultivation plots here. Wherever the vegetation is left alone however, new rainforest is developing. The rainforest is one of the most species-rich plant communities. This is also where the greatest number of leaf mosses are found on Saba. The evergreen and seasonal formation zones were also disturbed in the past, however the vegetation is recovering. The great variety of forest formations on The Mountain makes this area highly attractive to visitors. The uninhabited area in the northwest of the island is important to the survival of various small island populations and has a high scenic value.

Saba's fauna has very few species compared to a similar area on the mainland, but this is to be expected from a relatively isolated small island.

Among the vertebrates the birds form the largest group, represented by 26 local and breeding species. In addition 36 migrating species are present every year on a temporary basis. Amphibians and reptiles are the next largest group of vertebrates with eleven species.

Bats are the only mammals on Saba that were not introduced by humans. This group is represented by five species. There is one island endemic among the vertebrates: the lizard *Anolis sabanus*. One species, the Red-bellied Racer *Alsophis rufiventris* is limited to Saba and St. Eustatius and is listed on the "Red List of Threatened Animals" of the IUCN. Various vertebrates are endemic to the Lesser Antilles and the Virgin Islands, either at the species level or the subspecies level: two bats, nine birds, one amphibian and one reptile. The gecko

Sphaerodactylus sabanus, the bat sub-species *Natalus stramineus stramineus* and the Trembler *Cinlocerthia ruficauda pavid*a have a geographical range, which is limited to only a few islands. Among the birds and reptiles there are species of which the population has declined because of hunting or the gathering of the eggs, like for instance the Rednecked Pigeon *Columba squamosa*, the Audubon's Shearwater *Puffinus lherminieri*, and the green Iguana *Iguana iguana*. A few bird species are regionally almost completely limited to the habitat of the rainforest and the mountain formations, e.g. the Purple-throated *Carib Eulampis jugularis*, the Trembler *Cinlocerthia ruficauda pavid*a and the Blue-crowned Euphonia *Euphonia musica flavifrons*, which has not been seen since 1952. The possibly endangered Bridled Quail-dove *Geotrygon mystacea* and Red-billed Tropicbird *Phaeton aetherius mesonauta* breed on Saba. Of the latter the breeding population on Saba is the largest of the Caribbean region. Of the invertebrates not much more is known than 86 names. The Mountain Crab *Gecarcinus ruricola* is endangered through hunting.

In the past the nature of Saba was mainly impacted by activities related to agriculture and cattle breeding. Today, the most important threats are destruction and degradation of habitat by development in general, especially because of the lack of regulations.

Since the nineteenfifties there is a lot of interest in the conservation of nature and the beautiful scenery. The necessity to preserve the top of The Mountain is mentioned many times, accompanied by specific plans. A group of people even promoted the idea to declare the whole island of Saba a conservation park. Up until today however, the terrestrial nature on the island remains unprotected.

Several studies have produced a wealth of data, yet not enough for optimum nature conservation. Further vegetation research of the top of The Mountain and the northern part of the island is necessary, as well as further study of the status of the island populations of regionally rare and/or endangered species. Also additional knowledge of the invertebrates is needed.

For now a few general conclusions can be drawn with respect to conservation of the biodiversity. For this conservation it is necessary to secure large contiguous areas. For small islands this can be problematic, but there are still a lot of possibilities on Saba. In particular the **uninhabited northwestern part** of the island and **The Mountain above 450 meters** would qualify. Specific conservation is required for the **breeding places** of the Audubon's Shearwater, Tropicbirds and other seabirds on **Green Island** and **Diamond Rock**.

INTRODUCTION

PROJECT BACKGROUND

The three Windward Islands of the Netherlands Antilles have a rich, interesting and above all beautiful nature. On all three islands tourism is an important, if not the most important pillar of the economy. Tourism depends largely on what nature has to offer. This is one of the urgent reasons to protect and manage these natural resources. Up until now however, there is no nature policy in these islands and only one nature-park has been established: the Saba Underwater Park. On land practically all nature is still unprotected and unmanaged. Three NGO's: the Saba Conservation Foundation, the St. Eustatius National Parks Foundation and the St. Maarten Natural Heritage Foundation, are presently working to attain responsible nature management. This requires first of all knowledge of the nature in question. Without thorough knowledge it is difficult to select the best conservation areas, and to set conservation priorities and management guidelines.

Flora and fauna have been the subject of various studies in the past. The results of these studies are the building blocks for effective nature management. Carmabi has launched the project "Biological Inventory of the Windward Islands of the Netherlands Antilles (St. Maarten, Saba, St. Eustatius)" to review all existing information in order to support the activities of the island management organizations. This project was subsequently completed in cooperation with the three island foundations mentioned above.

PROJECT OBJECTIVE

Knowledge of the flora and fauna of the Windward Islands of the Netherlands Antilles is scattered and mostly dates back a long time. The purpose of this project is to collect a database of the references concerning the terrestrial natural resources of the islands complemented with field-observations in order to provide up-to-date documentation of the biological diversity and conservation values. At the same time an attempt is made to indicate threats and conservation priorities.

IMPORTANCE FOR ANTILLEAN NATURE

This project provides island and national NGO's with basic information necessary to:

- a. Identify terrestrial conservation and research priorities
- b. Raise funds for nature preservation
- c. Increase environmental awareness of the public

The information compiled will also be integrated in the "Netherlands Antilles Natural Heritage Database" at Carmabi, which is part of an international network of databases of natural resources initiated by the American organization: "The Nature Conservancy".

Working-contacts between the island NGO's and Carmabi were used for this project.

This strengthened the cooperation based on shared interests. Close cooperation between the NGO's of the Netherlands Antilles is of utmost importance to the optimum use of the limited and scattered funds that are available for nature conservation.

METHODS

LITERATURE RESEARCH

Many aspects of nature in the Windward Islands have been studied in the past. For the survey of the biodiversity of these islands the results of these studies, as published in several books, articles and reports, were used. At the end of this report you can find a list of the consulted literature. Oral statements and personal observations complemented the information from literature. The majority of the literature can be found in the library of the Carmabi Institute in Curaçao.

FIELDWORK

In order to obtain up-to-date information on the biodiversity of the islands a working visit was made to each of the three islands in August 1996. Although a one-week stay per island proved to be very short, a considerable amount of additional data was collected. Practically all conservation areas suggested in the past were visited to consider their current situation. In addition an effort was made to determine the occurrence and status of endemic and/or endangered plants and animal species. Plants were identified using several flora and plant books (Stoffers, 1962-1984; Arnoldo, 1971; Howard, 1974-1989; Liogier, 1985-1995; Coomans and Coomans-Eustatia, 1988); birds were identified using two bird books (Voous, 1983; Evans, 1990); and to identify reptiles two works were used (Lazell, 1972; Schwartz and Henderson, 1991).

During each field expedition land snails and butterflies were collected to extend the knowledge of the invertebrates of the islands. All specimens were sent to relevant authorities, the butterflies after tentative identification by Dr. A. Debrot at Carmabi. Many photographs were taken during these work-visits. A selection was made to illustrate the accompanying text. These are in the back of the report.

INVENTORY OF THE FLORA

For the inventory of the flora lists of plant species were made. It was decided to make lists per island, in order to facilitate island use. The lists enumerate ferns and related plants (Pteridophyta) and seed plants (Spermatophyta) (Appendix I). The grasses (Gramineae) and sedges (Cyperaceae) are listed separately (Appendix II). The records are based primarily on species mentioned in the "Flora of the Netherlands Antilles" by Dr. A. L. Stoffers (ed.). This Flora however, does not include all families. For the absent families the "Flora of the Lesser Antilles" by Richard A. Howard was used.

Cultivated species have not been included, only when clearly established after running wild. The Flora by Howard includes all families and with certain families (all Pteridophyta and the families Gramineae, Cyperaceae and Rubiaceae) a comparison was made between both Floras. This made it apparent that the two authors in many cases use different names for the same species. These cases are indicated in the lists. Various old names, which Stoffers uses in his publication of 1956, are also listed after the more recent name.

The authors also did not always list the same species for each of the different islands. With respect to the families mentioned above, species that are mentioned in the Flora by Howard but not in the Flora by Stoffers were added to the lists. The records are undoubtedly incom-

plete, since there are other families from which Howard mentions species that Stoffers doesn't. At the time of my visit on the islands I also found several species which neither author mentions. During further fieldwork the records undoubtedly will become longer. In addition to the scientific names of the species the popular names so far as known, are also listed in the records as well as the geographic range of distribution. With respect to the moss flora (Bryophytes) of Saba, lists of names can be found in the article by Wiersma (1984) and the report of Augustinus *et al.* (1985).

INVENTORY OF THE FAUNA

Species of the fauna were also listed per island (Appendix III). It concerns mainly vertebrates, because this group is the best known. Of the invertebrates only names and a few collecting sites are known. However, literature references about this have been included in the list of references. An exception was made for the diurnal butterflies, because it concerns unpublished data that were made available by L.D. Miller and J.Y. Miller. These data can be found in Annex IV.

In the lists of vertebrates, as with the plants, in addition to the scientific names, the common names, and where different from the common name, the island common name is listed. Also the geographic area of distribution is listed. With several animal groups the islands are inhabited by subspecies (=geographical varieties). These are also mentioned in the records with their geographical area of distribution.

Furthermore for each species the habitat is indicated, and in the last column information is given about places of occurrence and the conservation status. In the case of rare and/or endangered species in each case it is indicated whether these animals were found in August 1996.

REPORTING

This report presents an overview of what is known of the flora, fauna and vegetation of Saba up until now. The information collected during a one-week working visit in August 1996, was incorporated in this. On the basis of the most recent data an attempt is made to indicate the status of the different nature elements, while the most important threats are also discussed. In addition a short review is given of the efforts in the area of nature conservation management. In several areas the data are still incomplete. Wherever additional research is desirable for the benefit of nature conservation management, this is indicated. Finally a number of areas are indicated whose conservation is considered important to the conservation of biodiversity.

GENERAL INFORMATION

LOCATION OF THE ISLAND

Saba is located at 17°38' N latitude and 63°14' W longitude (De Palm, 1985). The island, like St. Maarten and St. Eustatius, is part of the island arc of the Lesser Antilles, extending from the Virgin Islands to Venezuela (Westermann, 1957). In fact there are two arcs to distinguish: an inner-arc and an outer-arc. Saba and St. Eustatius are the most northerly islands of the inner-arc (fig.1). Grenada borders



the inner-arc in the south. St. Maarten is part of the outer-arc,

Photo 1. The island of Saba seen from St. Eustatius.

which consists of the islands Sombrero up to and including Marie Galante. The islands of the inner-arc are geologically younger than the islands of the outer-arc and have geologically young volcanoes lacking on the islands of the outer-arc. Because of this the geological structure of the islands of the inner and outer-arc are different. The islands are located within seeing distance of each other (photo 1). The distance from Saba to St. Maarten is 48.1 km. (in a straight line), Saba and St. Eustatius are 33.6 km from each other (Land Register, 1997).

CLIMATE

The climate determines to a major extent which plants and animals are able to live in a certain part on earth. The climate of Saba is tropical (the average temperature in the coldest month lies above 18° C) and according to the system of Köppen falls between a savanna- and monsoon-climate (Stoffers, 1956). The average rainfall is 1101.3 mm per year (1891-1980, rain station in The Bottom), but the variation in yearly rainfall is large (De Palm, 1985). The monthly rainfall is very irregular too. No clear wet or dry season can be distinguished. Every 'wet' month may be dry and every 'dry' month may be wet. The average values over a large number of years do indicate however, that the least rain falls in February, March and April while the most rain falls in August, September, October and November. In those wet months the average rainfall is almost two and a half times as much as in the dry months. Lazell (1972) calls Saba and St. Eustatius "Snag-islands. This type of island has one high peak (more than 600 m high) that arrests (snags) a few clouds and is able to hold on to them mainly because of evaporation from the island itself. The lowlands of these islands are very dry. In Saba it is nevertheless the lowest lying rain-station (at 220 m) that on average collects the most rain (Braak, 1935 in Augustinus *et al*, 1985). There are however, only three rain-stations on the island and they are all located below 450 m altitude. According to Veenbos (1955) The Mountain on Saba has an average rainfall per year of more than 2000 mm, the kind of vegetation does in fact indicate this, however exact numbers are lacking. Augustinus' report (1985) indicates that differences in rainfall on Saba appear to occur above the critical height of 450 m. The rainfall there increases with height till it reaches a maximum on the top of The Mountain.

The average yearly temperature on Saba is probably the same as on St. Eustatius: 25.7° C (De Palm, 1985). The temperature drops however, with increasing height. In August 1980 the average day temperature at 600 m was 23° and at 800 meters 22° (Augustinus et al., 1985).

The top of The Mountain is almost constantly veiled in clouds. The relative humidity in August 1980 varied between 90-98% at a height of 600 meters and between 90-100% at 800 meters (Augustinus et al., 1985).

The dominant wind direction is east. All three Windward Islands are situated in the Atlantic hurricane zone. On average one tropical storm or hurricane passes at a distance of less than 200 km each year. Once every 4 or 5 years hurricane conditions occur (De Palm, 1985).

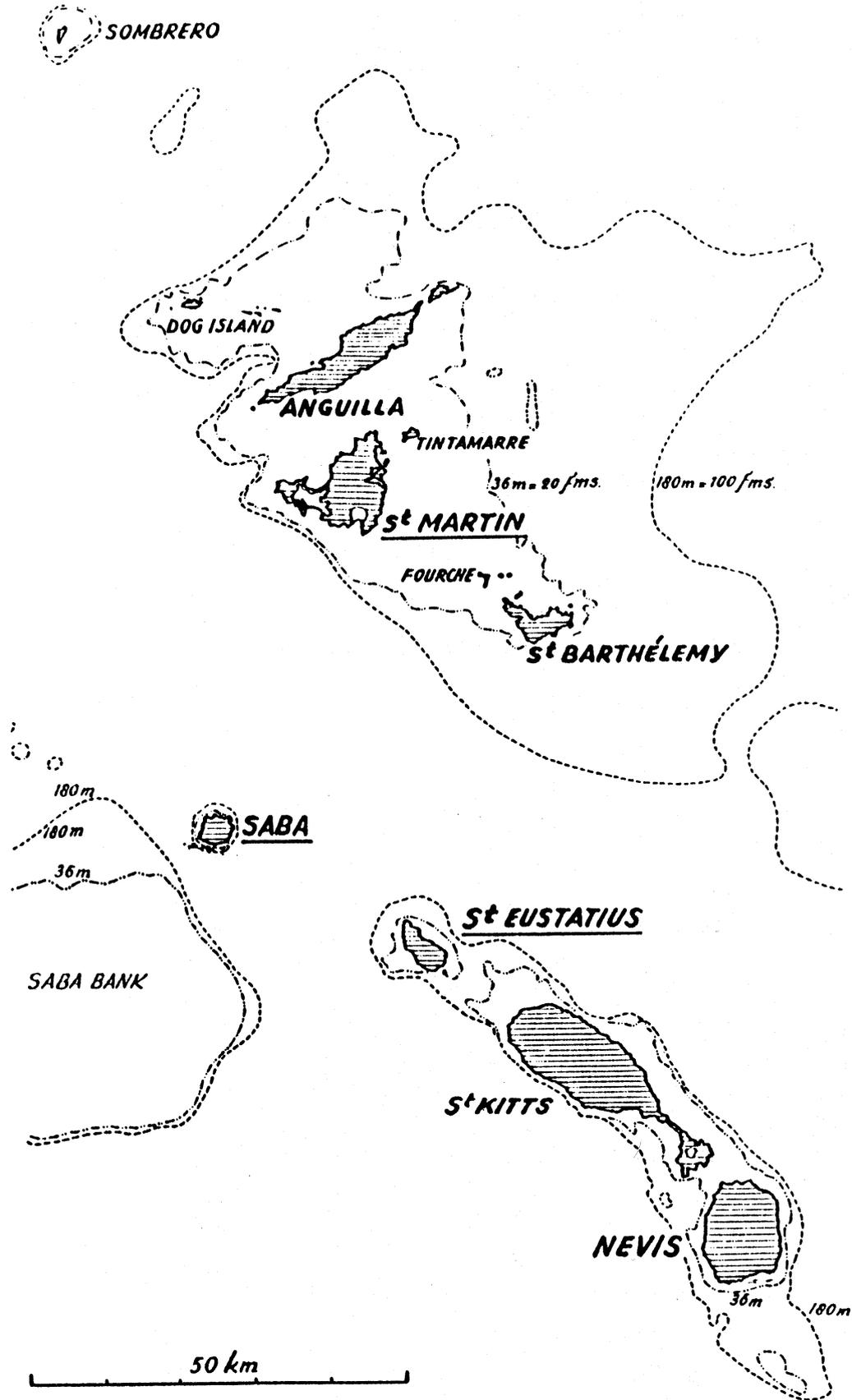


Fig. 1. Location of the Windward Islands of the Netherlands Antilles (Wagenaar Hummelinck, 1953)

TOPOGRAPHY

The island of Saba has an area of roughly 13 km² (De Palm, 1985). The island actually consists of the upper part of a volcano steeply rising from the sea (Westerman, 1957). The lowest part is situated beneath the sea, which is more than 600 meters deep around the island. The highest point of the island is the top of the volcano, called The Mountain or Mount Scenery, which is 870.4 meters high



Photo 2. The coast at Wells Bay.

(fig.2). Around the top there are several lower elevations, like

Troy (586 m.), Mary's Point Mountain (566 m), Peter Simon's Hill (223 m), Great Hill (423 m), Peak Hill (401 m) and Old Booby Hill (223 m). Weathering and erosion formed numerous deep, radially running ravines (so-called 'guts'). There are only a few flat areas. The largest is the valley where the little town The Bottom is situated. Another flat area is called Flat Point. Here the runway of the airport was built.

The sea has steadily undermined the sides of the island, causing them to be very steep or even vertical (photo 2). There are no permanent sand-beaches on Saba, only small rubble-beaches.

GEOLOGICAL HISTORY

Besides climate, geographic relief and soil conditions of the island determine its natural vegetation. Relief and soil condition are a reflection of its geological history.

Saba's geological history does not date back as far as that of the island of St. Maarten. It may be assumed that the first eruptions with which the Saba volcano's sub-marine phase started, date from the Middle or Upper-Pleistocene era ($\pm 500.000-10.000$ years ago), while the latest volcanic processes possibly continued till the middle of the Holocene (± 5.000 years ago) (Westermann and Kiel, 1961). The volcano has been dormant for a considerable time. The typical cone shape of so many volcanoes has not been preserved above sea level, below sea level however, this form still exists (Westermann, 1957). The lower parts of Saba consist mainly of agglomerates and tuffs (Westermann and Kiel, 1961) (fig. 3). In essence it is a strata-volcano, in which pyroclastic material dominates andesitic lava-streams. In the higher parts andesitic lava-layers become more numerous. Two lava-streams that erupted during the younger phase of the volcano now form the striking formations in the northwest of the island: Behind the Ridge and Flat Point.

There are no craters on Saba. A viscous lava plug formed in the original main crater of the strato-volcano in the last active period, closing the entrance. Mount Scenery is the top of the volcano with the cooled lava plug. Similarly and during the same period the several lower tops around Mount Scenery were formed. They are called lava domes (De Palm, 1985). At that time there were explosions of the type Mont-Pelee too (hot clouds of gas). These deposited the pyroclastic layers. This period of decline and the onset of dormancy of the volcano probably occurred in the middle of the Holocene (Westermann and Kiel, 1961).

Before complete dormancy the volcano had a stage in which there were no real eruptions anymore but there was some activity such as the outpouring of sulphurous gases, coming from not quite hardened magma in the deep (Westermann, 1957). This caused the sulphur and gypsum layer of Behind the Ridge, part of which was exploited in the 19th century. The old mine tunnels still exist.

The only recent and notable manifestation of post-volcanic activity is the warm water spring on the beach between Ladder Point and Tent Point (Westermann and Kiel, 1961).

Four kilometers Southwest from Saba lies the Saba-bank, an extensive submarine plateau (fig. 1). The sea above it is only 36 meters deep. Presumably there was an island there at the time of low sea level in the Pleistocene (Westermann, 1957). This island would have been abraded and drowned by the post-glacial sea level rise.



Fig. 2

Topographic chart

- | | |
|---------------------|---------------------------|
| 1. Tent Bay | 12. Great Hill |
| 2. Tent Point | 13. Troy |
| 3. Hot Water Spring | 14. Cow Pasture |
| 4. Well's Bay | 15. Mary's Point Mountain |
| 5. Diamond Rock | 16. Pirate Cliff |
| 6. Torrents Point | 17. Sandy Cruz |
| 7. Cave of Rum Bay | 18. Old Booby Hill |
| 8. Great Point | 19. Booby Hill |
| 9. Green Island | 20. Peter Simmon's Hill |
| 10. Core Gut Bay | 21. Rendez Vous |
| 11. Corner Point | 22. Thais Hill |

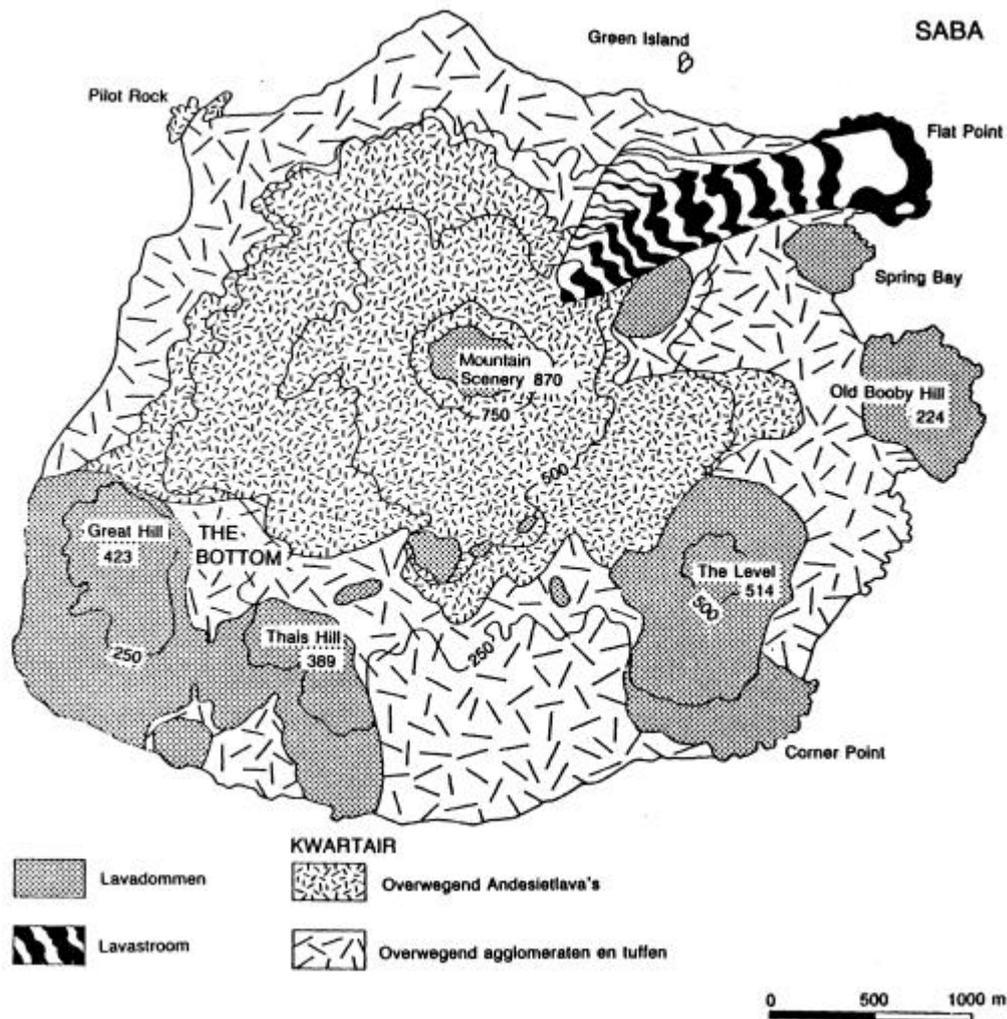


Fig. 3. Geological map (De Palm, 1985)

ECONOMICAL DEVELOPMENT AND LAND USE.

The present biodiversity does not only result from natural factors. It was impacted greatly by human activities. The main impact started with the European colonization of the island. Saba was populated by colonists from Zeeland around 1640 (De Palm, 1985), and later by English colonists. Around 1700 all of the available land on the island was cultivated with cotton and food crops. Sugarcane was grown too, and naturally rum was distilled. Most families lived on their plots in the mountains. Most men worked their lands together with their slaves. The island's relief made large plantations impossible. Only 216 of the 1300 hectares were usable for agriculture and cattle breeding. The Sabans produced mainly for their own subsistence. Consequently the number of slaves remained limited. There was some home industry nevertheless. Hammocks, shoes, stockings and hats were made. In 1772 a hurricane damaged the coffee and cotton cultivation. Ever since that year production became insufficient and people started to import cotton. In addition to the shortage in farmland, the inaccessibility of the island also made economical development problematic. In 1900 the situation became so bad that a member of parliament advised to evacuate the whole population to St. Eustatius. Nevertheless at the start of this century there was some recovery of agriculture and produce

was exported to Curaçao. In 1911 2500 people worked in agriculture. After that however, this sector declined steadily. Many Sabans left the island leaving a lot of agricultural land fallow.

After 1945 Saba's isolation slowly lessened. A road was built and in 1963 the airport was opened. In 1972 construction of the pier at Fort Bay followed. Bigger ships were able to moor then. Harbor related activities gradually increased. At the east side of the harbor a stone crushing facility started, which exported sand and gravel to St. Maarten and the other islands (photo 3). Some recovery of ag-



Photo 3. Stone crusher at Fort Bay.

riculture was made because of the increased export possibilities and governmental support. In the nineteen eighties however, only 63 hectares of the arable lands were cultivated. The government owns only 15% of Saba. Thus there is no land to be leased. Husbandry too is limited, but is very damaging to nature. This is because practically all goats are left to roam freely (Romeijn, 1987). Southeast of the highway the goats are private property (fig. 4). Elsewhere the goats are feral. Large parts of Saba remain permanently deforested because of this grazing (Romeijn, 1987).



Photo 4. Top of The Mountain.

In 1973 a British company was granted permission to build a radio mast on top of the Mount Scenery (photo 4). In addition some arts and crafts developed as small businesses such as a small belt factory and a fabric printer. Tourism also increased since the island became more accessible. Daytrips are made from St. Maarten among other things. Tourists are attracted by the beautiful nature, not however by beaches, since Saba has no sand beaches. In 1993 an American 'Medical School' settled on the island. New houses are now being built higher on the slopes too. The population of 956 persons in 1970, increased to about 1200 in 1995 (CBS, 1996).

There are now four communities in Saba: The Bottom, St. John's, Windward side and Hell's Gate. A paved road connects them. All habitation is concentrated in the southeastern part of the island and located between 200 and 450 meters altitude. The northwestern half of the island is as yet uninhabited.

A paved road was constructed however, from the Bottom to Well's Bay in the northwest.

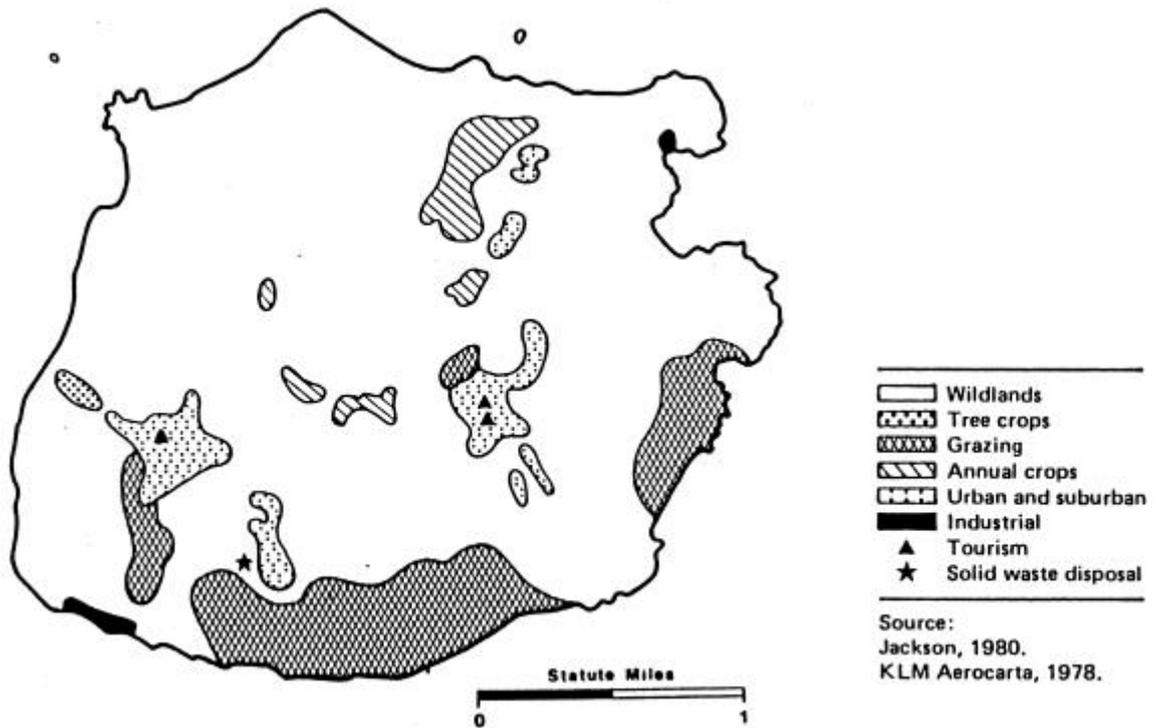


Fig. 4. Land use (after ECNAMP, 1980)

BIOLOGICAL SURVEY

THE FLORA

According to the data of Stoffers (1962,1963, 1966, 1973,1979, 1980,1982 and 1984) and Howard (1979, 1988 and 1989), and based on personal field observations (1966) the flora of Saba consists of 520 wild plants: 59 ferns and related species (Pteridophyta) and 461 seed-plants (Spermatophyta) of which 110 are monocotyledons and 351 are dicotyledons (Appendix I and II). Of the 110 monocotyledons 65 belong to the Cyperaceae and Gramineae (Appendix II).

There are no known island-endemic species on Saba Stoffers mentions two species in his publication, but both turned out to be species with a wider distribution. However there are species with a limited geographical distribution area. Of the 520 species, 98 (18.8%) are limited to the West Indies (including the south of Florida in some cases) and from these, 24 species only occur on the Lesser Antilles (including the Virgin Islands). This last group consists of 4.6% of the total number of plant species. Six species are limited to only a few islands. Two of those only occur on Saba and on one of the Greater Antilles, the others are also found on some other Lesser Antilles islands. It concerns the following species:

- *Bunchosia jamaicensis* (Malphiaceae) is found only in Saba and in Jamaica. Only one location is mentioned by Bolding: seawards from Tentgut Hill (Stoffers, 1984) Bolding's collection dates from 1906 (Stoffers (1956).
- *Mitracarpus polycladus* (Rubiaceae) is a species found in Saba and Puerto Rico. This species is found in several localities, both far in the past as well as recently, e.g. along the road between The Bottom and Windward side (Bolding in Stoffers (1984) and at Fort Bay (Arnoldo in Stoffers, 1984). Brother Arnoldo visited Saba in 1947 and 1950.
- *Eupatorium macranthum* (Compositae) is limited to Saba and the islands of the St. Kitts bank. Howard (1989) does not mention locations.
- *Begonia retusa* (Begoniaceae), the Mountain Manna, is found on Saba, St. Eustatius, St. Barths, St. Kitts and Montserrat. Stoffers (1966) reports several locations, his own as well as those of Arnoldo and Bolding. All locations are situated on The Mountain or between Hells' Gate and Santa Cruz. Stoffers visited Saba in 1953 (Stoffers, 1956). According to Stoffers the habitat of this species is the mountain forest.
- *Agave karatto* (Agavaceae) can be found on Saba and also on Antigua, Barbuda, St. Kitts, Montserrat and La Désirade. Howard (1979) does not mention collecting sites.
- *Myrcia citrifolia var.imrayana* (Myrtaceae), named Redwood or Birds Cherry, only grows on the Windward Islands of the Netherlands Antilles, and in Guadeloupe and Martinique. Several locations of this species are known, scattered over the island. (Stoffers, 1982).

In addition to these six species, a rare variety of the West Indies species *Charianthus purpureus* is found in Saba, i.e. *crinitus*. It does not grow anywhere else except in St. Kitts. In August 1996 it was found flowering on top of The Mountain (personal observation) (photo 5).

is remarkable that the smallest island of the Windward Islands in the Netherlands Antilles possesses almost as many species as the island of St. Maarten that is 6.6 times as big. This is



Photo 5. *Charianthus purpureus* var. *crinitus* in elfin forest.

lands, e.g. the Mountain Cabbage, *Prestoea montana*, and three different species of tree ferns. Many of these species are restricted to the Lesser Antilles with Saba the most northern island of their range of distribution. Howard (1989) indicates the importance of the Mountain Mahogany (*Freziera undulata*) that grows on the top of Mt. Scenery. This tree, although it also grows in Jamaica and the

other islands of the Lesser Antilles, is nevertheless much smaller there, and hardly ever dominates the vegetation like in Saba. Other plants in Saba that are unique for the Netherlands Antilles are, among others, the insect catching *Utricularia alpina* and the saprophyte *Voyeria aphylla* growing in the same area.

With regard to the Bryophyte flora in Saba, 48 species of leaf mosses are known (Wiersma, 1984) and 31 species of liverworts (Augustinus et al., 1985). Saba and St. Eustatius' leaf moss flora are characterized by a high percentage of neo-tropical species and an extremely low rate of endemism (Wiersma, 1984). The representation of bryo-geographical elements is very consistent with that of the Lesser Antilles as a whole, except with regard to endemism, which amounts to 12% in the Lesser Antilles as a whole and only 2% in Saba and St. Eustatius. However, endemism occurs only on the larger and older islands like Guadeloupe and Martinique. The very young and small islands Saba and St. Eustatius do not harbor endemic species. Only one endemic variety for the top of Saba has been described: *Campylopus atratus* var. *sabaensis*. Several species have a relatively small distribution range and all of them can be found above 600 meters altitude. Three species are called Caribbean species by Wiersma (West-Indies and the nearby coasts of Central and South America): *Leucoloma albulum*, *Crossomitrium orbiculatum* and *Porotrichum insularum*.

connected to the wide variety in habitats, including the very diverse habitat of the (secondary) rainforest. Especially Pteridophyta are numerous (photo 6). The climatological circumstances on The Mountain are very favorable for this group. Of the 59 species at least 40 species are found in this area. Furthermore Saba's flora consists of species that are restricted to the unique mountain formations,

completely absent or very limited in the other two Windward Is-



Photo 6. Three species of ferns, probably *Adiantum tenerum*, *Pitogramma calomelanos* en *Polypodium spec.*

THE VEGETATION

The following quotation from Stoffers' publication (1956) aptly describes Saba's pattern of vegetation: "The zoning of the plant societies can be perfectly demonstrated in high volcanic islands. Beards' classification starts with rainforest, occurring in places where 'the yearly aridity stops being effective, and where a year-round abundant supply of moisture exists'. The area below this zone is submitted to a relatively dry climate, which results in either a vegetation of dry evergreen forest or seasonal forest, while immediately along the coast a small and limited zone is influenced by the salt laden wind, which has a dehydrating effect and is mechanically destructive. This results in a dry evergreen forest-like vegetation. Although the rainfall keeps increasing and is always present above the rainforest level, the rainforest does not continue to the top of the mountain. A series of mountain formations results, in which growth progressively decreases again, both in shape and form. These mountain formations consist of lower mountain rain forest, mountain brushwood and elfin woodland, and their secondary or sub-climax communities".

Stoffers distinguishes the following types of vegetation on Saba:

Climactic communities

- ☐ Optimal formation
 - ⊙ Rain forest (1)
 - ⊙ Secondary rain forest (2)
 - ⊙ Tree-fern brake (3)
 - ⊙ Miconia thickets
 - ⊙ Piper dilatatum thicket
 - ⊙ Pioneer forest
- ☐ Montane formations
 - ⊙ Palm brake (4)
 - ⊙ Elfin woodlands (5)
- ☐ Seasonal formations
 - ⊙ Woodland derived from seasonal forest (6)
 - ⊙ Leucaena thickets
 - ⊙ Croton thickets
- ☐ Dry evergreen formations
 - ⊙ Woodland derived from dry evergreen forest (7)
 - ⊙ Croton thickets (8)

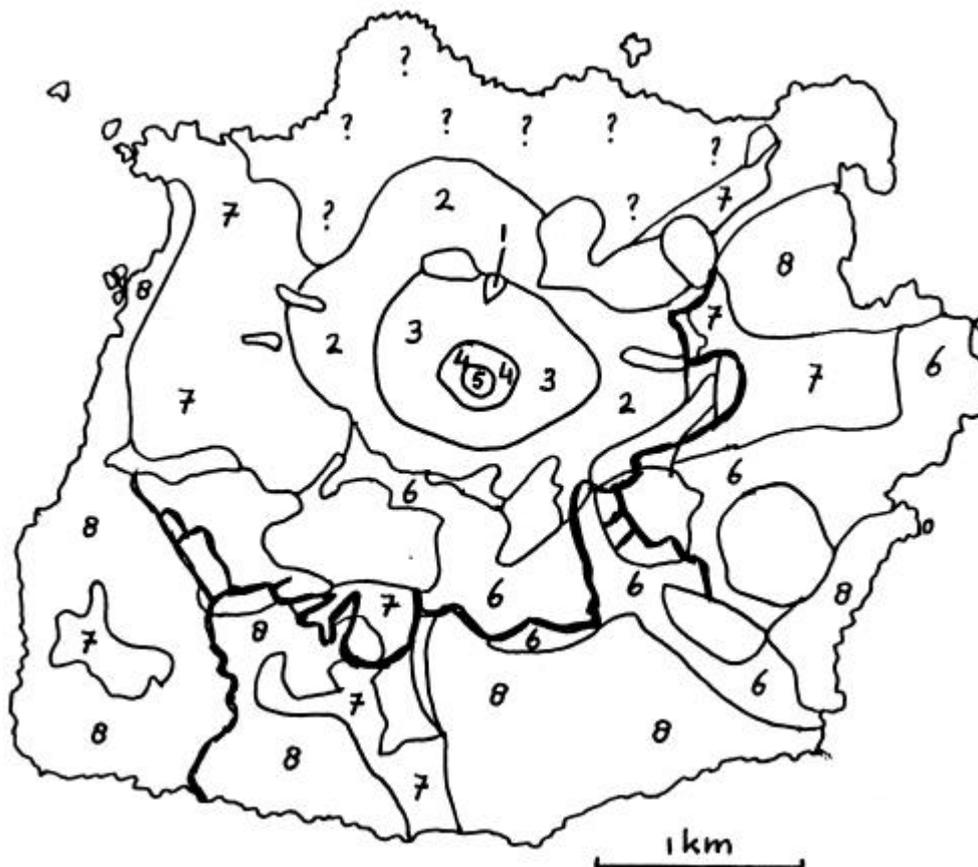


Figure 5. Vegetation chart (Stoffers, 1956)



Photo 7. Tree trunk covered in mosses, bromeliads, and Aracaeids in the elfin forest.

impenetrable vegetation of 6 meters high. On the leeward side of the mountain, just below the top however, this forest grows higher and Mountain Mahogany (*Freziera undulata*) trees of up to 15 meters tall were measured here (Van 't Hof, personal med., 1997). The branches of the trees and bushes are weighed down with mosses and other epiphytes (photo 7), mostly ferns, but orchids are also present. The Mountain Cabbage (*Prestoea montana*= *Euterpe globosa*) and tree ferns can be found, though in small numbers. Vines and creepers are numerous and epiphytes also grow terrestrial. Many trees are bush-like. The Mountain Mahogany and *Myrsine coriacea* (= *Rapanea coriacea*) are dominant. Among the shrubs *Marila racemosa*, *Charianthus purpureus var. crinitus* (= *C. crinitus*) and the White Bell (*Hillia parasitica*) often occur. Purple Heart (*Phytolacca rivinoides*) and *Psychotria guadelupensis* (= *P. pendula* in Stoffers, 1956) are present in small numbers. In the herb layer many ferns, Mountain Manna (*Begonia retusa*) and in some places *Anthurium cordatum* are found. The largest number of species consists of vines and epiphytes.

Leaf-mosses and liverworts play an important role in the vegetation types of Saba, both qualitatively and quantitatively (Augustinus et al., 1985). Under conditions of maximum humidity because of the continuous fog and rain showers, a remarkable development of bryophyte flora

Edaphic communities are lacking on Saba. The climax and mountain formations only occur above about 400 meters altitude in Saba. There, the rain is sufficient to provide the plants enough water throughout the whole year. Mountain formations are found above 800 meters. Lack of sunlight, due to mist, lower temperature, and the influence of the wind play a key role here.

The following is a short characterization of the most important types of vegetation from high to low (figure 5), indicating the importance of each, and possible endangering factors.

Elfin woodland

Elfin woodland, belonging to the montane formations, covers the top of The Mountain between 825 and 870 meters altitude (Augustinus et al., 1985). The average temperature and light-intensity are low there compared to lower parts of the island and the relative humidity is high. The elfin woodland consists of only a few tree species (Stoffers, 1956). These trees are mostly low and gnarled, and often form an



Photo 8. Liverworts on a palm leaf in the elfin forest.

took place on the top of The Mountain. In contrast with the moss flora in (the remains of) the elfin woodland in St. Eustatius, the moss flora in the elfin woodland in Saba consists mainly of liverworts (photo 8). Leaf mosses are rare. The trunks and branches of the trees and even the aerial roots of the epiphytic bromeliads are covered with a thick layer of liverworts. The weight of these mosses on each well-developed tree is estimated at hundreds of kilograms. The abundance of liverworts in this vegetation is larger in quality and quantity than in all other vegetation types.

Even though elfin woodland is found all over the Caribbean on high summits and mountain ranges that are veiled in clouds almost permanently (Stoffers, 1956), Howard says the elfin woodland in Saba is unique. The Mountain Mahogany also occurs in elfin woodland in other islands, however, nowhere is it the dominant species. According to Howard this tree is bigger on Saba than on the other islands. In the elfin woodland of St. Eustatius the Mountain Mahogany is absent. Here the Wild Balsam (*Clusia major*) dominates.

In the past a small-scale disturbance took place through the planting of tannia- and banana, and also by the construction of the present trail to the top and the building of the radio mast, the latter being the major disturbance. Howard (1989) points out that the vegetation of the top forms a thick water absorbing layer, which slowly releases its water to the lower levels, perhaps even down to the areas where agriculture takes place, including Rendezvous and the vilages of The Bottom, Windward Side and Hell's Gate. This "sponge" has already been broken by the construction of the transmitting mast, and the effects are visible in the form of a different kind of vegetation. Howard cautions that further removal of the vegetation for the benefit of more masts will deteriorate the situation. Besides, it will affect what is left of the unique vegetation on the top and may even impact the vegetation on all the slopes of Mount Scenery.



Photo 9. Palms (*Prestoea montana*) in the palm brake.

Palm brake

The palm brake lies below the elfin woodland between 775 and 825 meters altitude (Augustinus et al., 1985) and also belongs to the montane formations. This type of vegetation appears under the same climatological conditions as elfin woodland, but only on very steep slopes with loose substrate prone to sliding. Thus Beard (1949) considers this type of forest as a 'disturbance climax'. According to Romeijn (1987) in places where little stonewalls remain from former miniature cultivation plots the forest shows the same structure as in the adjacent areas, indicating a very fast regeneration capacity of the palm brake. In the palm brake the Mountain Cabbage (*Prestoea montana*= *Euterpe globosa* in Stoffers, 1956) is typical and dominant (Stoffers, 1956) (photo 9). The forest height is very variable (between 7 and 20 meters). There is no shrub layer, there is however, usually a very rich herb layer dominated by ferns. Here and there little groups of tree ferns are to be seen. Elsewhere in the Caribbean this type of vegetation is also found, and on several Lesser Antilles the Mountain Cabbage also is an

important species. Because this type of vegetation is connected to steep slopes, anthropogenic disruption has been slight. Furthermore goats only penetrate the forest above the 600 meters (Romeijn, 1987) in times of severe aridity. This forest can be counted as one of the few original types of forest.

Tree-fern brake

Below the palm brake lies the tree-fern brake. At an altitude of 575 meters there is a sudden change of secondary rain forest into this tree-fern forest (photo 10). The vegetation consists of up to 4-meter tall tree-ferns (*Cyathea arborea* en *Cyathea antillana*), standing very close together and making it too dark for a shrub or herb layer under the foliage. This vegetation is typical for secondary vegetation, which appears after the rainforest has disappeared because of human activities or a natural fire. The report of Augustinus et al. (1985) proposes that high humidity is essential to the development of this type of forest. The leaf moss flora of the tree-fern brake is much poorer than that of the secondary rain forest, but the liverwort flora is equally rich (Augustinus et al., 1985).

According to Romeijn (1987) the success of the tree-ferns can partly be explained by the fact that goats do not eat the leaves. Although goats occur mostly below the height of 300 meters, in arid times they can penetrate to above 600 meters. By doing so they influence the vegetation on the major part of the island.



Photo 10. Tree ferns (*Cyathea* sp.)

Rainforest

True rainforest, as a climax formation such as known from the larger Antilles, does not exist on Saba (Stoffers, 1956). There is a type of vegetation however, that can be called ravine rainforest. It is found only in deep ravines, too steep or too inaccessible to be planted. Two locations are known: Down Gut (Van 't Hof, pers. comm., 1997) and a ravine at Island Gut (Stoffers, 1956). In this latter location Bird's Cherry (*Myrcia citrifolia*) is the most common species. This tree reaches a height of 8-10 m. Bird's Cherry is accompanied by *Sloanea massoni* (= *S. truncata* in Stoffers, 1956). *Psychotria berteriana* is abundant as an often-bushy 6 m tall tree. Tree ferns are numerous, but the Mountain Cabbage is only found in small numbers. The climbing Elephant Ears (*Philodendron giganteum*) and *P. lingulatum* are abundant, and *Marcgravia umbellata* is common. The brush layer is rather open. Ferns are abundant. In the herb layer scattered groups of Wild Banana (*Heliconia bihai*) can be seen. Only one epiphyte was collected: *Tillandsia utriculata*. Trunks and leaves are generally covered in liverworts. Leaves are of medium size and evergreen. Neither buttress roots nor prop roots are found. According to Stoffers (1956) this type of rainforest has not been described for any of the other islands of the Lesser Antilles or Virgin Islands.

Secondary rainforest

Originally the major part of the zone between 420 and 650 m was covered in rainforest (Augustinus *et al.*, 1985). Since the colonization of the island a large part was deforested for agriculture. The agricultural area gradually decreased during the twentieth century however. Only at Troy, Rendezvous, and Hell's Gate some small plots can still be found (photo 11). Nowadays mostly secondary rainforest (photo 12) is seen in this zone, in which many signs of past anthropogenic influence are still present, such as terraces with low walls and planted fruit trees such as Guava (*Psidium guajava*), Cacao (*Theobroma cacao*) and Avocado (*Persea Americana*).



Photo 11. Terraced agricultural plots.



Photo 12. Secondary rain forest.

Usually thickets of young trees are found here, quite variable in height from place to place (Stoffers, 1956). Some trees have aerial roots. Undergrowth is practically absent, save some areas with *Anthurium cordatum*. The strangling fig (*Clusia major*) is frequently seen. Several typical rainforest species are found such as Black Seet Wood (*Nectandra krugii*), Hairy Plum (*Hirtella traindra*), Blue Berry (*Symplococcus martinicensis*) and Sticking Berry (*Cordia sulcata*). They signal the development of a new rainforest. Ferns are often abundant. Ten different species of orchids are found here on the trees together with a number of Bromeliads mostly of the genus *Tillandsia* (Stoffers, 1960). The low stone walls are overgrown with lichens, Piperaceae and ferns. As the altitude increases conditions become gradually more humid. The forest is regularly veiled in mist, causing a decrease of average light intensity and temperature (Augustinus *et al.*, 1985). Of all the vegetation types studied in Saba the moss flora present here is the richest. The number of species in this vegetation type increases with increasing altitude. Liverworts too are well represented.

Miconia en Piper dilatatum thickets

In some places in the secondary rainforest the vegetation consists mainly of thickets of *Miconia laevigata* and *Tetrazygia discolor*, or of trees with a dense shrub layer, in which *Piper reticulatum* often occurs (Stoffers, 1956). The first type of vegetation is called Miconia thicket by Stoffers, and the last Piper dilatatum thicket. According to Stoffers the latter was much

influenced by human activities, particularly by charcoal burning. At present however, charcoal burning no longer occurs (Van 't Hof, pers. med., 1997).

Woodland derived from dry evergreen forest

In the western part of the island between Parish Hill and Great Hill, and The Bottom and Torrents Point, and in the east below English Quarter (fig. 6) between 200 and 350/420 meters altitude (Augustinus et al., 1985), woodland derived from dry evergreen forest is found.

In the west this vegetation covers the largest area. This area is located on the drier leeward side of The Mountain. The vegetation here is very dense, about 5 meters high and made up of species of the genus *Guettarda*, *Eugenia*, *Myrcia*, *Citharexylum*, *Pithecellobium*, *Chiococca*, *Croton* and *Lantana*. From this several higher trees emerge, such as the Wild Mispale (*Morisonia americana*), the Tamarind (*Tamarindus indica*), the White Cedar (*Tabebuia heterophylla*= *T.pallida*) and *Trema lamarckiana* (= *T.lima* in Stoffers, 1956). In addition to the Tamarind other fruit trees from elsewhere are also found here and there, proving that these areas were formerly cultivated to some extent by Saba's inhabitants. In the ravines banana trees are usually growing at this altitude. According to Stoffers (1956) the vegetation below English Quarter in the east was severely impacted by human activity. As a result of all the past disturbances the vegetation, derived from dry evergreen forest, now shows a varied pattern.



Photo 13. Bare Manchineel trees at Core Gut Bay.



Photo 14. Sparse vegetation on the hills at Core Gut Bay.

Notable is part of the area north-east of Middle Island and along the stairs to Ladder Bay, where Stoffers saw many young Mahogany trees (*Swietenia mahagoni*) (personal observation, 1996). These trees have now grown into full-grown specimens (personal observation, 1996). Howard remarked in 1989 that within a few decades, seedlings of these trees had grown into fruit bearing trees. He considers it possible to plant these trees for wood production.

The flora of the leaf mosses in this area includes nine species (Wiersma 1984), much less than in the secondary rain forest (23 species). The liverwort flora of this type of vegetation is called poor (Augustinus et al., 1985).

Woodland derived from seasonal forest

Between Rendezvous, The Level and Old Booby Hill a secondary woody vegetation, derived from seasonal forest, is found. In some parts there are many loose rocks and locally it is very steep. Partly it is used as grazing land. The vegetation shows no closed

canopy. The density varies from very dense to rather open. Several taller shrubs and trees in this vegetation are *Miconia laevigata*, the Maho (*Daphnopsis americana* ssp. *caribaea* = *D. caribaea* in Stoffers, 1956), Sweet Wood (*Nectandra coriacea*) and Red Wood (*Inga laurina*). Grazing prevents progression in the succession series.



Photo 15. Northern hill area seen from Great Point.

Croton thickets

In lowest and driest parts of Saba Croton thickets are found (photo 13). Sometimes a few little trees or high shrubs are scattered in it, sometimes there is only Marrow (*Croton flavens*). Wild Sage (*Lantana camara*, *L. involucrata*) and several cactus species can often also be found. There are no leaf mosses here and only a few liverworts (Augustinus et al., 1985) The lower parts in the south and east are used for goat grazing, whereas in the northeast there are goats gone completely wild (Romeijn, 1987).

Even though Stoffers does not mention a coastal vegetation in his publication (1956), a small strip of Hippomane woody vegetation at Core Cut Bay can be reported (personal observation, 1996). Like in St. Maarten it was also in a bad condition (photo 14). Most trees were bare. Probably here too this is due to hurricane Luis.

Like in St. Eustatius the description of Saba's vegetation is incomplete. Stoffers did not consider the vegetation in the northern part of the island below roughly 500 meters. This area was visited however in August 1996. It is a wild and pristine area of high scenic value (photo 15). The coast here is very steep and the vegetation in the coastal area is influenced by the strong trade winds. In several steep ravines the vegetation is very lush. There are several points where the visitor can enjoy the beautiful views (photo 16).



Photo 16. Torrents Point with Cave of Rum Bay.

The elfin woodland is very important due to its regional rarity, the presence of unique species, and also because of its water retaining potential. The palm brake and the ravine rainforest are important especially because of their virginity, and the recovering secondary rainforest mainly because of its wealth in species, both of higher plants as well as of bryophytes. The secondary vegetations below the rainforest are mainly important in the control of erosion, and they also have scenic value, especially the parts between The Bottom and Well's Bay.

With regard to the woodland derived from dry evergreen forest, it should be taken into account that dry tropical forests have internationally been severely impacted by human activity and have for instance practically disappeared in Central America and certain areas in South America (Janzen, 1998, Ceballos, 1995).

THE FAUNA

Mammals

A total of five bat species were found at any time in Saba. (Appendix III).

Husson (1960) only mentions one, the St. Vincent Fruit-eating Bat, however on the Knox Jones and Phillips (1970) list of bats of the Lesser Antilles, three species are mentioned. A fourth species was collected in August 1996 and a fifth species in April 1997. Four of the five species can also be found on St. Eustatius and St. Maarten, one only on Saba. None of the species is endemic for Saba.

The St. Vincent Fruit-eating Bat (*Brachyphylla cavernarum*) is a West Indian species that can be locally abundant (Petersen et al., 1996). It is apparently not very sensitive to the effects of hurricanes because of its omnivorous diet (Petersen et al., 1996). This bat was collected in a small cave in 1949 and 1959, close to the coast at Landpoint (Husson, 1960). The name Landpoint is unknown on Saba. Surely Tentpoint was intended with Landpoint. Westermann and Kiel, (1961) mention the name Landpoint on their map of Saba instead of Tentpoint. Furthermore, Wagenaar Hummelinck (1979) mentions a cave on Saba not formed in limestone, supposedly called Bat Hole and situated on the coast west of Fort Bay. In this category of caves the same author mentions Chamber and Hall beneath the top of Great Hill. In August 1996 the cave at Tent Point was localized but could not be reached.

The Free-tailed Bat *Tadarida brasiliensis antillarum* and the Mastiff bat, *Molossus molossus debilis* are both small and insectivorous. They belong to the same families and resemble each other very much. The Free-tailed Bat is limited as sub-species to the West Indies and the Mastiff bat as sub-species to the northern Lesser Antilles (Knox Jones and Phillips, 1970). The Free-tailed Bat can be found in houses, in caves and in hollow trees. The Mastiff Bat is really a house bat. It prefers to live in attics. In Saba a Mastiff Bat was collected for the first time in August 1996. A resident of Saba (Mr. Don McGehee) found the animal in a swimming pool. Several Free-tailed Bats were netted nearby a swimming pool (Walsh-McGehee, personal comm., 1997).

The Mexican Funnel-eared Bat (*Natalus stramineus stramineus*) is a widely spread insect-eating American species. The sub-species however, is found only in the Lesser Antilles. In addition to Saba, this species was only seen in Antigua, Anguilla, Montserrat and Dominica.

The Jamaica Fruit-eating Bat (*Artibeus jamaicensis*), a large fruit-eater, is widespread on the American continent. It can easily cover the distance to these islands. Besides the small cave at Tent Point, where the St. Vincent Bat was found, no information was found in the literature about locations of diurnal roosts or foraging areas. In addition to the cave at Tent Point, informants only mention the sulphur mine at Pirate Cliff. A bat colony is supposedly roosting here. The sulphur mine was visited in August 1996, but no bats were found. The entrance of this mine caved in some time ago however, leaving only a small hole. Even though there are no other known caves in Saba, it is possible that there are holes in the numerous steep cliffs, which are used by bats. Furthermore buildings and hollow trees can serve as diurnal roosts.

Apparently there are no nectar-eating bats in Saba, which play an important role in pollination in many eco-systems. There are however fruit-eating bats, which are important for the spreading of seeds.

Birds

Differences between avifauna of the islands are caused by a combination of factors: the size of the island and the height above sea-level, variety in habitat, isolation and the influence of human and several imported animals (Evans, 1990). Saba being the smallest of the Windward Islands one would expect the smallest number of breeding birds. However, the number of breeding birds is the same as in St. Eustatius. Of course the size of the island limits the number of birds that can maintain themselves there, but this is partly compensated by the diversity and richness of the available habitats. Although coastal habitats are mostly lacking, there is large variety in terrestrial habitats, from dry Croton thickets to rainforest and elfin woodland. Especially the (secondary) rainforest offers optimum possibilities for birds. Although in the past a large part of this rainforest was cut down for farming, today many fields are deserted and the forest once again has the opportunity to develop. Also, several steep, densely overgrown ravines are inaccessible for people. In addition the population density is low, even lower than in the past, and large parts of the island are uninhabited. Furthermore the Mongoose is absent. These are all favorable conditions for the avifauna. In Saba inland bays and salina's are completely absent, but there are two very small rocky islands in front of the coast, that accommodate breeding seabirds.

Saba's avifauna consists of 26 sedentary and breeding birds, and 36 migratory birds and visitors from elsewhere (Voous, 1983). There are 17 seabirds, of which 5 species nest in Saba (Appendix III). None of the species is endemic to the island. However there are species or subspecies with a limited geographical range.

Most of Saba's breeding birds are West Indian species: 15 of the 26, of which 5 are endemic to the Lesser Antilles and the Virgin Islands. Of 4 species the subspecies are limited to the Lesser Antilles (Appendix III).

The following species are endemic to the Lesser Antilles and Virgin Islands at the species level:

- ★ *Eulampis jugularis*, the Purple-throated Carib
- ★ *Sericotes holosericeus holosericeus*, the Green-throated Carib
- ★ *Margarops fuscus*, the Scaly-breasted Thrasher
- ★ *Cinlocerthia ruficauda pavidus*, the Trembler
- ★ *Loxigilla noctis coryi*, the Lesser Antillean Bullfinch

And the following subspecies:

- ★ *Zenaida aurita aurita*, the Zenaida Dove
- ★ *Columbigalla passerina nigrirostris*, the Common Ground Dove
- ★ *Orthorhynchus cristatus exilios*, the Antillean Crested Hummingbird
- ★ *Euphonia musica flavifrons*, the Blue-crowned Euphonia

Terrestrial species

Caribs and Hummingbirds

The Green-throated Carib and the Antillean Crested Hummingbird exploit the wealth in flowering plants both in the forest as well as in the gardens and along the agriculture plots. They are common birds, but the Crested Hummingbird is not seen above the 400 meters (Voous, 1983). The Purple-throated Carib is more a bird of the humid forest and is rare on Saba. Usually it is only found in the lush vegetation at higher altitudes, especially in the tree-fern woods and in the banana plantings at the top of The Mountain (Voous, 1983). This bird was observed in the area of Sandy Cruz in August 1996. In the field it looks black and it flies like a small torpedo through the lower layers of the forest.

Thrasher

The Scaly-breasted Thrasher resembles the Pearly-eyed Thrasher (*Margarops fuscatus*) and lives in the same habitat, but in Saba it is more common (Voous, 1983). It is a shy bird that stays hidden in the dense foliage of the canopy layer. It feeds mainly on fruit. Sometimes both species are found in the same tree when they visit the fruit plantations. The Scaly-breasted Thrasher was observed only once in the forest of Troy in August 1996. The Pearly-eyed Thrasher however, was seen at several sites and was notably numerous in the secondary evergreen forest between The Bottom and Well's Bay.

Trembler

The trembler can be found in the humid cloud forests above 450 meters in Saba, where it moves between the vertical trunks of the tree-ferns and the lianas, looking for food among the bromeliads, orchids and other epiphytes (Voous, 1983). In general it is a quiet and inconspicuous bird, which can be easily missed (Evans, 1990). However in August 1996 it was observed and heard at Mount Scenery and Troy. This bird is limited within its range to mountain forests (Voous, 1983). On several islands it is an endangered species or may possibly be extinct already, like in Martinique. Saba's subspecies is limited to only a few islands: Saba, St. Eustatius, St. Kitts, Nevis, and Montserrat. Conservation of the vegetation of The Mountain above 450 meter is undoubtedly of major importance to the continued survival of this regionally rare species/sub-species.

Bullfinch

The Lesser Antillean Bullfinch is one of the more common birds in the Lesser Antilles (Evans, 1990). On Saba it feels at home in the shrubs at sea-level as well as in the humid forest high on The Mountain, and in the gardens of the houses (Voous, 1983). Saba's subspecies lives only on the islands south of Saba down to Montserrat. In St. Martin another subspecies is found.

Smaller dove species

The Zenaida Dove and Common Dove are species that live in the dryer habitats, although the Zenaida Dove sometimes penetrates the rainforest (Evans, 1990). The range of the Zenaida Dove given for Saba in The Preliminary Data Atlas of ECNAMP (1980) only includes the lower slopes along the coast, but according to Voous (1983) the bird is typical for the montane forest just like the Pearly-eyed Thrasher. In August 1996, it was observed in the area of Cow Pasture and at Lower Hell's Gate, while being especially numerous in low shrubs along the coast of Tent Bay. The Common Ground Dove is one of the most numerous species in inhabited areas in the other islands. However Voous reports it to be remarkably rare in Saba.

The Preliminary Data Atlas only mentions Flat Point as the range of the Common Ground Dove, but this bird was observed at the same location as the Zenaida Dove at Tent Bay in August 1996. Both birds are mentioned in the ECNAMP-report as species that are hunted.

Euphonia

The Blue-crowned Euphonia mostly lives in the rainforest within its range, especially montane rainforest, but occasionally also in dry woody vegetation and secondary brushland (Evans, 1990). It is not common there and easier heard than seen. This beautiful bird was seen a few times on Saba, always in the lush overgrown ravines above 300 meters (Voous, 1983). Breeding has not been proven, and since 1952 several observers looked for it in vain. It was not seen in August 1996, and none of the informants had ever observed one either. The species must be rare, endangered or already extinct.

Larger dove species

Two other larger dove species that are also hunted according to the ECNAMP report, are the Bridled Quail Dove (*Geotrychon mystacea*) and the Red-necked Pigeon (*Columba squamosa*).

Outside of the Lesser Antilles and the Virgin Islands, the Bridled Quail Dove is only found in Puerto Rico (Evans, 1990; Chipley, 1991), though it is rare there, except in a few locations (Rivera-Milán, 1992). This bird is most abundant in the larger Virgin Islands. There its numbers increased since the beginning of this century. Elsewhere however, the species has declined and according to Evans (1990) it should be considered highly endangered in the southern Antilles. In Dominica and Barbuda it is extinct already. The Bridled Quail Dove is Saba's only species mentioned in the ICBP/IUCN Red Data Book of 1992. It is listed as a nearly threatened species. On Saba this bird is rather common in the woody ravines and the cloud-forest (Voous, 1983). It even visits the gardens in Windwardside at 400 meters high.

According to the Preliminary Data Atlas (1980) it is also found in the secondary dry evergreen forest. It also occupies this latter habitat in the island of Guana (one of the Virgin Islands), where it avoids areas with cactuses and thorny bushes (Chipley, 1991). In August 1996 the Bridled Quail Dove was observed in the area of Mary's Point.

The Red-necked pigeon is a much persecuted bird. Everywhere in its range it is hunted. For that reason probably, it has become rare in many locations (Evans, 1990). Its preferred habitat is the rainforest, but it is also observed in the dryer woodland vegetations. On Saba it is found all over the island (ECNAMP, 1980), though more in the higher than in the lower parts. A couple were observed in Cow Pasture in August 1996 at an altitude of about 200 meters, thus rather low. On the other side of the island near Pirate Cliff and rather low too, the bird was also observed. The Red-necked Pigeon is suspected to make trips over the sea (Voous, 1983). That would be the reason why it occurs only periodically.

Birds of prey

The lower slopes in the east and southeast of the island are favorite hunting grounds of two species of bird of prey (Voous, 1983). The largest is the Red-tailed Hawk (*Buteo jamaicensis jamaicensis*). Evans (1990) calls it a common species in the northern Caribbean, where it is widespread in a large number of habitats with a preference for mountains.

This bird nests in the Virgin Islands and in Saba (Evans, 1990) and according to Voous (1983) also on St. Eustatius. Five or six couples supposedly live in Saba (Voous, 1983). In contrast to St. Eustatius, the Red-tailed Hawk was observed in Saba on several locations in

August 1996: Grey Hill, Sandy Cruz and Troy. Shortly before, four birds were observed together (Johnson, personal comm., 1996). These observations correspond with Voous' estimations. It is probable that these animals still nest in Saba. In St. Maarten has been hunted almost to extinction because it is supposed to be a chicken thief.

The American Kestrel (*Falco sparverius caribaeorum*), a small bird of prey, is common in the northern Lesser Antilles and the Virgin Islands, however in the east of St. Lucia it is only an occasional visitor (Evans, 1990). It is listed on Appendix II of CITES. This bird can also be found in inhabited areas. In August 1996 it was seen flying above the road to Hell's Gate.

Other terrestrial breeding birds

The other seven terrestrial breeding birds (Annex III) have an extensive geographical range. Most of them are common in Saba. However, two species, which in the other islands are numerous in the vicinity of houses, are scarce in Saba: the Bananaquit (*Coereba flaveola bartholemica*) and the Black-faced Grassquit (*Tiaris bicolor omissa*). The first lives in all kinds of habitats, but the latter inhabits only dry warm slopes with low shrubs (Voous, 1983).

Among the terrestrial breeding birds there is only one coastal bird: the Green Heron (*Butorides striatus*). Breeding in the island has not been proven however. Voous (1983) does not mention the Yellow-crowned Night Heron (*Nyctanassa violacea bancrofti*) as a breeding species. According to him it was observed only once. Mulder and Stam (1987) observed this bird several times in 1987. It is known to be a crab eating species. It might be possible that this bird nests on Saba.

Seabirds

Notwithstanding the lack of inland bays, marshlands and sandy beaches, five species of seabirds nest in the island. Important factors are the steep cliffs along the coast, and two rocks in the sea: Green Island on the northern coast and Diamond Rock on the northwest side of the island. Van Halewyn and Norton (1984) do not classify Saba as an important breeding area for seabirds; nevertheless several seabirds do nest here which according to these authors are considered possibly threatened or threatened.

Shearwater

Audubon's Shearwater (*Puffinus lherminieri lherminieri*) has the status of a threatened species, which should receive special attention with regard to conservation measures. The breeding grounds of these birds are almost exclusively restricted to the Caribbean region, with the islands of the Southern Lesser Antilles and Tobago as the main area (Halewyn and Norton, 1984). The breeding habitat is quite varied. The birds nest in holes in the ground high in the hills, but also in natural hollows under cliffs, rocks and in limestone, sometimes only just above sea level. Both the birds and their eggs are subject to human exploitation. These birds are known to breed in sheltered places in the higher parts of the island (Voous, 1983). Nests were found above Hell's Gate at an altitude of 600 meters in 1928 and 1937. In the ECNAMP Preliminary Data Atlas a location on Great Hill is also indicated.

Tropicbirds

Two species of tropicbirds nest on Saba. The Red-billed Tropicbird (*Phaeton aetherius mesonauta*) is possibly threatened according to van Halewyn and Norton (1984). Its status should therefore be monitored. The Caribbean region is its main breeding ground. According to van Halewyn and Norton (1984) this species is most numerous in the Virgin Islands and

Tobago. Voous (1983) estimated their numbers in Saba at 20 couples or less. In the Preliminary Data Atlas (ECNAMP, 1980) three locations are mentioned: Kelby's Ridge, Old Booby Hill and Fort Bay. Voous (1983) only mentions Booby Hill Cliffs, but he observed that there are undoubtedly many other breeding places. The results of counts of the Red-billed Tropicbirds in April 1997 all around the island (Walsh-McGehee, 1997) require an adjustment of the numbers Voous reports for Saba. The number of Red-billed



Photo 17. Cliff face with holes in which tropic birds disappeared at Pirate Cliff.

Tropicbirds is estimated at 750 to 1000 pairs according to these counts, however these were counted outside the peak period (Walsh-McGehee, 1997). This makes Saba the island with the largest number of breeding pairs in the Caribbean Region. Red-billed Tropicbirds were seen at Cove bay, Tent Bay and Green Island in August 1996. A pair disappeared in a crack in the rocks opposite Green Island (Pirate Cliff) (photo 7).

According to van Haleweyn and Norton (1984) eggs of Red-billed Tropicbirds are occasionally gathered and birds are sometimes killed also, but these activities remain limited because the nesting places (holes in sea cliffs) are mostly inaccessible. In several locations the lack of sufficient nesting habitat may limit the population size. That would be why the Caribbean populations are small, but relatively stable according to van Halewyn and Norton (1984). Walsh-McGehee (1997) however, warns that coastal development, so common in West Indian islands, is causing enormous habitat losses.

The Yellow-billed Tropicbird (*Phaeton lepturus catesbyi*) also nests in Saba, however according to Voous (1983) only a few pairs are present. Walsh-McGehee (1997) reports that their numbers in Saba are much lower than of the Red-billed Tropicbirds, and their nests are less accessible. The Red-billed Tropicbird dominates the Yellow-billed in places where they compete for nesting sites (van Halewyn and Norton, 1984). Their breeding seasons overlap only

partly however. The Yellow-billed Tropicbird nests in spring and in summer.

According to van Halewyn and Norton (1984), the conservation status of this species is not really worrying, but recent data suggests that the Caribbean breeding populations have decreased by half since the 1980s (Walsh-McGehee, pers. comm. 1997). Coastal development and loss of nesting sites are supposed to be the main cause for their decline. That is why Walsh-McGehee



Photo 18. Diamond Rock.

thinks Saba is so important for breeding Tropicbirds.

Nesting sites of the Yellow-billed Tropicbirds are known from Fort Bay to Flat Point (Voous, 1983), and from several locations on the northern and western coast (ACNAMP, 1980). The species was possibly not distinguished from the Red-billed Tropicbird in August 1996.

Other seabirds

On the little rock island Diamond Rock (photo 18) the Bridled Tern (*Sterna anaethetus recognita*= *S. anathetus melanoptera*?) nests. This tern is widespread and a rather common breeding bird in the Caribbean region (van Halewyn and Norton, 1984). It is quite rare above the sea around Saba. In 1972 a breeding colony of at least 25 pairs was found at Diamond Rock (Voous, 1983). Van Halewyn and Norton (1984) report the number of 50 pairs.

The Brown Noddy (*Anous stolidus stolidus*) is second most numerous breeding seabird in the Caribbean region (van Halewyn and Norton, 1984). It nests in several habitats, but disturbance may force it to take refuge in less suitable breeding habitats. In summer it is quite common above the sea around Saba. It probably nests on Green Island (photo 19) but was also observed around Diamond Rock and Flat Point (Voous, 1983). Roughly 150 birds were seen around Green Island in August 1996.

Brown Boobies (*Sula leucogaster*) possibly nest on Diamond Rock and Green Island (Voous, 1983). These birds are regularly seen there (Voous, 1983 and Van 't Hof, personal med., 1996).

Other seabirds are observed above the sea around Saba, but do not breed on the island.

The Magnificent Frigatebird (*Fregata magnificens*) and



Photo 19. Green Island.

Brown Pelican (*Pelecanus occidentalis*), that are considered endangered by Halewyn en Norton (1984), are regularly observed around the island. Frigatebirds were observed at Well's Bay and Cove Bay, and the Brown Pelican at Green Island among Brown Noddy's in August 1996.

Migrants and Visitors

Saba, like the other Antillean islands, is important for migratory birds and winter visitors from North America (Annex III). Mostly they are not numerous, but are easily missed in the dense vegetation (Voous, 1983). Voous (1955) mentions the visiting American Redstart (*setophaga ruticilla*) a bird typical for the montane forests.

Amphibians and Reptiles

The relative isolation of the island because of the relatively large distance to other islands is reflected in the island's herpetofauna: a few species, but there is one true island endemic. One amphibian and 10 reptiles are known from Saba: 5 species of lizards, one species of snake and 4 species of seaturtles. Of the 5 species of lizards, only two are active during the day, half as many as on St. Eustatius. One of these two is an endemic anolis: *Anolis sabanus*. Ground-lizards are totally absent. Of the other three lizards that are active during the night one has a limited geographical range. The snake species is limited to Saba and St. Eustatius.

The piping frog

Saba's only amphibian is the same as the one in St. Maarten and St. Eustatius: *Eleutherodactylus johnstonei* (Annex III). It is species of the Lesser Antilles. On most islands it is abundant in disturbed habitats and secondary forest, but on smaller islands it also occurs in primary forest due to the lack of other species of *Eleutherodactylus*, as is the case in Saba (Kaiser and Henderson, 1994). On some islands of the Lesser Antilles this species was imported and according to Schwartz (1967) possibly also in Saba from St. Eustatius. The animal adapts easily and is supposed to be able to outcompete other, native species (Kaiser and Henderson, 1994). Although its size is small, the piping frog makes an impressive sound. This amphibian's singing is heard on Saba as soon as dark sets in and also during the day after a rain shower.

Anolis sabanus

Lazell (1972) calls it the harlequin among the anolises of the Lesser Antilles because of the dark spots that occur all over the body of the males (photo 20). The females are mostly paler and they have paler spots. Sometimes females have vague stripes on their back. This anolis is found from sea level to 870 meters high, however not on Diamond Rock and Green Island (Lazell, 1972). It is evenly distributed and numerous all over the island, except in the driest areas, where it occurs in small groups in the



Photo 20. *Anolis sabanus*.

shade around shrubs. It is inconspicuous in its behavior and withdraws into holes and cracks when disturbed. This lizard was seen in different habitats in August 1996, from the rubble beach of Well's Bay to the top of Mount Scenery.

The Red-bellied Racer

Saba's only snake, the Red-bellied Racer *Alsophis rufiventris* (photo 22) has a very limited geographic range. In addition to Saba, it is only found on St. Eustatius. The animal used to live on St. Kitts and Nevis, but has not been seen there since the 19th century (Daltry *et al.*, 1997). Its disappearance is related to the introduction to these islands of the Mongoose. Because of the dramatic decline of its range (from 302 km² to 33 km²), the Red-bellied Racer

is now listed as endangered on the IUCN's "Red List of Threatened Animals" of 1996. Within its present day range it appears to be still present in high densities, especially at higher altitudes. It was more often observed in Saba than in St. Eustatius (Daltry et al., 1997). According to the guide Johnson it is often sighted during field trips. In August 1996 a specimen was observed in the neighborhood of Mary's Point. Daltry *et al.*, (1997) report that 55 % of the snakes had incomplete tails, which suggests that they are nevertheless seriously predated. The natural enemy of this snake is the American kestrel, *Falco sparverius*. Among the introduced predators cats hunt snakes, and even chickens have snake on their menus. Rats eat snake eggs and on other islands are known to also attack the Racers. Moreover people on Saba persecute snakes believing them to be poisonous. Daltry *et al.*, 1997 point out the danger of accidental introduction of the mongoose from other islands. The Red-bellied racer preys on *Eleutherodactylus* and lizards (Schwartz and Henderson, 1975). These prey are present in abundance, especially in the wooded habitats.

Gecko's

Three lizard-species of Saba belong to the geckos that are active at night. One of these species, *Sphaerodactylus sabanus* is only found on Saba, St. Eustatius, and St. Kitts and Nevis. Nothing is known about its habits and status. Two other geckos are widespread. They often occur in houses and were probably introduced by humans.

The Green Iguana

The Green Iguana is widely spread throughout the Antillean islands and the American continent (Annex III).

Destruction of habitat endangers many populations in its range of distribution (Lazell, 1973). Almost everywhere it is hunted for food. It is listed on the Appendix II of CITES. On Saba too hunting endangers it. Its habitat extends from sealevel to about 500 meters high. Steep rockwalls are its preferred habitat. Informants particularly note the area around Spring Well's Bay to the road (Leysner and Johnson, personal comm., 1996). The inaccessibility of the Green Iguana's habitat is no obstruction for the hunters regrettably, who get their prey with rifles (Carmabi/Stinapa, annual report 1992). In August 1996 one animal was observed at the side of the road near English Quarter.

Sea turtles

Four species of sea turtle are common in the sea around the island: the Green Turtle (*Chelonia midas*), the Hawksbill Turtle (*Eretmochelys imbricata*), the Loggerhead (*Caretta caretta*) and the Leatherback (*Dermochelys coriacea*). The first two are seen most often (Sybesma, 1992). All four species are listed on Appendix I of CITES as endangered species. Green, Hawksbill and Leatherback Turtle have in the past nested on Saba, however the nesting frequency must be very low because Saba only has temporary sandy beaches. In the past nesting was observed at Fort Bay, Well's Bay and Cave or Rum Bay (Barkau Maylan, 1983). Sea turtles enjoy a certain protection on Saba. There is an island regulation that limits their capture (Sybesma, 1992).

Other Animals

There are two species of land crabs found on Saba. The Red Shank (*Gecarcinus lateralis*) lives close to the sea (v.d. Hoeven and Walters, 1987). The Mountain Crab (*Gecarcinus ruricola*) lives on the ground in the higher regions. Both species are important as detritivores in the terrestrial ecosystem of the island. Since the early 80's The Mountain Crab was collected and shipped to St. Maarten. This caused a serious decline of the population. During the late 70's these crabs are supposed to have been present in large numbers on and besides the roads (v.d. Hoeven and Walters, 1988). Mulder and Stam (1988) also studied the Hermit Crab *Coenobitus clypeatus* on Saba, as well as the Mountain Crab.

In addition, the literature and personal communications report from Saba:

14 species of terrestrial and fresh water snails (Vernhout, 1914; Haas, 1960 and 1962),

one species of scorpion, probably endemic (de Armas, 1983),

one species of mite (Kohls, 1969),

70 insect species (Weber, 1948; v.d.Kuyp, 1953 en 1954; Cobben, 1960; Drake & Cobben, 1960; Marcuzzi, 1962; Forrest Gilmour, 1963; v.Doesburg, 1970; Cobben & Wygodzinsky, 1975; Stusák & Cobben, 1975; Marcuzzi, 1977; Simonthomas, 1984),

including 27 species of diurnal butterflies (Smith et al., 1994; Miller and Miller, pers.comm., 1996).

In August 1996 eight species of diurnal butterflies were collected. The specimens were sent to butterfly expert Lee D. Miller for definitive identification. In addition five species of terrestrial and fresh water snails were collected. These were sent to snail expert Dr. A. Hovestadt for identification.

THREATS

In the preceding text several threats to the biodiversity have already come forward. With the exception of hurricanes, humans are the source of all threats. Below are the most important ones:

- ★ **Uncontrolled construction of houses and roads**, which will cause degradation of flora and fauna, e.g. in the as yet uninhabited north and northwest of the island, or in the ravines, disrupting water drainage systems.
- ★ **Uncontrolled tourism development**, leading to the sacrifice of valuable nature and scenic areas for the construction of buildings and facilities.
- ★ **Uncontrolled exploitation of nature**, leading to degradation of nature values due to pollution, fire, removal of plants and animals, and breaking of new trails where they are undesirable.
- ★ **Expansion of the activities on the top of Mount Scenery**, causing the loss of part of the unique and sensitive elfin woodland, which also has a function in the water drainage system of the whole Mountain, as well as being a tourism attraction.
- ★ **Expansion of the stone crushing facility**, with all its consequences for the geological formations, scenery, biodiversity in the sea and dive tourism (Sybesma and Visser, 1996)
- ★ **Pollution of the ravines with household garbage**, disrupting water drainage and causing garbage to end up in the sea
- ★ **Free-roaming cattle**. Goats in particular roam free (pers. obs., e.g. at Fort Bay, 1996) (photo 21). This causes degradation of the vegetation, prevents regeneration and leads to erosion.
- ★ **Hunting**. Two types of animals are clearly endangered by hunting: the Mountain Crab and the Green Iguana.
- ★ **Introduced predators**, such as cats, dogs, and rats. Rats are found all the way to the top of the Mountain (pers. obs., 1996). Rats are especially detrimental to the bird population, and they can also attack snakes. There is a possibility of accidental introduction of the Mongoose from islands where it has established itself.
- ★ **Introduced invertebrates** that cause disease among indigeneous species, such as the moth *Psychonocta spec.* which attacks several tree species, in particular the White Cedar, another moth that has eradicated almost all *Opuntia* cacti (report ABC-Advies, 1994), and possibly the snail *Zadrysie auricoma*, which is in the process of spreading from a garden on The Level (pers. obs. 1996).
- ★ **Hurricanes**. E.g. hurricane Hugo which severely damaged the top vegetation and caused landslides. The disastrous consequences of hurricanes were harrowingly obvious in St. Maarten after hurricane Luis in 1995. The effects of hurricanes are all the more destructive where nature has already deteriorated due to other (usually anthropogenic) causes



Photo 21. Goats at Fort Bay.

NATURE CONSERVATION AND MANAGEMENT

HISTORY AND PRESENT SITUATION

Of the three Windward islands of the Netherlands Antilles Saba has without question received the most attention with regard to the conservation of its natural heritage. Even in 1957 Thijsse, studying possibilities to increase the level of prosperity in the Windward Islands and in Bonaire, concludes that conservation of certain nature areas is indispensable if one wants to activate the tourism potential. He notes that this will necessitate additional legislation in the area of nature conservation, conservation of monuments, agriculture and husbandry, planning, and construction. Winsemius (1962) was commissioned to study the planological results of tourism as a consequence of the imminent opening of the airport and the construction of the harbor. He speaks highly of the nature and scenery in this "dream island" and predicts that the attraction for tourists will be extremely great. Even then there was supposedly great interest for Saba in the US. Winsemius however, counsels steady development and protection of "strategic" areas.

Stinapa already became involved in the new developments in Saba in 1968, and made concrete proposals for the establishment of nature reserves and the management of some of them (Westermann, 1969). Several important people supported these initiatives. Westermann (1969) for example stresses in his article that the remains of the woodlands in Saba should be managed as a nature reserve for the good of science and recreation. This would also safeguard the habitat of the Trembler, the Common Ground Dove and the Blue-crowned Euphonia. According to him there would be no objections to the construction of trails and even some tourist roads in the area to be preserved, but construction of houses and agriculture should be excluded. Westermann calls the volcano highly interesting, but does not feel the need for special protection of Saba's geological formations since it is unlikely that human activities would cause them to disappear or to be seriously affected. In the case of the stone crushing facility though, there is a definite alteration of the geological formations, and of the scenery. Mörzer Bruyns (1969) is of the opinion that Saba is such a beautiful and "rich" island, that the whole island should without hesitation be declared a 'national park', for practical reasons perhaps with the exclusion of the settlements and their immediate surroundings.

He points out that tourists take orchids as souvenirs, while tree ferns are cut to make flower boxes. Because Saba is completely dependent on the development of tourism, he recommends among other things, opening up of beautiful nature areas with walking trails, for research and educational purposes as well as for 'ordinary' tourism. Such development would of course need to go hand in hand with legislation to protect flora and fauna. Where necessary, particularly important areas should be designated as strict reserves.

Later plans of several oil companies to explore and develop suspected oil strata in the Saba bank, and the attending dangers to the island's integrity, caused several people, for instance Lichtveld and Henriquez, to devote themselves to the idea already proposed by Mörzer Bruyns, i.e. to designate all of Saba as a National Park. These persons set up an ad hoc committee for this. According to Henriquez (1977) the uninhabited northwest part of the island would meet the requirements for a National Park and the southeast part should then be declared to be a National Scenic Park. A scenic park features both nature areas and elements, as well as cultural areas valuable for their cultural historical and scenic values. Saba's administrative government was in complete agreement with these plans (Sticusa Journal, 1977). Supposedly since 1960 a committee has been working on a proposal for a regulation to make it easier to purchase undivided estates.

Voous (1979) who published a memorandum on nature conservation and management in the Netherlands Antilles, noted that in most of the Lesser Antilles the humid hill forests with their animal life are seriously threatened by deforestation and subsequent erosion, imparting more than local importance to Saba's top. He opposes expansion of farming and agriculture to the higher areas, favoring small-scale development. Such development would not be in conflict with the aspiration to establish Saba as a national park.

In spite of all ideas and plans and the willingness of the island's Executive Council at that time to establish a national park, the year report of Carmabi and Stinapa of 1982 notes that it was extremely difficult to get something off the ground, because people were insufficiently aware of the value of this wealth of nature with respect to education, but also from an economical point of view. The year report does note a clear change at that time however, especially in the younger generation, which now did recognize the importance of good nature management. Hence in 1982 the government requested Stinapa to prepare a management plan for a park with nature trails, with which the foundation immediately complied. The island government promised their cooperation, as did the department of Culture and Education in Curaçao. STICUSA was willing to finance part of the costs. Indeed several trails are constructed, using mainly historical footpaths. Route descriptions are also made (Romeijn, 1987). Construction of these trails is seen as a useful first step to establish one or more national parks. Romeijn (1987) also points out the unique function of the area for water management and erosion prevention. However the establishment of a land park is not attained. With respect to the sea developments are more favorable. The group in Saba promoting dive tourism also advocates management of the reef (Carmabi/Stinapa, 1982). In 1987 the island government passes an island ordinance establishing the underwater park of Saba (Carmabi/Stinapa, 1989). The Saba Conservation Foundation founded in 1987, is charged with the management.

After the building of a radio mast on top of The Mountain in the seventies, in 1989 the unique vegetation of the top was further threatened with destruction. Several telecommunication companies show an interest to build new masts on the top (Carmabi/Stinapa, 1989). The Saba Conservation Foundation asks Stinapa's assistance against these attacks on Saba's natural heritage. Stinapa again urges the island government to establish Mount Scenery as a national park. At the central government level a national framework ordinance for spatial planning is in place since 1976 (Zadelhoff, 1993). The Saba Conservation Foundation proposes to develop a zoning plan for Saba. Dr. Richard Howard is asked to advise in this. Howard (1989) warns against further destruction of the elfin woodlands vegetation, and comes out with new arguments in the pursuit of having the top of The Mountain established as a national park. He also gives practical advice for the management. In addition he points out the uniqueness of Saba's terrace agriculture and recommends ethno-botanical research. Notwithstanding all these recommendations and advice there is still no terrestrial nature park on Saba nor a zoning plan.

RESEARCH FOR CONSERVATION MANAGEMENT

It is to be hoped that shortly the legal framework for actual nature conservation and management will come into existence. In the implementation, a thorough knowledge of nature elements and processes is of great importance. In the past several studies were done that are useful for nature management. The present "Red-bellied Racer Conservation Project", initiated by Fauna and Flora International, and Walsh-McGehee's study of the Red-billed Tropicbird are also important contributions to this. Nevertheless, further research is necessary. Dr. Richard Howard (1989) points out for instance that a complete inventory of plants growing on

the top of Mount Scenery is desirable, as well as good satellite photos to determine where additional trails should be constructed and to localize plant populations. Furthermore he indicates that an ecological study of the elfin woodlands would make comparison with studies of elfin woodlands elsewhere possible. Stoffers' vegetation map (1956) shows an unclassified northern part of the island below about 450 meters. A vegetation analysis of this area should be made. In addition to the Red-bellied Racer and the Red-billed Tropicbird, Saba also possesses several other small populations of regionally rare or endangered vertebrates. In order to ensure their continued survival in Saba it is necessary to study these island populations also. About the status of the invertebrates nothing much can be said as yet. Here too is a wide unexplored field for study.

CONCLUSIONS

Based on the available literature, conversations with relevant people and personal observations *in situ*, the following areas are considered to have great natural value, and are recommended for conservation and management in order to preserve the biodiversity of Saba.

- ★ **The Area of The Mountain above 450 meters**, with secondary rainforest, ravine rain forest and montane formations. The Mountain's woodland formations in general protect the steep slopes from erosion. The area is characterized by a large diversity of forest formations in a small region. Because of this the area is very attractive for visitors, and interesting for research. The naturally small area available for the various forest formations, also makes this area very vulnerable. The secondary rainforest presents several stages in the succession series, that could be positively influenced by protective measures. As a result of the decrease in agricultural area this type of forest now occupies a larger area than before. Although it is undoubtedly poorer compared to the original forest, this type of forest is still rich in species, both in regard to higher plants and with respect to ferns and mosses. The ravine rainforest can be considered a remainder of the original forest. Its virginity is the main reason to preserve this type of forest. It is probably also important to the regeneration of the surrounding secondary rainforest. The elfin woodland is already unique because of its restriction to unique climatological circumstances and worthy of protection. It also harbors several special plants. Additionally Saba's elfin woodlands are of a regionally unique type. A thick water absorbent layer has also been built up, which plays an important role in the island's water management. The palm brake is an original type of forest, which has hardly been disturbed by human activity because it is situated on very steep slopes. The area contains the major part of the animals of the land fauna, among which the endemic anolis, and several birds that are regionally rare and/or endangered.
- ★ **all ravines from high to low** in order to guarantee a good drainage system and preserve the vegetation in the ravines.
- ★ **the area in the west and below English Quarter** with secondary dry evergreen forest because of its scenic beauty and because it protects against erosion.
- ★ **the entire northwest uninhabited part** of the island because of its undisturbed character and its scenic values. Internationally, conservation of large undivided nature areas is advocated, instead of various small fragmented areas. Saba has the unique possibility to secure a large uninhabited and presently undisturbed area against development. Here, the naturally small island populations can get an optimal opportunity to survive. Well-balanced use for eco-tourism may well be combined with this.
- ★ **All breeding areas of seabirds** along the coast, on the little rock-islands of Diamond Rock and Green Island, on Great Hill and above Hell's Gate. Breeding places of seabirds are under strain all over the Caribbean. In particular the breeding places of the endangered Shearwater and the possibly endangered Red-billed Tropicbird require protection. Besides, the beautiful Tropicbirds are characteristic appearances along the coast of the island.

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Photo 22. Guide James Johnson.

LITERATURE

- Adolph, S.C. and J.Roughgarden, 1983. Foraging by Passerine Birds and *Anolis* Lizards on St.Eustatius (Neth.Antilles): Implications for Interclass Competition, and Predation. *Oecologia*, 56: 313-318.
- AIDEnvironment/Envovision, 1996. Sint Maarten's natural resources after 'Luis' and 'Marilyn'. VROM-report.
- Arnoldo, Fr. M., 1971. Gekweekte en Nuttige Planten van de Nederlandse Antillen. Uitgaven "Nat.Wet.Werkgr.Ned.Ant." Curaçao.
- Augustinus, P.G.E.F., R.P.M.Mees and M.Prins (eds.), 1985. Biotic and abiotic components of the landscapes of St. Eustatius (Netherlands Antilles). Uitgaven "Nat.Wet.Studiekr.Sur.& N.A."
- Beard, J.S., 1949. The Natural Vegetation of the Windward & Leeward Islands. At the Clarendon Press.Oxford.
- Barkau Maylan, A., 1983. Marine Turtles of the Leeward Islands, Lesser Antilles. Atoll Research Bulletin, 278. The Smithsonian Institution, Washington, D.C..
- Baskin, J.N. & E.E. Williams, 1966. The Lesser Antillean Ameiva. (Sauria, Teiidae) Re-evaluation, zoogeography and the effects of predation. *Stud.Fauna.Cur.& Car.Isl.* XXIII: 144-176.
- Brongersma, I.D., 1959. Some Snakes from the Lesser Antilles. *Stud.Fauna Cur. & Car. Isl.*, IX(37), 50-61.
- Buurt van, G., 1995. De Schildpadden van Curaçao en Bonaire. Van Buurt Boek Productions. Alphen a/d Rijn.
- Carmabi/Stinapa. Jaarverslagen 1980 en 1981: 23-28
- Carmabi/Stinapa en Stinapa-Aruba. Jaarverslagen 1982. *Stinapa no.28*: 17-22.
- Carmabi/Stinapa, 1995. Jaarverslagen 1992. *Stinapa no.41*: 5-8.
- Carmabi/Stinapa, 1996. Jaarverslagen 1993. *Stinapa no.42*: 17
- Centraal Bureau voor Statistiek. Statistical Yearbook 1996, Neth.Ant., Willemstad
- Ceballos, G., 1995. Conserving Neotropical Biodiversity: the Role of Dry Forests in Western Mexico. *Cons.Biol.* 9(6): 1349-1356.
- Chiple, R.M. 1991. Notes on the Biology of the Bridled Quail-Dove (*Geotrygon mystacea*). *Car.J.Sc.* 27(3-4): 180-184.
- Cobben, R.H., 1960. The Heteroptera of the Netherlands Antilles-I. Forword. Gerridae, Veliidae, Mesovelliidae (Waterstriders).-II. Saldidae (Shorebugs). *Stud.Fauna Cur.& Car.Isl.* XI: 1-97.
- Cobben, R.H. & D. Wygodzinsky, 1975. The Heteroptera of the Netherlands Antilles- IX. Reduviidae (Assasin Bugs). *Stud. Fauna Cur.& Car.Isl.* XLVIII: 1-62.
- Collar, N.J., L.P.Gonzaga, N.Krabbe, A.Madraño Nieto, L.G. Naranjo, T.A.Parker and D.C.Wege, 1992. Threatened Birds of the Americas. The ICBP/IUCN Red Data Book 3rd Ed. part 2. Smithsonian Institute Press, Washington and London.
- Coomans, H.E., 1967. The Non-marine Mollusca of St. Martin (Lesser Antilles). *Stud.Fauna Cur.& Car.Isl.* XXIII: 118-145
- Coomans, H.E. and M. Coomans - Eustatia, 1988. Flowers from St. Martin. De Walburg Pers.
- Corbet, G.B. and J.E. Hill, 1991. A World List of Mammalian Species. Oxford University Press. Oxford, New York, Toronto.
- Daltry, J.C., M.L.Day en N.Ford, 1997. Red-bellied Racer Conservation Project. Draft of Project Report No.1: Conservation Status of the Red-bellied Racer. Fauna & Flora International in partnership with St.Eustatius National Parks Foundation and Saba Conservation Foundation.

- Davis T.J. (ed.), 1994. The Ramsar Convention Manual, A Guide to the Convention of Wetlands of International Importance.
- De Armas, L.F., 1983. The Lesser Antillean Scorpions of the genus *Centruroides*. Stud. Fauna Cur.& Car.Isl. LXV: 5-68.
- De Kort-Gommers & N. Nieser, 1969. Records of Antillean Water-Striders (Heteroptera). Stud.Fauna Cur.& Car.Isl. XXX: 72-87.
- De Palm, J.Ph. (ed.), 1985. Encyclopedie van de Nederlandse Antillen. De Walburg Pers, Zutphen.
- Doesburg, P.H., 1970. Records of Surphidae (Diptera) from the Lesser Antilles. Stud.Fauna Cur.& Car.Isl. XXXIV : 90-101.
- Drake, C.J. & R.H.Cobben, 1960. The Heteroptera of the Netherlands Antilles -V. Tingidae (Lace Bugs). Stud.Fauna Cur.& Car.Isl. XI: 67-97.
- ECNAMP, 1980. Saba, Sint Eustatius, Sint.Maarten/Saint Martin Preliminary Data Atlas. Survey of Conservation Priorities in the Lesser Antilles.
- EcoVision/AID Environment, 1996. Zoning plan for the Hillside-area Sint Maarten.
- EcoVision/AID Environment, 1996. Ponds of Sint Maarten
- Emmons, L.H., 1990. Neotropical Rainforest Mammals. A Field Guide. The University of Chicago Press, Chicago.
- Evans, P.G.H., 1990. Birds of the Eastern Caribbean. MacMillan Education LTD. London and Basingstoke.
- Florschütz, P.A., 1967. Mosses from the Netherlands Antilles. Acta Botanica Neerlandica. 15: 524-529.
- Forrest Gilmour, E., 1963. Some Caribbean Coleoptera Carambycidae. Stud.Fauna Cur.& Car.Isl. XVIII: 75-102.
- Haas, F., 1960. Caribbean Land Molluscs: Vertiginidae. Stud. Fauna Cur.& Car.Isl. X: 1-17.
- Haas, F., 1962. Caribbean Land Molluscs: Subulinidae and Oleacinidae. Stud.Fauna Cur.& Car.Isl. XIII: 49-60.
- Halewyn, R. van & R.L. Norton, 1984. The status and Conservation of Seabirds in the Caribbean. In: Croxall, J.P., P.G.H.Evans and R.W.Schreiber (eds.). Status and conservation of the World's Seabird. J.C.B.P. Technical Publication 2: 169-222.
- Helmond, 1977. Saba vergt bescherming. Sticusa Journaal 7(6): 5-7, Amsterdam.
- Henderson, R.W., 1992. Consequences of Predator Introductions and Habitat Destruction on Amphibians and Reptiles in the post Columbus West Indies. Car.J.Sc. 28 (1-2): 1-10.
- Henriquez, P.C., 1977. Een werkwijze voor Saba's toekomst. Sticusa Journaal 7 (nr.6): 10-11
- Hoeven, E.C. v.d.en L.H.M. Walters, 1988. Meer over de Ecologie en de Populatiodynamiek van de Landkrab *Gecarcinus ruricola* (Latreille) op Saba. Proceedings of the Saba Crab Research Centre 2, unpublished. Carmabi/UvA.
- Hoogerwerf, A., 1977. Notes on the Birds of St.Martin, Saba and St.Eustatius. Stud.Fauna Cur.& Car.Isl. LIV: 60-123.
- Howard, R.A., 1974. Flora of the Lesser Antilles. Orchidaceae. Arnold Arboretum, Harvard University, Massachusetts.
- Howard, R.A., 1977, 1988, 1989. Flora of the Lesser Antilles. Vol.2: Pteridophyta. Vol 3: Monocotyledoneae. Vol 4, 5, 6: Dicotyledoneae I, II, III. Arnold Arboretum, Harvard University, Massachusetts.
- Howard, R.A. 1989. Report of Richard Howard following trip to Saba. Unpublished Report.
- Howard, R.A., 1991. Comments on the Ecosystems of St. Maarten. Stinapa St.Maarten-document.
- Howard, R.A. and J.A. McDonald, 1995. *Ipomoea sphenophylla* Urban recollected and Neotypified. Harvard Papers in Botany 7: 69-72.

- Husson, A.M., 1960. De Zoogdieren van de Nederlandse Antillen. Uitgaven "Nat.Wet.Werkgr.N.A." Curaçao.
- Janzen, D.M., 1988. Tropical dry forests: the most endangered major tropical ecosystem. In: E.O.Wilson (ed). Biodiversity. National Academy Press, Washington D.C. p. 130-137.
- Jonge Poerink, W.H., 1953. Caribbean Tiger Beetles of the Genus *Cicindela*. Stud.Fauna Cur.& Car.Isl. IV: 120-143..
- Kaiser, H. and R.W. Henderson, 1994. The Conservation status of Lesser Antillean Frogs. Herp.Nat.Hist. 2(2): 41-56.
- Knox Jones jr., J. and C.J. Phillips, 1970. Comments on the Systematics and Zoography of Bats in the Lesser Antilles. Stud.Fauna Cur.& Car.Isl. XXXII: 131-145.
- Kohls, G.M., 1969. New Records of Ticks from the Lesser Antilles. Stud.Fauna Cur.& Car.Isl. XXVIII: 126-134.
- Koopman, K.F., 1968. Taxonomic and Distributional Notes on Lesser Antillean Bats. Am.Mus.Novitates. 2333: 1-13.
- Kristensen, I., 1978. Natuurbescherming op de N.A.. Stinapa Serie 16.
- Kuyp, E. v.d., 1953. Culicinae from the Netherlands Antilles and some other Caribbean Localities. Stud.Fauna Cur.& Car.Isl. IV: 144-148.
- Kuyp, E. v.d., 1954. Mosquitos of the Netherlands Antilles and their Hygienic Importance. Stud.Fauna Cur.& Car.Isl. V: 37-114.
- Lazell, J.D., 1972. The Anoles (Sauria, Iguanidae) of the Lesser Antilles. Bull.Mus.Comp.Zool. 143(1): 1-115.
- Lazell, J.D., 1973. The Lizard Genus *Iguana* in the Lesser Antilles. Bull.Mus.Comp.Zool., 145(1): 1-28.
- Liogier, H.A., 1985-1995. Descriptive Flora of Puerto Rico and Adjacent Islands. Vol. I, II, III, IV. Editorial de la Universidad de Puerto Rico.
- Marcuzzi, G., 1962. Tenebrionid Beetles of the West Indies. Stud.Fauna Cur.& Car.Isl. XIII: 21-48.
- Marcuzzi, G., 1977. Further Studies on Caribbean Tenebrionid Beetles. Stud.Fauna Cur.& Car.Isl. LII: 1-71.
- Ministerie van Landbouw, Natuurbeheer en Visserij, 1995. Alfabetische lijst en synoniemen lijst van Beschermd Diersoorten. Directie Natuurbeheer, CITES-bureau
- Morzer Bruyns, M.F. 1970. Natuurbehoud en natuurbeheer op de Nederlandse Antillen. Rijksinstituut voor Natuurbeheer, Zeist.
- Mulder, A. en E.Stam, 1988. Ecologische en Populatiodynamische Waarnemingen aan de Landkrab *Gecarcinus ruricola* (Latreille) op Saba. Proceedings of the Saba Crab Research Centre. Vol 1. unpublished. Carmabi/UvA .
- Nellis, D.W. & C.O.R. Everard, 1983. The Biology of the Mongoose in the Caribbean. Stud.Fauna Cur.& Car.Isl. LXIV: 1-162.
- Nieser, N., 1967. The Heteroptera of the Netherlands Antilles - VI. Notonectidae. Stud.Fauna Cur.& Car.Isl. XXIV: 159-189
- Nieser, N., 1969. The Heteroptera of the Netherlands Antilles -VII Corixidae. Stud.Fauna Cur.& Car.Isl. XXVIII: 135-164
- Nieser, N. 1969. The Heteroptera of the Netherlands Antilles - VIII. Pleidae, Naucoridae, Ranatridae. Stud.Fauna Cur.& Car.Isl. XXX: 58-71.
- Nieser, N., 1969. Notes on Antillean Notonectidae. Stud.Fauna Cur.& Car.Isl. XXX: 88-98.
- Nijkamp, H., R.Djohani and E.Meesters, 1995. The Marine Environment of St. Maarten. AIDEnvironment/ Ecovision N.V., VROM-report.
- Peterson, S.C., H.H.Genoways, and P.W.Freeman, 1996. Notes on Bats from Montserrat (L.A.) with Comments concerning the Effects of Hurricane Hugo. Car.J.Sc., 32 (2): 206-213

- Powell, R., R.J. Passaro and R.W. Henderson, 1992. Noteworthy Herpetological Records from Saint Maarten, Netherlands Antilles. *Car.J.Sc.* 28(3-4): 234-235.
- Rivera-Milan, F.F., 1992. Distribution and relative Abundance Pattern of Columbids in Puerto Rico. *The Condor* 94: 224-238.
- Rivera-Milán, F., 1996. Nest Density and Success of Columbids in Puerto Rico. *The Condor* 98: 100-113.
- Romeijn, P. 1987. Saba (N.A.), Bos en Nationale Parken. Vakgroep Bosteelt en Boscologie.
- Schwartz, A. and R.W. Henderson, 1991. Amphibians and Reptiles of the West Indies. Descriptions, Distributions and Natural History. University of Florida Press, Gainesville
- Schwartz, A., 1967. Frogs of the genus *Eleutherodactylus* in the Lesser Antilles. *Stud.Fauna Cur.& Car.Isl.* XXIV: 1-62.
- Schwartz, A. 1969. The Antillean *Eleutherodactylus* of the *Auriculatus* Group. In: *Stud. Fauna Cur.& Car.Isl.* XXX: 99-115.
- Schwartz, A. and R.Thomas, 1975. A checklist of West Indian Amphibians and Reptiles. Carnegie Museum of Nat.Hist., Pittsburg.
- Simonthomas, R.T. 1984. Notes on the Hymenoptera Aculeata from St. Martin, Saba and St. Eustatius. *Stud.Fauna Cur.& Car. Isl.* LXVII: 92-97.
- Smith, D.S., L.D.Miller and J.Y.Miller, 1994. The Butterflies of the West Indies and South Florida. Oxford University Press, New York.
- Stichting ABC-Advies, 1994. Unpublished report concerning the attack by a caterpillar on the wood of different tree species in Saba.
- Stinapa St. Maarten - documenten 1992-1993.
- Stinapa Ned.Ant., sectie St. Maarten, 1990. National Park Sint Maarten projekt voorstel.
- Stock, J.H., 1977. The Taxonomy and Zoogeography of the Hadziid Amphipoda, with Emphasis on the West Indian Taxa. *Stud.Fauna Cur.& Car.Isl.* LX: 1-130.
- Stoffers, A.L. 1956. *Stud.Flora Cur.& Car.Isl.* I. Uitgaven "Nat.Wet.Studiekring Sur.& N.A.", Utrecht.
- Stoffers, A.L. 1960. Plantengroei op St. Eustatius. In: Stoffers, A.L.. *Het plantenklee op de Nederlandse Antillen.* Schakels NA 33: 26-32.
- Stoffers, A.L., 1960. Vegetation on the Windward Islands of the Netherlands Antilles. The vegetation of Saba. The Vegetation of St. Eustatius. Schakels 36
- Stoffers, A.L., 1962. Pteridophyta. Flora of the Netherlands Antilles Vol.1:1-84. Uitgaven "Nat.Studiekr. Sur.& N.A.", Utrecht.
- Stoffers, A.L., 1963. Spermatophyta (Monocotyledoneae), Flora of the Netherlands Antilles Vol.1: 85-203. Uitgaven "Nat.Studiekr. Sur.& N.A.", Utrecht.
- Stoffers, A.L., 1966, 1973, 1979, 1980, 1982, 1984. Spermatophyta (Dicotyledoneae). Flora of the Netherlands Antilles Vol.II: 1-96, 97-209, 211-315. Vol.III: 1-60, 61-142, 143-409. Uitgaven "Nat.Studiekr. Sur.& N.A.", Utrecht.
- Stusák, J.M. & R.H. Cobben, 1975. The Heteroptera of the Netherlands Antilles - X Berytiniidae (Stilt Bugs). *Stud.Fauna Cur.& Car.Isl.* XLVIII: 63-78.
- Sutty, L. 1993. Fauna of the Caribbean. The Last Survivors. MacMillan Press Ltd. London and Basingstoke.
- Sybesma, J. 1992. Sea Turtle Recovery Action Plan for the Netherlands Antilles (K.L. Eckert, ed.). CEP Technical Report No.11.
- Sybesma, J. & N. Visser. 1996. "Een vuiltje aan de lucht" Milieugevolgen van de Stone crusher op Saba. Rapport VOMIL. Sectie Milieu en Natuur.
- Thijsse, J.P., 1957. Rapporten over een studiereis naar Bonaire en de Bovenwindse Eilanden in opdracht van de T.E.R.N.A.. Den Haag.
- Veenbos, J.S. 1955. A Soil and Land Capability Survey of St. Maarten, St.Eustatius and Saba, Netherlands Antilles. Publ. "Fun.Sc.Res.Sur.& N.A." 11.

- Venmans, L.A.W.C., 1963. Caribbean Land Molluscs: Streptaxidae. *Stud.Fauna Cur.& Car.Isl.* XI: 41-75.
- Vernhout, J.H., 1914. The Land- and Freshwater-molluscs of the Dutch West Indian Islands. Notes from the Leyden Museum XXXVI.
- Vliegen, J. 1980. Rockwalls, Dry walls. *Stinapa St.Maarten*.
- Vliegen, J. 1981. Description and Inventory of the proposed Bi-National Reserve. Belvédère/Les Deux Frères. *Stinapa St.Maarten*.
- Voous, K.H. 1979. Natuurbehoud en Natuurbeheer op de Nederlandse Antillen. *Stinapa Documentation Series* 5.
- Voous, K.H. 1955. The Birds of St. Martin, Saba and St. Eustatius. *Stud.Fauna Cur.& Car.Isl.* VI: 1-83.
- Voous, K.H. 1983. Birds of the Netherlands Antilles. *De Walburg Pers*.
- Wagenaar Hummelinck, P. 1955. Caribbean Tiger Beetles of the Genus *Megacephala*. *Stud.Fauna Cur.& Car.Isl.* XI: 89-125
- Wagenaar Hummelinck, P., 1979. De Grotten van de Nederlandse Antillen. Uitgaven "Nat.Studiekr.Sur.& N.A."
- Wagenaar Hummelinck, P. 1983. Additional Notes on Caribbean Tiger-beetles of the Genera *Cicindella* and *Megacephala*. *Stud. Fauna Cur.& Car.Isl.* LXV: 69-129.
- Walsh-McGehee, M. 1997. Summary of the presentation at the Society of Caribbean Ornithology in Aruba in August 1997.
- Walstra, G. 1986. Inventory of the natural areas of the Netherlands Antilles. *Carmabi/Stinapa verslag en studentenverslag LU Wageningen*.
- Weber, N.A., 1948. Ants from the Leeward Group and some other Caribbean Localities. *Stud.Fauna Cur.& Car.Isl.* III: 78-88.
- Westermann, J.H. 1969. Natuurreservaten op de Bovenwinden, *Stinapa* no.3: 15-22.
- Westermann, J.H. 1957. De Geologische Geschiedenis der drie Bovenwindse eilanden St. Martin, Saba en St. Eustatius. "Nat.Wet.Werkgr.N.A.". no. 7: 127-168.
- Westermann, J.H. and H. Kiel, 1961. The Geology of Saba and St. Eustatius, with notes on the Geology of St. Kits, Nevis and Montserrat (Lesser Antilles). Uitgaven "Nat.Wet.Studiekr. Sur.& N.A.", Utrecht.
- Wiersma, P., 1984. Moss Flora and Vegetation of Saba and St. Eustatius (West Indies). *Proc.Kon.Ned.Akad.Wet. Series C.* 87(3): 337-369.
- Winsemius, J., 1962. Saba. *Schakels* 38: 25-33
- Zadelhoff, F.J., 1993. Natuurbescherming op de Nederlandse Antillen. Voorstellen ter versterking van het natuurbeleid op de Antillen op basis van een inventariserende missie van 13-29 april 1993. Informatie- en Kennis Centrum Nat., Bos, Landschap en Fauna, Wageningen.

APPENDIX I

PLANTS OF SABA

abbreviations:

SA= Saba

SE= St.Eustatius

SM= St.Martin

LA= Lesser Antilles

WI= West Indies

AM= America (American Continent + West Indies)

WO= world (America + other parts of the world)

Sources:

Stoffers A.L. 1962, 1966, 1980, 1973, 1979, 1982, 1984. Flora of the Netherlands Antilles, Pteridophyta Vol.I p.1-84, Spermatophyta, Dicotyledoneae Vol. II p.1-92, Vol. II p.97-209, Vol.II p.211-315, Vol.III p.1-60, Vol.III p.61-142, Vol.III p.143-409, Uitgaven "Natuurwetenschappelijke Studiekring voor Suriname and the Nederlandse Antillen", Utrecht

Stoffers, A.L., 1956. The Vegetation of the Netherlands Antilles. In: Studies on the Flora of Curaçao and other Caribbean Islands. Vol.I. Uitgaven "Natuurwetenschappelijke Studiekring voor Suriname en de Nederlandse Antillen", Utrecht

Howard R.A. 1974, 1977, 1979, 1989. Flora of the Lesser Antilles: Orchidaceae, Vol. 2 Pteridophyta, Vol.3 Monocotyledoneae, Vol.4 Dicotyledoneae-Part I, Vol.5, Dicotyledoneae-Part 2, Vol.6 Dicotyledoneae-Part 3. Arnold Arboretum, Harvard University, Massachusetts

abbreviations:

(ST)= source is the Flora of Stoffers

(ST 1956)= source is: The Vegetation of the Netherlands Antilles by Stoffers

(H)= source is the Flora of Howard

(list H)= source is a list of plants recorded from St. Martin, compiled by Richard A.Howard in March 1991

*= illustration in the "Flora of the Lesser Antilles" of Richard A.Howard

(L)= local name from Saba, reported by J.Johnson

scientific name	common name	area of distribution
PTERIDOPHYTA		
<u>Cyatheaceae</u> (ST)		
<i>Cyathea arborea</i> *		SA, SE--AM
<i>Cyathea muricata</i>		SA--LA
<i>Cyathea grandiflora</i> (= <i>Cnemidaria grandifolia</i> * <i>var.grandifolia</i> in H)		SA--LA
<u>Gleicheniaceae</u> (ST)		
<i>Gleichenia bifida</i>		SA--AM
<u>Hymenophyllaceae</u> (ST)		
<i>Trichomanes alatum</i> *		SA--WI
<i>Hymenophyllum hirtellum</i>		SA--WI

<i>Hymenophyllum polyanthos</i> (var. <i>polyanthos</i> in H)		SA--WO
<i>Hymenophyllum macrothecum</i> *		SA--LA
<u>Lycopodiaceae</u> (ST)		
<i>Lycopodium setaceum</i> * (= <i>L.verticillatum</i> in H)		SA--AM
<i>Lycopodium wilsonii</i>		SA--AM
<i>Lycopodium taxifolium</i>		SA--AM
<u>Ophioglossaceae</u> (ST)		
<i>Ophioglossum reticulatum</i> *		SA--WO
<u>Polypodiaceae</u> (ST)		
<i>Nephrolepis rivularis</i>		SA, SE--AM
<i>Pteris longifolia</i>		SA--AM
<i>Pteris biaurita</i>		SA--WO
<i>Pteris laciniata</i> (= <i>Anisosorus hirsutus</i> * in H)		SA--AM
<i>Pitogramma chrysophylla</i>		SA--AM
<i>Cheilanthes microphylla</i>		SA (H), SE--AM
<i>Pitogramma calomelanos</i> *		SA, SE, SM--WO
<i>Adiantum tenerum</i>		SA, SE, SM--AM
<i>Polypodium plumula</i>		SA--AM
<i>Polypodium loriceum</i>		SA--AM
<i>Polypodium polypodioides</i>		SA, SE, SM--AM
<i>Polypodium aureum</i> (var. <i>aureum</i> in H)		SA, SE, SM--AM
<i>Polypodium triseriale</i>		SA, SE, SM--AM
<i>Polypodium phyllitidis</i>		SA, SE, SM--AM
<i>Polypodium crassifolium</i>		SA--AM
<i>Polypodium piloselloides</i>		SA, SM--AM
<i>Polypodium heterophyllum</i>		SA, SE, SM--AM
<i>Polypodium lycopodioides</i>		SA, SE, SM--WO
<i>Xiphopteris taenifolia</i> (= <i>Grammitis taenifolia</i> in H)		SA--AM
<i>Xiphopteris serrulata</i> (= <i>Grammitis serrulata</i> * in H)		SA--AM
<i>Thelypteris opposita</i>		SA, SE--AM
<i>Thelypteris sprengelii</i>		SA--AM
<i>Thelipteris decussata</i> (H)		SA--AM
<i>Thelipteris patens</i>		SA--AM
<i>Thelipteris dentata</i>		SA, SE--WO
<i>Thelipteris reticulata</i>		SA--AM
<i>Thelipteris tetragona</i> var. <i>tetragona</i>		SA, SE, SM--AM
var. <i>guadelupensis</i>		SA, in H: WI
<i>Thelipteris nephrodioides</i>		SA, SE--AM
<i>Tectaria incisa</i>		SA (not in H), SE--AM
<i>Tectaria trifoliata</i> *		SA, SE--AM
<i>Polybotrya cervina</i> *		SA--AM

<i>Diplazium striatum</i>		SA--AM
<i>Lomariopsis sorbifolia</i> *		SA?, SE--WI
<i>Elaphoglossum martinicense</i>		SA, SE--WI
<i>Elaphoglossum longifolium</i>		SA--WI (AM in H)
<i>Elaphoglossum rigidum</i>		SA--AM
<i>Asplenium cristatum</i>		SA, SE, SM--AM
<i>Asplenium formosum</i>		SA--WO
<i>Asplenium auritum</i> (var. <i>rigidum</i> in H)		SA, SE--AM
<i>Asplenium pumilum</i>		SA, SM--AM
<i>Asplenium serratum</i>		SA, SE--AM
<i>Blechnum occidentale</i>		SA, SE, SM--AM (introduced in Hawai)
<i>Blechnum nesioticum</i> (= <i>B. ryanii</i> in H)		SA--LA
Psilotaceae (ST)		
<i>Psilotum nudum</i> *		SA--WO
Selaginellaceae (ST)		
<i>Selaginella flabellata</i>		SA--LA (+ St. Thomas?)
<i>Selaginella substipitata</i>		SA--WI
<i>Selaginella tenella</i> *		SA--WI
<u>SPERMATOPHYTA</u>		
MONOCOTYLEDONEAE		
<u>Agavaceae (H)</u>		
<i>Agave karatto</i>		SA--LA: Antigua, Barbuda, St. Kitts, Montserrat, La Desirade
<i>Furcraea tuberosa</i> *		SA, SE--LA
<u>Amaryllidaceae (H)</u>		
<i>Hippeastrum puniceum</i> *	easter lily	SA, SE, SM--AM
<i>Hymenocallis caribaea</i>	spider, white lily	SA, SE, SM--WI
<i>Zephyranthes citrina</i> *		SA, SM--AM
<i>Zephyranthes grandiflora</i>		SA, SE--AM
<i>Zephyranthes puertoricensis</i>	crocus, white snow drop	SA, SE, SM--AM
<u>Araceae (H)</u>		
<i>Anthurium cordatum</i>		SA, SE (ST 1956)--WI
<i>Anthurium grandifolium</i> *	monkeytail (list H)	SA, SE, SM--WI
<i>Monstera adansonii</i> *	mountain ears	SA--LA + Trinidad and Tobago
<i>Philodendron giganteum</i> *	chinny leafs (L) elephant ears arum lily (ST 1956)	SA, SE--WI
<i>Philodendron lingulatum</i>		SA, SE--WI

<u>Bromeliaceae</u> (H)		
<i>Aechmea lingulata</i>		SA--AM
<i>Bromelia pinguin</i> *		SA, SE, SM--AM
<i>Catopsis floribunda</i>		SA, SE, SM--AM
<i>Guzmanis lingulata</i>		SA, SM--AM
<i>Pitcairnia angustifolia</i>	clapper (L)	SA, SE--WI
<i>Tillandsia fasciculata</i>		SA, SM--WI
<i>Tillandsia recurvata</i> *	ballmoss	SA, SE, SM--AM
<i>Tillandsia usnoides</i>	spanish moss	SA, SE, SM--AM
<i>Tillandsia utriculata</i>		SA, SE, SM--AM
<i>Vriesea antillana</i>		SA--LA
<i>Vriesea ringens</i>		SA, SE--AM
<u>Commelinaceae</u> (H)		
<i>Callisia repens</i>	waterweed (L)	SA,SE, SM--AM
<i>Commelina elegans</i>	watergrass waterweed (L)	SA, SE, SM--AM
<i>Rhoeo spathacea</i> *		SA--AM
<i>Tradescantia pallida</i> *	purple heart?	SA, SE, SM--AM
<i>Zebrina pendula</i> *		SA--AM
<u>Cymodoceaceae</u> (H)		
<i>Syringodium filiforme</i> *		SA, SM--AM
<u>Dioscoreaceae</u> (H)		
<i>Dioscorea trifida</i>		SA, SM--AM
<u>Heliconiaceae</u> (H)		
<i>Heliconia bihai</i>	wild banana	SA, SE--WI
<u>Hypoxidaceae</u> (H)		
<i>Hypoxis decumbens</i> *		SA--AM
<u>Palmae</u> (H) (=Arecaceae in ST 1956)		
<i>Coccoloba barbadense</i> * (= <i>C. sabanus</i> in ST 1956)		SA--WI (LA +Trinidad and Tobago, possibly also Puerto Rico and Virgin Islands)
<i>Prestoea montana</i> * (= <i>Euterpe globosa</i> in ST 1956)	mountain cabbage (L)	SA, SM--WI
<u>Orchidaceae</u> (H)		
<i>Erythroides plantaginea</i> *		SA, SE--WI
<i>Jacquinella globosa</i> *		SA, SE--AM
<i>Epidendrum ciliare</i> *		SA, SE, SM--AM
<i>Epidendrum kraenzlinii</i>		SA, SE (Faber), SM--WI
<i>Epidendrum secundum</i> *		SA, SE, SM--AM
<i>Epidendrum strobiliferum</i> *		SA--AM
<i>Maxillaria coccinea</i>		SA--WI
<i>Brassavola cucullata</i> *		SA, SE, SM--AM
<i>Oncidium leiboldii</i>		SA, SE, SM--AM
<u>Smilacaceae</u> (H)		
<i>Smilax coriacea</i>	white withe	SA, SE, SM--WI

<i>Smilax guianensis</i> *		SA, SE--LA
DICOTYLEDONEAE		
<u>Acantaceae</u> (H)		
<i>Justicia eustachiana</i> *		SA, SE, SM (list H)--LA
<i>Justicia secunda</i>		SA--AM
<i>Justicia sessilis</i>	prickly balsum	SA, SE, SM--AM
<i>Ruellia tuberosa</i> *	fever root	SA, SE, SM--AM
<i>Thunbergia alata</i> *	black eyed Susan	SA--WO, native to Africa (L)
<i>Thunbergia fragrans</i>		SA--WO, native to India
<u>Aizoaceae</u> (ST)		
<i>Sesuvium portulacastrum</i>		SA, SE, SM--WO
<u>Amaranthaceae</u> (ST)		
<i>Chamissoa altissima</i> *		SA--AM
<i>Amaranthus polygonoides</i> <i>ssp.polygonoides</i>	white polly	SA, SE, SM--AM
<i>Amaranthus dubius</i>		SA, SE, SM--AM, introduced in Europe
<i>Amaranthus spinosus</i> *		SA, SE, SM--WO, probably native to AM
<i>Amaranthus viridus</i>		SA, SE, SM--WO
<i>Achyranthes indica</i> (= <i>Achyranthes aspera</i> * <i>var.aspera</i> in H)	man better man worry vine (list H)	SA, SE, SM--WO
<i>Alternanthera caracasana</i>		SA, SE, SM--WO
<i>Lithophila muscoides</i> *		SA, SE, SM--WI
<i>Iresine diffusa</i> *		SA, SE, SM--AM
<u>Anacardiaceae</u> (ST)		
<i>Comocladia dodonaea</i> *	red man, centepee plant, money bush	SA, SE, SM--WI
<i>Spondias mombin</i>	yellow plum	SA, SE--WO
<i>Spondias purpurea</i> *	Jamaica plum, red plum	SA, SE--AM
<u>Annonaceae</u> (ST)		
<i>Annona muricata</i> *	soursop	SA, SE, SM--AM, probably native to WI
<i>Annona montana</i>		SA, SE, SM--AM
<i>Annona reticulata</i>	custard apple	SA, SE--AM, probably native to WI
<u>Apiaceae</u> (ST)		
<i>Eryngium foetidum</i> *		SA, SM--WO, native to AM
<u>Apocynaceae</u> (ST)		
<i>Allamanda cathartica</i>	buttercup, yellow bell	SA, SM--WO?
<i>Thevetia peruviana</i>		SA--AM
<i>Rauvolfia viridis</i>	snakeberry tree, antigua balsam	SA, SE, SM--AM
<i>Plumeria alba</i> *	white frangepane,	SA, SE, SM--WI

	pigeon wood	
<i>Catharanthus rosea</i> *	churchyard blossom old maids olleander(list H)	SA, SE, SM--WO, native to Madagascar,
<i>Tabernaemontana citrifolia</i> *	milky tree, milky wood	SA, SE, SM--WI
	billyache (list H)	
<i>Urechites lutea</i> *	bitter pod	SA, SE, SM--WI
	bay withe (L)	
<u>Aristolochiaceae</u> (ST)		
<i>Aristolochia littoralis</i>	duck	SA, SM--AM
<u>Asclepiadaceae</u> (ST)		
<i>Cryptostegia grandiflora</i>	palu di lechi ,	SA--AM, native to Maga- gascar
<i>Calotropis procera</i> *		SA, SE--WO, native to the Old World
<i>Asclepias curassavica</i> *	ipecacuanha hippetyigu- ana (L)	SA, SE, SM--WO, native to AM
<i>f.curassavica</i>		SA, SE--WI: Cuba, Trini- dad and Tobago
<i>Asclepias nivea</i>	ipecacuanha	SA, SE, SM--WI
<i>Matelea maritima</i>	*	SA, SE, SM--AM
<u>Begoniaceae</u> (ST)		
<i>Begonia retusa</i>	mountain manna	SA, SE--LA: St.Barts, St.Kitts, Montserrat
<u>Bignoniaceae</u> (H)		
<i>Crescentia cujete</i> *	calabash	SA, SE, SM--WO, native to AM
<i>Macfaydena unguis-cati</i> *	cat claw	SA, SE, SM--AM
<i>Tabebuia heterophylla</i> * (= <i>T.pallida</i>)	white cedar	SA (not in H, but seen in SA), SE, SM, WI
<i>Tecoma stans</i> *	yellow blossom	SA, SE, SM--AM
<u>Boraginaceae</u> (H)		
<i>Argusia gnaphalodes</i> *	white lavendel	SA, SE, SM--WI
<i>Bouyeria succulenta</i> *	white chank	SA, SE, SM--AM
<i>Cordia nesophila</i>		SA, SE--LA
<i>Cordia sulcata</i>	manjack sticking berry, Jack tree (L)	SA, SE--WI
<i>Heliotropium angiospermum</i>		SA, SE, SM--AM
<i>Heliotropium ternatum</i>	seaside lavender	SA, SM--AM
<i>Tournefortia bicolor</i> *		SA, SM--AM
<i>Tournefortia filiflora</i>		SA, SE, SM--WI
<i>Tournefortia volubilis</i>		SA, SE, SM--AM
<u>Brassicaceae</u> (ST)		
<i>Brassica integrifolia</i>	mustard, mustard salade	SA, SE--WO, native to Asia
<i>Lepidium virginicum</i> *		SA, SE, SM--AM, intro- duced in Europe
<u>Burseraceae</u> (ST)		
<i>Bursera simaruba</i> *	gum tree, balsam tree,	SA, SE, SM--AM

	lime tree terpine tree (L)	
<u>Cactaceae (H)</u>		
<i>Opuntia triacantha</i> *	spanish lady (ST) suckers (list H + L)	SA, SE, SM--WI
<i>Opuntia dillenii</i>	sour prickly (ST) prickly (list H)	SA, SE, SM--AM
<i>Opuntia elatior</i>	jumbie prickly (list H)	SA, SM (escaped)--AM
<i>Hylocereus trigonus</i>	strawberry (ST) prickly (list H)	SA, SE, SM--WI
<i>Melocactus intortus</i>	popehead (list H) tothead (L)	SA, SE, SM--WI
<i>Pilocereus royeri</i> (= <i>Cephalocereus royerii</i>)	dildo (list H)	SA, SE, SM--WI
<i>Selenicium grandiflorum</i> *		SA, SE, SM--WI: Jamaica, cultivated and escaped
<u>Caesalpiniaceae (ST)</u> (in H: <i>Caesalpinioideae</i>)		
<i>Hymenaea courbaril</i> *	locust	SA, SE, SM--AM
<i>Tamarindus indica</i>	tamarind	SA, SE, SM--WO, probably native to Africa
<i>Bauhinia monandra</i>		SA--WO, native to Asia
<i>Cassia bicapsularis</i> * (= <i>Senna bicapsularis</i> in H)	blydog	SA, SE, SM--WO, native to AM
<i>Cassia occidentalis</i>	bitter root	SA, SE, SM--WO, probably native to AM
<i>Cassia glandulosa</i>	wild peas	SA, SE, SM--AM
<i>Caesalpinia coriaria</i>	dividivi	SA, SE, SM--AM, introduced in India
<i>Caesalpinia bonduca</i> *		SA, SE, SM--WO, native to Asia
<i>Caesalpinia ciliata</i>		SA (H), SM--LA (WI in H)
<u>Capparaceae (ST)</u>		
<i>Capparis cynophallophora</i>		SA, SE, SM--AM
<i>Capparis indica</i> *	black willow	SA, SE, SM--AM
<i>Capparis frondosa</i> (= <i>C. baduca</i>)	church blossom wild cocoa (list H)	SA, SE, SM--AM
<i>Capparis flexuosa</i>	mustard tree, man of war bush nightwood (L)	SA, SE, SM--AM
<i>Morisonia americana</i> *	wild misple, ratapple (list H)	SA, SE, SM--AM
<i>Cleome viscosa</i>	wild massamby	SA, SE, SM--WO, native to the Old World
<i>Cleome gynandra</i>	massamby	SA, SE, SM--WO, native to Asia and Africa
<u>Caryophyllaceae (ST)</u>		
<i>Drymaria cordata</i>	white snow	SA, SM--WO
<u>Celastraceae (ST)</u>		

<i>Crossopetalum rhacoma</i> *		SA, SE, SM--AM
<i>Schaefferia frutescens</i> *		SA, SE, SM--AM
<u>Chenopodiaceae (ST)</u>		
<i>Chenopodium ambrosioides</i>	wormbush	SA, SE, SM--WO, native to AM
<u>Chrysobalanaceae (ST)</u>		
<i>Chrysobalanus icaco</i> *	cocoa plum, fatpork,	SA, SE, SM--AM
<i>Hirtella triandra</i> *	hairy plum	SA, SE--AM
<u>Clusiaceae (ST)</u>		
<i>Marila racemosa</i> *		SA--LA
<i>Mammea americana</i> *	mamaya	SA, SE--AM, cultivated in the Old World
<i>Clusia major (=C.alba)</i>	wild mammy, wild Balsum, balsum (L)	SA, SE--LA
<u>Compositae (H)</u>		
<i>Ageratum conyzoides</i> *	white cap	SA, SE, SM--WO, native to AM
<i>Ambrosia hispida</i> *		SA, SE, SM--WI
<i>Bidens pilosa</i>		SA, SE, SM--AM
<i>Borrchia arborescens</i> *		SA, SE, SM--AM
<i>Chaptalia nutans</i> *		SA, SE, SM--AM
<i>Clibadium erosum</i> *		SA, SM--WI
<i>Conyza apurensis</i> *		SA, SM--AM
<i>Conyza bonariensis</i>		SA--WO, native to AM
<i>Conyza canadensis</i>		SA, SE, SM--WO
<i>Emilia fosbergii</i> *		SA--WO, probably native to the Old World
<i>Emilia sonchifolia</i>		SA, SE, SM--WO, native to the Old World
<i>Erechtites hieracifolia</i>		SA, SE, SM--WO, native to AM
<i>Erechtites valerianifolia</i> *		SA--WO, native to AM
<i>Eupatorium corymbosum</i>		SA--WI
<i>Eupatorium iresinoides</i>		SA--AM
<i>Eupatorium macranthum</i>		SA, SE--LA: St.Kitts, Nevis
<i>Eupatorium macrophyllum</i>		SA, SM--AM
<i>Eupatorium microstemon</i>		SA, SM--WO
<i>Eupatorium odoratum</i>		SA, SE, SM--AM
<i>Gnaphalium antillanum</i> *		SA, SM--WI
<i>Gundlachia corymbosa</i> *		SA--WI
<i>Lagascea mollis</i> *		SA, SM--WO, native to AM
<i>Neurolaena lobata</i> *		SA, SE--AM
<i>Parthenium hysterophorus</i> *		SA, SE, SM--WO, native to AM
<i>Pectis humifusa</i>		SA, SE, SM--WI
<i>Pectis linearis</i>		SA--AM
<i>Porophyllum ruderale</i> *		SA, SE, SM--AM

<i>Pseudelephantopus spicatus</i> *		SA, SE, SM--AM
<i>Sonchus oleraceus</i>	wild salad	SA, SE, SM--WO
<i>Synedrella nodiflora</i> *		SA, SE, SM--WO, native to AM
<i>Thymophylla tenuiloba</i>		SA--AM
<i>Vernonia albicaulis</i>	wild tobacco	SA, SE, SM--WI
<i>Vernonia cinerea</i>		SA, SE, SM--WO
<i>Wedelia calycina</i>	yellow sage	SA, SE--AM
	cup tree (L)	
<u>Convolvulaceae (H)</u>		
<i>Cuscuta americana</i>	love vine	SA, SE, SM--AM
<i>Cuscuta umbellata</i>		SA--WO
<i>Ipomoea nil</i>		SA, SE, SM--WO
<i>Ipomoea quamoclit</i>		SA, SE, SM--WO
<i>Ipomoea tricolor</i>		SA, SM--AM
<i>Ipomoea violacea</i>		SA, SE--WO
<i>Jacquemontia pentantha</i>		SA, SE, SM--WO
<i>Merremia dissecta</i>		SA, SE, SM--WO
<i>Operculina turpethum</i>		SA, SE (cultivated), SM--LA, cultivated in WI
<u>Crassulaceae (ST)</u>		
<i>Bryophyllum pinnatum</i> *	leaf of life	SA, SE--WO, native to Africa
<u>Cucurbitaceae (ST)</u>		
<i>Melothria guadelupensis</i>		SA, SE--AM
<i>Cucumis anguria</i>	pumpkin	SA, SE--AM
<i>Momordica charantia</i> *	snake apple bush (L) maidenapple (list H)	SA, SE, SM--WO, native to the Old World
<u>Elaeocarpaceae (ST)</u>		
<i>Sloanea massoni</i> *		SA--LA
<u>Erythroxylaceae (ST)</u>		
<i>Erythroxylum havanense</i>	bracelet	SA, SE, SM--AM
<u>Euphorbiaceae (ST)</u>		
<i>Phyllanthus amarus</i>		SA, SE, SM--WO, native to AM
<i>Margaritaria nobilis</i> *	goose berry	SA, SM--AM
<i>Croton lobatus</i>	lilac bush	SA, SE, SM--WO
<i>Croton flavens</i>	yellow balsam, marrow	SA, SE, SM--AM (WI + Yucatan)
<i>Acalypha chamaedrifolia</i>	bastard nettle	SA, SE, SM--WI + S.Florida
<i>Acalypha poiretii</i>		SA, SM--AM
<i>Tragia volubilis</i> *	stinging nettle (SM)	SA, SE, SM--WO
<i>Ricinus communis</i> *	castor oil plant	SA--WO, native to Afrika
	oil nut tree (L)	
<i>Jatropha gossypifolia</i> *	physic nut oil nut tree (L)	SA, SE, SM--WO, native to AM
<i>Jatropha curcas</i> *	grave physic nut	SA, SE, SM--WO

<i>Hippomane mancinella</i> *	manchineel tree	SA, SE, SM--AM
<i>Euphorbia articulata</i>		SA, SE, SM--WI
<i>Euphorbia hirta</i>		SA, SE, SM--WO
<i>Euphorbia hypericifolia</i>		SA, SE, SM--AM
<i>Euphorbia prostrata</i>		SA, SE, SM--WO, native to AM
<i>Pedilanthus tithymaloides</i> *		SA--AM (species and subspecies)
<i>ssp.parasiticus</i>		
<u>Fabaceae</u> (ST) (=Faboideae in H)		
<i>Crotolaria verrucosa</i>	purple popbush	SA, SE, SM--WO
<i>Crotolaria incana</i>	small yellow popbush	SA, SE, SM--WO
<i>Andira inermis</i>		SA, SE--WO
<i>Tephrosia cathartica</i> (= <i>T.senna</i> * in H)		SA, SE--AM
<i>Indigofera suffruticosa</i> *	wild indigo	SA, SE, SM--AM, cultivated in Asia and Africa
<i>Cajanus cajan</i> *	pigeon pea	SA, SE--WO?, cultivated and naturalised
<i>Rhynchosia minima</i>		SA, SE, SM--WO
<i>Rhynchosia reticulata</i> *	pea withe	SA, SE, SM--AM
<i>Galactia rubra</i> *		SA, SE, SM--LA
<i>Erythrina variegata</i>		SA, SM--WO, native to the Old World
<i>Centrosema virginianum</i> *	blue bell	SA, SE, SM--WO
<i>Teramnus labialis</i>		SA, SM--WO
<i>Abrus precatorius</i> *	jumby beans, liquorise plant	SA (Rojer), SE, SM--WO
<i>Stylosanthes hamata</i> *	wild clover	SA, SE, SM--AM
<i>Alysicarpus vaginalis</i> *	sistern pea nut	SA, SE, SM--WO, native to Asia
<i>Desmodium axillare</i>	wire with	SA--AM
<i>Desmodium canum</i> * (= <i>D.incanum</i> in H)	wild pea (list H) hore laces? (L)	SA, SE, SM--WO
<i>Desmodium glabrum</i>		SA--AM
<i>Desmodium scorpiurus</i>		SA, SE--WO, native to AM
<i>Desmodium tortuosum</i>		SA, SE, SM--WO, native to AM
<u>Flacourtiaceae</u> (ST)		
<i>Casearia decandra</i>	crack open	SA, SE, SM--AM
<u>Gentianaceae</u> (ST)		
<i>Voyria aphylla</i> *		SA, SE--AM
<u>Gesneriaceae</u> (H)		
<i>Gesneria ventricosa</i> *	dare meat (L)	SA, SE--LA and St.Croix
<i>Besleria lutea</i> *		SA--WI
<u>Labiatae</u> (H) (= Lamiaceae)		
<i>Hyptis pectinata</i>	holly stalk (list H)	SA, SE, SM--WO
<i>Leonotis nepetifolia</i> *	adonis abbot (list H) li-	SA, SE (Rojer)--WO, na-

	on's tail (L)	tive to Africa
<i>Leonurus sibiricus</i> *		SA, SM--WO, native to Asia
<i>Plectranthus amboinicus</i> *	stinging thyme (list H)	SA, SM--WO, native to Africa
<i>Salvia micrantha</i>	rabbit meat (list H)	SA, SM--AM
<u>Lauraceae</u> (ST)		
<i>Nectandra coriacea</i> (= <i>Ocotea coriacea</i> in H)	sweet wood	SA, SE, SM--AM
<i>Nectandra krugii</i> (= <i>Ocotea krugii</i> in H)	black sweet wood	SA (H), SE--WI
<u>Lentibulariaceae</u> (H)		
<i>Utricularia alpina</i> *		SA (ST 1956)--AM
<u>Loganiaceae</u> (ST)		
<i>Spigelia anthelmia</i>		SA, SM--WO, native to AM
<u>Loranthaceae</u> (ST)		
<i>Phoradendron trinervium</i>		SA, SE, SM--WI (AM in H)
<u>Malpighiaceae</u> (ST)		
<i>Malpighia emarginata</i>	cherry, West Indian cherry	SA, SE, SM--WI, cultivated in AM
<i>Byrsonima spicata</i>	hilly hock mahogany tree (L)	SA, SE--AM
<i>Bunchosia jamaicensis</i>		SA--WI: Jamaica
<i>Bunchosia polystachia</i> *		SA--WI
<u>Malvaceae</u> (ST)		
<i>Abutilon hirtum</i>		SA--AM
<i>Abutilon indicum</i>		SA, SE, SM--AM
<i>Malvastrum americanum</i>		SA, SE, SM--WO, native to AM
<i>Malvastrum coromandelianum</i>		SA, SE, SM--WO, probably native to AM
<i>Sida javensis</i>		SA, SM--AM
<i>Sida jamaicensis</i>		SA--AM
<i>Sida acuta</i> ssp. <i>carpinifolia</i> (no subspecies in H)	soap bush (list H)	SA, SE, SM--WO
<i>Sida cordifolia</i>	mash mellow (list H)	SA, SE, SM--WO
<i>var. cordifolia</i> (no variety in H)	broombush (L)	
<i>var. althaeifolia</i>		SA, SE, SM--WO
<i>Sida rombifolia</i>		SA, SM--WO
<i>Urena lobata</i>		SA--WO
<i>Pavonia spinifex</i>	ginger bush	SA, SE--SM--AM
<i>Thespesia populnea</i> *		SA, SE, SM--WO
<u>Marcgraviaceae</u> (ST)		
<i>Marcgravia umbellata</i> *		SA--LA
<u>Meliaceae</u> (H)		
<i>Swietenia mahagoni</i> *	mahogany	SA--AM
<u>Melastomaceae</u> (ST)		

<i>Miconia laevigata</i>	sweet butchberry? (L)	SA, SE, SM--AM
<i>Charianthus purpurea</i>		SA--WI for the species,
<i>var. critinus</i>		SA and St.Kitts for the variety
<i>Tetrazygia discolor</i>		SA--AM (LA + Guyana)
<i>Tibouchina longifolia</i>		SA--AM
<i>Tibouchina strigosa</i>		SA--AM
<u>Menispermaceae</u> (ST)		
<i>Hyperbaena domingensis</i> *		SA, SE--AM
<i>Cissampelos pareira</i> *		SA, SE, SM--WO
<u>Mimosaceae</u> (ST) (= Mimosoideae in H)		
<i>Inga laurina</i> *	red wood	SA, SE, SM--AM
<i>Pithecellobium unguis-cati</i> *	crab wood, moneybush	SA, SE, SM--AM
<i>Albizia lebeck</i> *	woman's tongue	SA, SE, SM--WO, native to the Old World
<i>Acacia farnesiana</i>	cashia	SA, SE, SM--WO, probably native to AM
<i>Leucaena leucocephala</i> *	mimosa, tantan	SA, SE, SM--WO, probably native to AM
<i>Desmanthus virgatus</i> *	wild tantan	SA, SE, SM--WO
<u>Moraceae</u> (ST)		
<i>Ficus citrifolia</i>	rubber tree list H)	SA, SE, SM--AM
<i>Ficus nymphaefolia</i>		SA, SE, SM--AM
<i>Ficus americana</i> *		SA, SE--AM
<i>Cecropia schreberiana</i>	downgolog (L) trumpet tree (H)	SA, SE—WI
<u>Moringaceae</u> (ST)		
<i>Moringa oleifera</i> *	moringo, orselli	SA, SE, SM--WO, native to Asia
<u>Myrsinaceae</u> (ST)		
<i>Ardisia obovata</i> *	bastard cinnamon	SA, SE, SM--WI
<i>Myrsine coriacea</i> *		SA--AM
(<i>Rapanea ferruginea</i> in ST 1956)		
<u>Myrtaceae</u> (ST)		
<i>Psidium guayava</i> *	guava, guave tree	SA, SE--WO, probably native to AM
<i>Pimenta racemosa</i> *	cinnamon tree,	SA, SE, SM--WO, native to WI
	bayberry, bayrom tree(H + L)	
<i>Myrcia splendens</i>	Surinam cherry?	SA, SE, SM--AM
<i>Myrcia citrifolia</i> <i>var.imrayana</i>	redwood, birds cherry (list H)	SA, SE, SM--LA: Guadeloupe and Martinique
<i>Eugenia uniflora</i>	honey berry, Surinam cherry	SA, SE--AM, cultivated in Tropics and Sub-Tropics
<i>Eugenia axillaris</i>	choaky berry, pigeon berry	SA, SE, SM--AM,

<i>Eugenia rhombea</i>		SA, SE, SM--AM
<i>Eugenia procera</i>		SA, SE, SM--AM
<u>Nyctaginaceae (ST)</u>		
<i>Pisonia subcordata</i>	mappo mampoo, bloody (L) black loblolly, bloody tree list (H)	SA, SE, SM—WI
<i>Pisonia aculeata</i> *	cockspur	SA, SE, SM--WO
<i>Pisonia helleri</i>		SA--AM
<i>Mirabilis jalapa</i> *	four'o clock	SA, SE--WO, native to AM
<i>Boerhavia erecta</i>	hogmeat (list H)	SA, SE—WO
<i>Boerhavia diffusa</i>		SA, SE, SM--WO
<i>Boerhavia coccinea</i> *	hog meat bush (L)	SA, SE, SM--WO
<u>Ochnaceae</u>		
<i>Sauvagesia erecta</i> *		SA--WO
<u>Olacaceae (ST)</u>		
<i>Schoepfia schreberi</i> *		SA, SE--AM
<u>Oleaceae (ST)</u>		
<i>Chionanthus compactus</i> *	bridgo tree bachoa? (L)	SA, SE, SM—AM
<u>Oxalidaceae (ST)</u>		
<i>Oxalis corymbosa</i>		SA--WO, native to AM
<i>Oxalis corniculata</i>		SA, SE, SM--WO, native to Europe
<u>Papavaraceae (ST)</u>		
<i>Argemone mexicana</i> *	thistle	SA, SE, SM--WO, native to AM
<u>Passifloraceae (ST)</u>		
<i>Passiflora suberosa</i>		SA, SE, SM--WO, native to AM
<i>Passiflora laurifolia</i>	bell apple	SA, SE, SM--WO, native to AM
<i>Passiflora rubra</i>	snakeberry vine	SA, SE, SM--AM
<i>Passiflora foetida</i> var. <i>hispida</i>	killip (lijst H)	SA, SM--WO
<u>Phytolaccaceae (ST)</u>		
<i>Phytolacca rivinoides</i> *	purple heart (L)	SA--AM
<i>Rivina humilis</i> *	jumbi pepper	SA, SE, SM--AM
<i>Trichostigma octandrum</i> *	white hoop	SA, SE, SM--AM
<i>Petiveria alliacea</i> *		SA, SE, SM--AM
<i>Microtea debilis</i> *		SA, SE, SM--AM
<u>Piperaceae (ST)</u>		
<i>Piper reticulatum</i>	joint wood tree? (L)	SA, SE--AM
<i>Piper dilatatum</i>		SA, SE, SM--AM
<i>Pothomorphe peltata</i>		SA--WO
<i>Peperomia pellucida</i>		SA, SE--WO
<i>Peperomia glabella</i> var. <i>glabella</i>		SA, SE, SM--AM
<i>Peperomia nigropunctata</i>		SA, SE, SM--WI
<i>Peperomia guadeloupensis</i> (= <i>P.boldinghii</i> in ST 1956,		SA, SE, SM--WI (LA + St.Croix in H)

= <i>P.myrtifolia</i> in H)		
<i>Peperomia alata</i>		SA, SE, SM--AM
<i>Peperomia serpens</i>		SA, SE--AM
<i>Peperomia urocarpa</i>		SA--AM
<i>Peperomia magnoliifolia</i>		SA, SE, SM--AM
<i>Peperomia hernandiifolia</i> *		SA--AM
<i>Peperomia emarginella</i>		SA--AM
<u>Plantaginaceae</u> (H)		
<i>Plantago major</i> *		SA--WO
<u>Plumbaginaceae</u> (ST)		
<i>Plumbago scandens</i> *	blister bush bright eyes (L) eyebright (list H)	SA, SE, SM-- AM
<u>Polygonaceae</u> (ST)		
<i>Antigonon leptopus</i> *	coralito (list H)	SA, SE, SM--WO?
<i>Coccoloba swartii</i>	red mangle, redwood	SA, SE--AM
<i>Coccoloba uvifera</i>	sea grape	SA, SE, SM--AM
<i>Coccoloba venosa</i>	hoag apple, sugary grape	SA, SE, SM--AM
<u>Portulacaceae</u> (ST)		
<i>Portulaca oleracea</i>	purslane	SA, SE, SM--WO
<i>Portulaca halimoides</i>	silk cotton purslane	SA, SE, SM--AM
<i>Portulaca spinosa</i>		SA--AM
<i>Talinum paniculatum</i>		SA--AM
<i>Talinum triangulare</i> (= <i>T.fruticosum</i> * in H)		SA, SE, SM--AM
<u>Punicaceae</u> (ST)		
<i>Punica granatum</i> *	pome granate tree	SA, SE, SM--WO, probably native to Asia
<u>Rhamnaceae</u> (ST)		
<i>Gouania lupuloides</i> *	white root	SA, SE, SM--AM
<i>Colubrina arborescens</i>		SA, SE--AM, cultivated in Africa
<u>Rosaceae</u> (ST)		
<i>Rubus rosifolius</i> *	raspberry (L)	SA--WO, native to Asia
<u>Rubiaceae</u> (ST)		
<i>Exostema caribaeum</i>		SA (H), SE (H), SM--AM
<i>Hillia parasitica</i> *	white bell, morning star (L)	SA, SE, SM (list H)--AM
<i>Gonzalagunia spicata</i> (<i>G.hirsuta</i> in H)		SA, SE--AM
<i>Randia aculeata</i>	black cherry (list H)	SA, SE, SM--AM
<i>Hamelia axillaris</i>		SA, SE--AM
<i>Faramea occidentalis</i> *		SA, SE--AM
<i>Guettarda scabra</i> *	candle wood, wild guave	SA, SE, SM--WI + S.Florida
<i>Guettarda parviflora</i>	wild cherry	SA, SE, SM--AM
<i>Chiococca alba</i> *	buckroot amadesiac (L)	SA, SE, SM--AM
<i>Chiococca parvifolia</i>		SA, SE--AM
<i>Coffea arabica</i>	coffee	SA, SE--WO, native to the

		Old World
<i>Psychotria nervosa</i>	bastard canckerberry	SA, SE, SM--AM
<i>Psychotria microdon</i>		SA, SE, SM--AM
<i>Psychotria guadelupensis</i> (= <i>P.pendula</i> in ST 1956)		SA--WI
<i>Psychotria berteriana</i>		SA--AM
<i>Palicourea domingensis</i>		SA, SE--WI
<i>Palicourea crocea</i>	*	SA--AM
<i>Ernodea littoralis</i> *		SA, SE, SM--AM
<i>Spermacoce confusa</i>		SA, SE, SM--AM
<i>Borreria laevis</i>		SA, SE--AM
<i>Borreria ocimoides</i>		SA--WO
<i>Mitracarpus polycladus</i>		SA--WI: Puerto Rico
<i>Mitracarpus villosus</i>		SA--AM
<u>Rutaceae</u> (ST)		
<i>Zanthoxylum martinicensis</i>	yellow prickly	SA, SE, SM--AM
<u>Sapindaceae</u> (ST)		
<i>Cardiospermum halicacabum</i>	sprainbush vine	SA, SE, SM--WO
<i>var.microcarpa</i> (= <i>C.microcarpum</i>)		(list H)
<i>Allophylus racemosus</i> *		SA, SE, SM--AM
<u>Sapotaceae</u> (ST)		
<i>Bumelia obovata</i> <i>var.obovata</i> (= <i>Sideroxylon obovata</i> in H)	nickerberry (L)	SA, SE, SM--AM (WI + N.Venezuela)
<i>Chrysophyllum argenteum</i> *		SA, SE, SM--WI
<i>Mastichodendron foetidissimum</i> sp. <i>foetidissimum.</i>	mastic tree	SA--AM for the species WI + Florida for the sub-species
<i>Pouteria multiflora</i>		SA--WI
<i>Manilkara zapota</i>	mispel, sapodille	SA, SE--AM, often cultivated
<u>Scrophulariaceae</u> (H)		
<i>Scoparia dulcis</i> *		SA, SE--WO
<u>Simaroubaceae</u> (ST)		
<i>Picrasma antillana</i> (= <i>P.excelsa</i> * bij H)	bitter ash wild coffee, bastard bough (list H)	SA, SE, SM--LA + Virgin Islands
<u>Solanaceae</u> (H)		
<i>Acnistus arborescens</i> *		SA, SM--AM
<i>Cestrum laurifolium</i>		SA, SE--WI
<i>Physalis pubescens</i>		SA, SE (Rojer)--AM
<i>Solanum americanum</i>	wild pepper	SA--WO
<i>Solanum lancifolium</i>		SA, SE, SM--AM
<i>Solanum racemosum</i> *	cancer berry	SA, SE, SM--LA + Virgin Islands
<i>Solanum torvum</i>	foulberry tree (L)	SA, SM--WO, native to AM
<u>Sterculiaceae</u> (ST)		
<i>Waltheria indica</i> *	mash mellow	SA, SE, SM--WO
<u>Symplocaceae</u> (ST)		

<i>Symplococcus martinicensis</i> *	blue berry	SA, SE--WI
<u>Theaceae</u> (ST)		
<i>Freziera undulata</i> *	mountain mahogany(H)	SA--WI
<u>Theophrastaceae</u> (ST)		
<i>Jacquinea barbasco</i> (= <i>J. arborea</i> = <i>J. armillaris</i> * in H)	picrous bark	SA, SE, SM--WI
<u>Thymelaeaceae</u> (ST)		
<i>Daphnopsis americana</i> *	maho	SA, SE, SM--AM
<i>ssp. caribaea</i>	mahow (L)	
<u>Tiliaceae</u> (ST)		
<i>Triumfetta rhomboidea</i>	wild maho	SA, SE?--WO
<i>Triumfetta lappula</i>	wild maho	SA, SE, SM--WO
<i>Triumfetta semitrilobata</i> *	wild maho	SA, SE, SM--WO
<u>Turneraceae</u> (ST)		
<i>Turnera ulmifolia</i>		SA, SE, SM--AM
<i>var. ulmifolia</i>		
<u>Ulmaceae</u> (ST)		
<i>Celtis iguanaea</i>	snaky	SA, SE, SM--AM
<i>Trema micrantha</i>		SA, SE--AM
<i>Trema lamarckiana</i> * (<i>T. lima</i> in ST 1956)		SA--AM (WI + Florida)
<u>Urticaceae</u> (ST)		
<i>Pilea semidentata</i>		SA, SE--WI
<i>Pilea nummulariifolia</i>		SA--WI
<i>Pilea parietaria</i>		SA--AM
<i>Pilea microphylla</i>	creeping charly	SA, SE, SM--AM
<i>Pilea obtusata</i>		SA--WI
<i>Boehmeria ramiflora</i> *		SA, SE--AM
<i>Laportea aestuans</i>	*stinging nettle	SA, SE, SM--AM
<i>Rousselia humilis</i>		SA--AM
<u>Verbenaceae</u> (H)		
<i>Bouchea prismatica</i>		SA, SE--AM
<i>Citharexylum spinosum</i> *	savannah berry, Susanna berry (list) fiddlewood (L)	SA, SE, SM--AM
<i>Clerodendrum aculeatum</i> *	Persian lilac, haguebush (list)	SA, SE, SM--WI
<i>Lantana camara</i>	sage, scrubby cup, scrubby tree (L)	SA, SE, SM--WO, native to WI
<i>Lantana involucrata</i> *	sage	SA, SE, SM--AM
<i>Lantana urticifolia</i>		SA, SE, SM--AM
<i>Priva lappulacea</i> *		SA--WO, native to AM
<i>Stachytarpheta jamaicensis</i> *	purple worm bush sho- wer bell (L)	SA, SE (Rojer), SM--WO?
<u>Vitaceae</u> (ST)		
<i>Cissus sicyoides</i> (= <i>C. verticillata</i> * in H)	pudding withe	SA, SE, SM--AM
<u>Zygophyllaceae</u> (ST)		
<i>Kallstroemia pubescens</i>		SA, SE, SM--WO, native

		to AM
<i>Kallstroemia maxima</i> *		SA, SE-AM

APPENDIX II

CYPERACEAE AND GRAMINEAE OF SABA

abbreviations:

SA= Saba

SE= St.Eustatius

SM= St.Martin

LA= Lesser Antilles

WI= West Indies

AM= America (American Continent + West Indies)

WO= world (America + other parts of the world)

sources:

Stoffers, A.L. 1963, Flora of the Netherlands Antilles, Vol. I. p. 85-203, Spermatophyta, Monocotyledoneae, Uitgaven "Natuurwetenschappelijke Studiekring voor Suriname en de Nederlandse Antillen", no.36, Utrecht

Howard R.A. 1979, Flora of the Lesser Antilles, Vol.3, Monocotyledoneae, Arnold Arboretum, Harvard University, Massachusetts

(ST)= source is the Flora of Stoffers

(H)= source is the Flora of Howard

Scientific name	Common name	Area of distribution
<u>Cyperaceae</u> (ST)		
<i>Cladium restioides</i>		SA--WI
<i>Cyperus rotundus</i>	nutgrass	SA, SE, SM--WO
<i>Cyperus nanus var.nanus</i>		SA--WI
<i>Cyperus confertus</i>		SA (not in H), SE (not in H)--AM
(<i>Mariscus confertus</i> in H)		
<i>Cyperus planifolius</i>	bullgrass	SA, SE (not in H), SM (not in H)--WI
(= <i>Mariscus planifolius</i> in H)		
<i>Cyperus ligularis</i>		SA--WO
<i>Cyperus flavus</i>		SA--AM
<i>Cyperus ferax</i>		SA (not in H), SE (not in H)--WO
(= <i>Torulium odoratum</i> in H)		
<i>Cyperus brevifolius</i>		SA (not in H), SM (not in H)--WO
(= <i>Kyllinga brevifolia</i> in H)		
<i>Fimbrostylis annua</i>		SA (not in H), SM (not in H)--WO
(= <i>F.dichotoma</i> in H)		
<i>Rhynchospora polyphylla</i>		SA--AM
<i>Rhynchospora radicans</i> (H)		SA--AM
<i>Scleria pterota</i>		SA--AM
<i>Mariscus brunneus</i> (H)		SA--AM
<u>Gramineae</u> (ST)		
<i>Eragrostis ciliaris var.ciliaris</i>		SA, SE, SM--WO
<i>Eragrostis tephrosanthos</i>		SA, SM (not in H)--AM
<i>Eragrostis pilosa</i>		SA (H), SM--WO
<i>Eragrostis amabilis</i>		SA (not in H), SM (not in H)--WO
(= <i>E.tenella</i> in H)		

<i>Pappophorum pappiferum</i>	crabgrass	SA, SE, SM--AM
<i>Sporobolus poiretii</i> (= <i>S.indicus</i> in H)	lizard grass	SA (not in H), SM (not in H)--AM
<i>Sporobolus virginicus</i>		SA, SE, SM--WO
<i>Sporobolus jacquemontii</i> (H)		SA, SM--AM
<i>Aristida adscencionis</i>	mule grass	SA, SE (not in H)--WO
<i>Aristida cognata</i>		SA (not in H)--WI
<i>Anthephora hermaphrodita</i>		SA, SE, SM--AM
<i>Tragus berteronianus</i>		SA, SE, SM--AM
<i>Leptochloa panicea</i>	windgrass	SA--AM
<i>Leptochloa domingensis</i>		SA, SE--AM
<i>Leptochloa virgata</i>		SA, SM (H)--AM
<i>Eleusine indica</i>	dutch grass	SA, SE, SM--WO
<i>Dactyloctenium aegyptium</i>		SA, SE, SM--WO
<i>Cynodon dactylon</i>	bahama grass	SA, SE, SM--WO
<i>Chloris inflata</i>		SA, SE, SM--AM
<i>Chloris radiata</i>		SA, SM (H)--AM
<i>Bouteloua americana</i> (H)		SA, SE, SM--AM
<i>Pharus glaber</i>		SA, SE, SM--AM
<i>Digitaria insularis</i>	long grass	SA, SE, SM--AM
<i>Digitaria adscendens</i> (= <i>D.ciliaris</i> in H)		SA (not in H)--WO
<i>Digitaria horizontalis</i>	hay grass	SA (not in H), SE (not in H), SM--WO
<i>Brachiaria purpurascens</i>	para grass	SA, SE, SM--WO
<i>Brachiaria fasciculata</i> (H)		SA, SE, SM--AM
<i>Axanopus compressus</i>		SA (not in H), SM (not in H)--WO
<i>Paspalum fimbriatum</i>		SA, SE, SM--AM
<i>Paspalum conjugatum</i> (var. <i>conjugatum</i> in H)	crab grass	SA, SM--WO
<i>Paspalum laxum</i>		SA (not in H), SE (not in H), SM (not in H)--WI
<i>Paspalum paniculatum</i> (H)		SA, SM--WO
<i>Panicum trichoides</i>		SA, SM (H)--AM
<i>Panicum maximum</i>	guinea grass	SA, SE, SM--WO
<i>Panicum adspersum</i> (= <i>Brachiaria adspersum</i> in H)		SA, SE, SM--AM
<i>Ichnanthus pallens</i>	water grass	SA, SM (H)--WO
<i>Ichnanthus nemorosus</i>		SA (not in H)--AM
<i>Lasiacis harrisii</i> (= <i>L.divaricata</i> in H)	cane grass, wild cane	SA, SE, SM--AM
<i>Isachne disperma</i>		SA (not in H), SM (H)--LA
<i>Isachne rigidifolia</i>		SA (not in H)--WI
<i>Oplismenus setarius</i> (= <i>O.hirtellus</i> ssp. <i>setarius</i> in H)	running mountain grass	SA, SE, SM--AM
<i>Echinochloa colonum</i>		SA (H), SM--WO
<i>Tricholaena repens</i> (= <i>Rhynchelytrum repens</i> in H)		SA (not in H), SM--WO

<i>=Tricholaena rosea)</i>		
<i>Setaria geniculata</i>		SA, SE, SM (H)--AM
<i>Setaria setosa</i>		SA, SE, SM--AM
(var. <i>setosa</i> in H)		
<i>Setaria glauca</i> (H)		SA, SE--WO
<i>Isachne rigens</i>		SA--AM
<i>Cenchrus echinatus</i>	burrgrass	SA, SE (not in H), SM (not in H)--AM
<i>Imperata contrata</i>		SA--AM
<i>Andropogon bicornis</i>		SA, SM--AM
<i>Andropogon glomeratus</i>		SA, SM --AM

APPENDIX III

THE ANIMALS OF SABA

abbreviations:

SA= Saba

SE= St.Eustatius

SM= St.Martin

LA= Lesser Antilles

WI= West Indies

AM= America (American Continent and West Indies)

WO= world (America + other parts of the world)

Mammals

Sources:

Emmons, L.H. (1990) Neotropical Rainforest Mammals. The University of Chicago Press.

Husson, A.M. (1960) Zoogdieren van de Nederlandse Antillen. Natuurwetensch.Werkgr.Ned.Ant.

Knox Jones Jr., J. and C.J.Phillips (1970) Comments on the Systematics and Zoography of Bats in the Lesser Antilles. In: Stud. Fauna Cur. and other Carib. Isl. no.121. Corbet, G.B and J.E.Hill (1991) A World List of Mammalian Species. Oxford University Press.

scientific name, common name and local name	area of distribution	habitat	status and particular details
<i>Brachyphylla cavernarum cavernarum</i> St.Vincent fruit-eating bat	WI (species and subspecies)		formerly encountered in a small cave near Tent Point; in August 1996 this cave was localised, but could not be reached; one specimen was identified from a photo taken in 1997 (Walsh-McGehee, pers.comm.)
<i>Artibeus jamaicensis</i>	AM (species	mature and secondary rainfo-	this bat can be found in hollow trees, under palm leaves, in

<i>sis jamaicensis</i> Jamaica fruit-eating bat	and subspecies)	rests and deciduous forest	caves or occasionally in buildings; widespread and common in its range; locations of dayroosts in Saba are unknown
<i>Natalus stramineus stramineus</i> Mexican Funnel-eared Bat	AM for the species LA for the subspecies	rainforest, but more often more arid habitats of deciduous or dry forest and gardens and plantations	widespread and common but usually patchy in distribution; numerous in a few caves in its range; not any dayroost known from Saba
<i>Molossus molossus debilis</i> Mastiff bat	AM for the species northern LA for the subspecies	rainforest and many types of drier habitats, and in towns and cities	common to uncommon in its range; roosts in tree holes, rotting trees, rock piles, and buildings; often found in large colonies of hundreds in narrow, closed spaces under the roofs of houses in towns; in August 1996 one specimen collected; this was the first record from Saba; subspecies not sure
<i>Tadarida brasiliensis antillarum</i> Free-tailed Bat	AM for the species WI for the subspecies	dry or montane habitats on the fringes of the entire rainforest region	locally common and widespread in its range: roosts in tree holes, caves, rock crevices and under the roof of houses; several caught in mist net in april 1997 near swimming pool (Walsh-McGehee, pers.comm.)

Birds

Sources:

Voous, Prof.Dr.K.H. (1983) Birds of the Netherlands Antilles. De Walburg Pers.

Evans, P. (1990) Birds of the Eastern Caribbean. MacMillan Education Ltd.

Halewyn, R. van and R.L.Norton (1984) The Status and Conservation of Seabirds in the Caribbean. ICBP Technical Publication No.2.

ECNAMP (1980) Preliminary Data Atlas, Saba.

Walsh-McGehee, M. (1997) Summary of the presentation at the Society of Caribbean Ornithology in Aruba in August 1997.

scientific name, common name and local name	area of distribution	habitat	status and particularities
Resident- and breeding birds			
<i>Buteo jamaicensis jamaicensis</i> Red-tailed Hawk Macou (local-Johnson)	AM for the species WI for the subspecies	wide range of habitats, particularly mountaneous ones	considered a chicken thief, but probablyunbased; breeding bird in SA; according toVoous 5 or 6 pairs; observed in August 1996 at 3 different locations: Grey Hill, Sandy Cruz and Troy; one recent sight record of 4 birds together (Johnson, pers.comm. 1996)
<i>Falco sparverius caribaeorum</i> American Kestrel Killy (local)	AM for the species WI for the subspecies	dry woodlands, not too dense	though fairly common in its range it appears on the list of Appendix II of CITES; less numerous in SA than in the middle of 1930 (Voous); seen flying over the road near Hell's Gate in August 1996
<i>Columba squamosa</i> Red-necked Pigeon Pigeon, Blue Pigeon (local) Mountain Pigeon (local-Johnson)	WI (including Aruba, Bonaire, Curaçao, Los Testigos and Los Frailes)	rainforest, but also drier lowland woodland	commonly hunted in all islands and probably become rare in the main part of its range for that reason; two birds observed in August 1996 in the area of Cow Pasture

<i>Zenaida aurita aurita</i> Zenaida Dove Turtle Dove (local- Johnson)	WI for the species LA for the subspe- cies	lowland dry woodland and adjacent open country, some- times rainforest or along	common in SA in lowlands and low hills, most numerous in arid scrub; observed in August 1996 at different locations on the lower slopes of the island, especially numerous in low bushes along the coast of Tent Bay
<i>Columbigallina pas- serina nigrirostris</i> Common Ground Do- ve Ground Dove (local)	AM for the species LA for the subspe- cies	lowland open country and woodland, particularly xer- ophytic vegetation, roads- ides and gardens	restricted to sunny, arid patches on mountain slopes with low shrubbery; on map of Data Atlas local range restricted to Flat Point; in August 1996 observed in low bushes along the coast of Tent Bay
<i>Geotrygon mystacea</i> Bridled Quail Dove Wood Hen (local)	LA, Puerto Rico and Virgin Islands	lowland dry scrub woodland (Evans) or mountain zones with dense luxuriant vegeta- tion (Voous)	rare or irregular in some parts of its range; must probably be considered seriously endangered; not uncommon in wooded guts and in the cloud forest of SA; entering gardens at Wind- wardside at about 400 m altitude; observed in August 1996 near Mary's Point
<i>Eulampis jugularis</i> Purple-throated Carib Docter bird (local)	LA and Virgin Is- lands	humid forest and adjacent plantations, but also lowland dry forest sometimes	only species of endemic genus of LA; scarce, if not decidedly rare in SA; usually restricted to luxuriant vegetation at higher elevations and particularly known from ferntree forest and banana groves on mountain top of SA; seen in August 1996 at Sandy Cruz; over-sea flights suspected
<i>Sericotes holoseri- ceus holosericeus</i> Green-throated Carib Docter bird (local)	LA and Virgin Is- lands for the species LA for the subspe- cies	lowland dry woodland, gar- dens cultivated areas, some- times open areas in mountain regions	only species of endemic genus of LA and Virgin Islands; common in SA in gardens, along roadsides and in all kinds of vegetation, but not observed above 400 m altitude; probably less numerous than Crested Hummingbird; over-sea flights seem more regular than of Cr.H.; observed in August 1996 at feeding place in garden (Troy)

<i>Orthorhyncus cristatus exilios</i> Antillean Crested Hummingbird Docter bird (local)	LA, Virgin Islands and Tobago for the species LA and Virgin Islands for the subspecies	all habitats from sea level to the tops of the highest mountains and luxuriant vegetations of guts and	only species of endemic genus of LA, Virgin Islands and Tobago; one of the commonest birds of the Eastern Caribbean; commonest hummingbird in SA; occurs along roadsides, in scrub mountain slopes; August 1996 observed at Sandy Cruz
<i>Elaenia martinica martinica</i> Caribbean Eleania Whistler, Cheery-cheer (local)	WI for the species range of subspecies not available	all habitats, except dense rainforest	commonest of flycatchers in the region but more often heard than seen
<i>Tyrannus dominicensis dominicensis</i> Grey Kingbird Woodpecker (local)	WI (species and subspecies)	open land	conspicuous, migrating; compared with SE and SM least numerous on SA; seasonal fluctuations in numbers; the passage of migrants is suspected
<i>Progne dominicensis</i> Caribbean Martin Gale Bird (local)	WI	towns, open country and along sea-cliffs	mainly summer visitors, who spend the winter in S.America; some remain through the year; rather common; mainly along the coast; observed in August 1996
<i>Margarops fuscatus fuscatus</i> Pearly-eyed Thrasher Thrush (local)	WI for the species range of the subspecies is not available	rainforest, but also secondary wooded vegetation and adjacent common, but shy species; in all kinds tree plantations	genus endemic to WI; relatively of vegetation, gardens and fruit plantations, including the cloud forest; frequently seen in August 1996: in Island Gut, at The Flat, on The Mountain, in garden at Troy and many along the road from The Bottom to Well's Bay
<i>Margarops fuscus</i> Scaly-breasted Thrasher Thrush, Black-billed Thrush (local)	LA	mainly lowland dry woodland, but also rainforest	relatively common, but shy species in its range and preferring the canopy of trees or tall shrubs; in SA less common than Pearly-eyed Thrasher; the two species often occur together in the same fruit-bearing tree; in August 1996 seen at Troy

<i>Cinclocerthia ruficauda pavid</i> Trembler	LA for the species SA, SE, St.Kitts, Nevis and Montserrat for the subspecies	mainly mountain rainforest	only species of endemic genus of LA; not very common and locally endangered or already extinct in its range, but mostly silent and easily overlooked; occurs in the damp cloud forest of SA above 450 m altitude; observed and heard on Mount Scenery and Troy in August 1996
<i>Vireo antiloquus barbadensis</i> Black-whiskered Vireo	WI for the species range of the subspecies is not available	most wooded habitats from sea level to mountain rainforest, but dry scrub woodland is preferred	widespread in the Eastern Caribbean, but uncommon in the Virgin Islands, SA and SM; birds of the northern part of its range are migratory and seem to winter in S.America; few sight records from SA; usually inconspicuous; moves between the islands; not seen in August 1996
<i>Coereba flaveola bartholemica</i> Banaquit Yellowbreast (local)	AM for the species N.LA for the subspecies	all kinds of habitat	one of the commonest and widely distributed birds in the Caribbean; abundant in secondary vegetation, gardens and plantations, including the fern-tree forest; often very tame; less abundant than the Pearly-eyed Thrasher
<i>Euphonia musica flavifrons</i> Blue-crowned Euphonia, Green Euphonia Parrot (local)	WI for the species LA for the subspecies	primarily mountain rainforest, but also lowland dry woodland records from SA; all observations were in secondary scrub	generally uncommon in its range; few made in well-wooded steep ravines above 300 m altitude; probably breeding in SA; since 1952 sought in vain by various observers; not observed in August 1996
<i>Loxigilla noctis coryi</i> Lesser Antillean Bullfinch Robin, Sparrow, Cheechee bird (local)	LA and Virgin islands for the species LA and Virgin Islands south to Montserrat for the subspecies	all habitats from sea level to mountain top; secondary vegetation, gardens along the forest edge and scrubby are preferred	one of the commonest birds of the LA; common in low bushes, scrubby and gardens from sea level well into the luxuriant evergreen forest on the misty slopes of SA; also observed at Sandy Cruz in August 1996

<i>Tiaris bicolor omissa</i> Black-faced Grassquit Tobacco Seed (local) Tobacco Seed Bird	AM (species and subspecies)	open grassland, ticket, scrub and gardens, also waste ground along roadsides or field margins	adundant and widely distributed in its range; absent in moist woodland and forest: in SA restricted to warm arid slopes with low shubbery; most numerous on roadsides and often close to human habitations; observed in August 1996 in Lower Hells Gate (Johnson)
<i>Puffinus lherminieri lherminieri</i> Audubon's Shearwater Wedrego (local)	WO for the species WI for the subspecies	tropical seas; breeding habitat mainly small off-shore islets and sea cliffs	birds and eggs are exploited by man; its conservation status is of special concern; rather common in Saba Seas; several records from the coasts; nests found in Hell's Gate at 600 m in 1928 and 1937 and also on Great Hil; not observed in August 1996
<i>Phaeton aethereus mesonauta</i> Red-billed Tropicbird Tropic, White Bird (local)	WO (species and subspecies)	tropical seas, sea-cliffs for breeding	Caribbean populations are small, but probably stable; its conservation status needs to be monitored; breeding recorded in the past from Booby Hill Cliffs; breeds undoubtly at many other places; according to recent census SA has the largest breeding population in the Caribbean: estimated between 750 and 1,000 pairs; in August 1996 observed around Green Island, at Cove Bay and Tent Bay
<i>Phaeton lepturus catesbyi</i> White-tailed or Yellow-billed Tropicbird Tropic (local)	WO for the species WI for the subspecies	tropical seas; seacliffs for breeding	most numerous in the Caribbean where its range does not overlap that of <i>P.aetherius</i> ; breeding population in the Caribbean is now 1/2 of what was estimated in the eighties (Walsh-reason is coastal development and loss of nesting sites; breeding recorded from Fort Bay and Flat Point; several breeding sites along W and N coast; estimated at only a few pairs; in August 1996 possibly not distinguished from Red-billed Tropic birds McGehee, pers.comm.1997); main

<i>Butorides striatus virescens</i> Green, Striated Heron or Green-backed Heron Gaulin, Little Gaulin, Pond Bird (local)	WO for the species AM for the subspecies	wide range of habitats, particularly swamps and along lakes, ponds and streams	one of the commonest herons in the E.Caribbean; nests and eggs not yet found, but most certainly breeding; often feeding on open shores, sometimes seen in scrub far from water
<i>Sterna anaethetus recognita</i> (= <i>S.a.melanoptera</i> ?) Bridled Tern Egg bird (local)	WO for the species WI for the subspecies	offshore zone	rather common breeder in the Caribbean; nests in small breeding parties; breeding colony on Diament Rock; at least 25 pairs; not observed in August 1996
<i>Anous stolidus stolidus</i> Common or Brown Noddy Blackbird, Catbird (local)	WO for the species WI for the subspecies	oceans and coastal waters	second most numerous seabird nesting throughout the E.Caribbean; eggs exploited by man; solitary or in flocks up to 60; probably breeding on Island; also recorded around Diamond Rock and Flat Point; in August 1996 about 150 birds observed on and around Green Island
Migrants, visitors and non-breeding Seabirds			
<i>Falco columbarius</i> Merlin, Pigeon Hawk	WO	during migration any habitat from sea level to mountain top	regular passage migrant and winter visitor in the Virgin Islands and N. LA; further south only a casual visitor; on list of Appendix II of CITES; one record from SA
<i>Pandion haliaetus</i> Osprey Fish Hawk (local)	WO	all kinds of sea coasts, lagoons and inland bays	numbers have declined, but still a rare though regular winter visitor; on Appendix II list of CITES; one specimen collected in SA
<i>Oceanites oceanicus</i> Wilson's Storm Petrel	WO	cold-temperate waters of N. oceans; coasts and coastal mountains for breeding	of scarce occurrence in the Caribbean; casual passage migrant around the Windward Islands of the Netherlands Antilles; observed at sea between SM and SA

<i>Oceanodroma leucorhoa</i> Leach's Storm Petrel	WO	cold and temperate waters	uncommon in the Caribbean,; casual passage migrant; scarce in Saba seas
<i>Sala sula</i> Red-footed Booby Booby (local)	WO	tropical seas; small islands away from continental shelves with trees, shrubs or mangroves for breeding	less common than Brown Booby in the E.Caribbean; breeding sites need protection; non-breeding visitor in Saba; recorded in Saba Seas
<i>Sula dactylatra</i> White, Masked or Blue-faced Booby Booby (local)	WO	tropical seas; small islands for nesting and breeding	rarest booby in the Caribbean; endangered; only one record from Saba Seas
<i>Sula leucogaster</i> Brown Booby Booby (local)	WO	tropical seas; flat rocky islands and atolls, steep outlying rocks and cays as breeding places	commonest booby in the WI, but breeding colonies have declined considerable; its status needs to be monitored; regular, though scarce visitor along all coasts of SA and in Saba Seas; suspected nesting on Diamond Rock and Green Island; on map of Data Atlas Diamond Rock is indicated as nesting site; not seen in August 1996, but has been regularly observed on Green Island and near Old Booby Hill (van't Hof, pers.comm. 1996)
<i>Pelecanus occidentalis</i> Brown Pelican Pelican (local)	AM	coastal seas; mangrove swamp for breeding	uncommon visitor to most of the LA; breeding colonies need protection; regularly seen all year round along coasts; in August 1996 observed near Green Island

<i>Fregata magnificens</i> Magnificent Frigate-bird Weather bird (local)	WO	along tropical coasts and bays; mangrove swamp for breeding and steep rocks for roosting	common appearance throughout the WI , but few known breeding sites; breeding colonies should be fully protected; largest number recorded at sea more than 65 around small tanker near SA; communal sleeping roosts known from Green Island and Booby Hill Cliffs, with gatherings of 20-25 birds recorded and up to 200 birds on sleeping place opposite the airport; in August 1996 observed in Cove Bay near Green island and in Well's Bay
<i>Nyctanassa violacea</i> Yellow-crowned Night Heron Crabeater (local)	AM	mangrove swamp and along coast	most common in its range where there are extensive areas of mangrove swamp; predate on mountain crabs; some records from SA
<i>Bubulcus ibis</i> Cattle egret Cowbird (local)	WO	around grazing animals; mangrove swamp for roosting and coastal islets for breeding	invaders from Africa in the Caribbean as recently as 1930; first seen in SA in 1969; at present regular in appearance but very irregular in numbers
<i>Egretta caerulea</i> Little Blue Heron Water Gallinule (local)	AM	almost any habitat from damp pasture at sea level to montane swamp or stream; fresh or brackish water is preferred	commonly observed in the eastern Caribbean; once recorded from SA
<i>Egretta alba</i> Great White Egret	WO	extensive lagoons and quiet bays in the shelter of mangroves	in most of the Lesser Antilles uncommon though regular visitor; few records from SA
<i>Aix sponsa</i> Wood duck	AM	along woodland streams and forested bottomlands	casual winter visitor or straggler; once shot in SA; occurrence as far south as SA is exceptional
<i>Gallinula chloropus</i> Common Gallinule, Moorhen	WO	fresh water marshes, ponds and pools	common resident throughout the E. Caribbean; only once a very weak male caught in SA

<i>Pluvialis squatarola</i> Grey Plover, Black-bellied Plover	WO	arid tundras; mud flats and shores, lagoons, salt pans, open grasslands and tidal pools	some birds remain in the tropics throughout the year; one record from SA
<i>Calidris minutilla</i> Least Sandpiper Pond Bird (local)	AM	arid tundras; mud flats and shores, lagoons, salt pans, open grasslands and tidal and fresh water pools	visitor, recorded in all months of the year, often mixed with other waders; once a small flock was observed at Flat Point, SA
<i>Tringa flavipes</i> Lesser Yellowlegs Pond Bird (local)	AM	tundras; along salt and fresh water	visitor; one of the commonest transient waders; one record from SA
<i>Actitis macularia</i> Spotted Sandpiper Weather bird (local)	AM	all kinds of fresh water habitats	abundant transient and winter visitor in the West Indies; recorded in SA
<i>Stercorarius pomarinus</i>	WO	swampy tundras; tropical seas and oceans	mostly seen solitary and far from land; passage migrant; recorded in Saba Seas
<i>Larus atricilla</i> Laughing Gull Laughing bird, Davy (local)	AM	temperate and warm coasts	breeds throughout the E.Caribbean in small colonies; summer-visitor; few records off the coast of SA, but regular over Saba Bank
<i>Larus argentatus</i> Herring gull	WO	seas and coasts	occasional winter visitor; one sight record from Saba Seas
<i>Sterna maxima</i> Royal Tern Sea gull (local)	WO	warm and tropical coasts	may be seen at any time of the year throughout the E.Caribbean, however breeding colonies are few and small here; its status needs to be monitored; observed in Saba Seas throughout the year; one record from SA, Fort Bay
<i>Sterna hirundo</i> Common Tern	WO	coastal seas, harbours, inland bays, salinas, salt pans	passage migrant and winter visitor; its status needs to be monitored; one or two records from SA two birds observed daily in Saba Seas;

<i>Sterna fuscata</i> Sooty Tern Egg bird (local)	WO	oceans; seacliffs and remote islets for breeding	most numerous breeding seabird species in the Caribbean, but egg collecting is a serious threat; its status needs to be monitored; rather common in Saba Seas, mostly north of Saba Bank; in flocks of 50-300; flock of over 100 birds observed on rocky key
<i>Caprimulgus carolinensis</i> Chuck-will's-widow Owl (local)	AM	dry forests	winter visitor; one records from SA
<i>Streptoprocne zonaris</i> Collared or White-collared Swift	AM	?	South American race is migratory; records from the LA refer to this race; casual visitor in SA; three birds observed over Mt.Scenery in 1969
<i>Ceryle alcyon</i> Belted Kingfisher	AM	bays and seashores, lowland rivers, lakes and lagoons	passage migrant and winter visitor in the Caribbean; not uncommon in SA; solitary or in pairs; often on telephone wires
<i>Hirundo rustica</i> Barn Swallow Christmas bird (local)	WO	lowland open country, roadsides	common passage migrant and winter visitor in the E.Caribbean, also in SA
<i>Mniotilta varia</i> Black-and-white Warbler SA, numbers varying each year	AM	deciduous and coniferous woodlands	regular passage migrant and winter visitor in the E.Caribbean; scarce in
<i>Parula americana</i> Northern Parula Warbler	AM	swampy woodlands	regular and fairly common passage migrant and winter visitor in the E.Caribbean; not uncommon in SA, but numbers varying each year; observed from arid scrub at sealevel to the lower fern-tree zone on the Mountain
<i>Dendroica discolor</i> Prairie Warbler	AM WI	bush and scrub	uncommon winter visitor, probably not present each year in SA

<i>Setophaga ruticilla</i> American Redstart	AM	open, mainly deciduous forests	regular passage migrant and winter visitor in the E.Caribbean; observed in all kinds of vegetation in SA, rather numerous in some years, almost absent in others
<i>Seiurus noveboracensis</i> Northern waterthrush	AM	wooded swamps; shores of all kinds of fresh waters	regular passage migrant and winter visitor in the E.Caribbean probably in SA too
<i>Wilsonia citrina</i> Hooded Warbler	AM	deciduous woodland	winter visitor; one record from SA, Ladder Hill
<i>Piranga olivacea</i> Scarlet Tanager	AM	woodlands	accidental in the E.Caribbean; once caught in SA

Amphibians and Reptiles

Sources:

- Barkau Maylan, A. (1983) Marine Turtles of the Leeward Islands, Lesser Antilles. In: Atoll Research Bulletin no.278.
- Brongersma, L.D. (1959) Some snakes from the Lesser Antilles. In : Stud.Fauna Cur. and other Carib.Isl., no.37.
- Carmabi & Stinapa, Jaarverslag 1992. Conserveringsstatus van de Antillenleguaan.
- Daltry, J.C., M.L.Day and N.Ford (1997). Red-Bellied Racer Conservation Project. Draft of Project Report No.1.
- Lazell, J. (1972) The Anoles of the Lesser Antilles. In: Bul.of the Mus.of Com.Zoo. vol.143 no.1
- Schwartz, A. (1967) Frogs of the genus *Eleutherodactylus* in the Lesser Antilles. In: Stud.Fauna Cur. and other Car.Isl., XXIV, no.91.
- Schwartz, A. and R.W.Henderson (1991) Amphibians and Reptiles of the West Indies. University of Florida Press.
- Schwartz, A. and R.Thomas (1975) A Checklist of West Indian Amphibians and Reptiles. Carnegie Museum of Natural history.
- Sutty, L.(1993) Fauna of the Caribbean. The Last Survivors.The MacMillan Press Ltd.
- Sybesma, J. (K.Lind Eckert, ed.) (1992) Sea Turtle Recovery Action Plan for the Neth.Antilles. CEP Technical Report no.11, UNEP. Caribbean Environmental Programme

scientific name, common name and local name	area of distribution	habitat	status and particular details
Amphibians			
<i>Eleutherodactylus johnstonei</i> Piping Frog	LA, introduced in Jamaica and Bermuda	mesic forests, including rainforest, also cut-over fields, yards, gardens and adjacent to sugarcane fields	very common in its range; occurs from sea level to elevations of at least 854 m; can be encountered in almost any terrestrial situation which offers concealment and some moisture; makes a weak 2-note call, which was heard in August 1996 at night and in response to rain showers; possibly introduced in SA by man

Reptiles			
<i>Anolis sabanus</i> Tree Lizard	SA, endemic	all kinds of habitat from sea level to mountain top	infradispersed and abundant all over the island except in the driest areas; in driest areas clumped around bushes; does not occur on Diament Rock or Green Island; in August 1996 observed all over the island from the stony beach of Well's Bay to the top of the Mountain
<i>Iguana iguana</i> Green Iguana, Common Iguana	AM	all kind of habitats from xeric to mesic	occurs in the lower parts of the island up to ca 500 m altitude; steep cliffs are their preferred habitat; suffers from hunting by humans; in August 1996 observed on roadside, English Quarter; reported from the area of Spring Well's Bay (Johnson, pers.comm. 1996)
<i>Hemidactylus mabouia</i> Common Gecko, Mabouya	WO	buildings, open rocky areas	active at night; introduced from Africa
<i>Sphaerodactylus sabanus</i>	SA, SE, St.Kitts and Nevis	mesophilic	
<i>Thecadactylus rapicauda</i> Woodslave, Houseslave	AM	mesophilic; rainforest, mesic highlands, plantations, buildings	nocturnal
<i>Alsophis rufiventris</i> Red-bellied Racer Snake	SA, SE, formerly also St.Kitts and Nevis	mesophilic; rainforest, along forest edge, rock-strewn areas at forest edge or in forest, gardens, heavily disturbed areas	diurnal; preys on <i>Eleutherodactylus</i> , <i>Anolis</i> and <i>Ameiva</i> ; in view of the dramatic decrease of its range assessed to be 'Endangered' in the 1996 IUCN Red list of Threatened Animals; appears to be very abundant within its current distribution range and more abundant on SA than on SE; seen in August 1996 near Mary's Point

<i>Chelonia midas</i> Green Turtle	WO	oceans; shallow water with sea grass beds; large open beaches for nesting	endangered; numbers have declined very much worldwide because of exploitation by humans; appears on list of Appendix I of CITES; year-round seen in waters around SA; occasional nesting reported from Fort Bay, Well's Bay and Cave of Rum Bay
<i>Eretmochyls imbricata</i> Hawksbill	WO	tropical oceans, coral reefs and rocky coasts; small quiet beaches for nesting	highly endangered; numbers have declined worldwide: appears on list of Appendix I of CITES; seen year-round in foraging habitats; nesting reported on rare occasions at the same seasonal beaches as Green Turtle
<i>Caretta caretta</i> Loggerhead	WO	tropical and subtropical oceans; subtropical continental beaches	endangered; appears on list of Appendix I of CITES; only once reported from SA: a turtle captured on Saba Bank (before 1983)
<i>Dermochelys coriacea</i> Leatherback	WO	tropical, temperate and sub-arctic seas and oceans, in tropical areas only	endangered; appears on list of Appendix I of CITES; sighted on Saba Bank only on rare occasions presumably when passing in migration to other destinations; nesting should have taken place at Fort Bay long ago

APPENDIX IV

Butterflies of Saba

Abbreviations:

SA= Saba

SE= St.Eustatius

SM= St.Martin

LA= Lesser Antilles

WI= West Indies

AM= America (American Continent and West Indies)

WO= World (America + other parts of the world)

Source:

pers. comm. J. Y. Miller and L.D.Miller, 1996.

Common names from:

Gerber, E. J. and R. H. Arnette, Jr. 1989. Florida butterflies. Natural Science Publications, Inc. Baltimore, MD.

Stiling, P. D. 1986. Butterflies and other insects of the Eastern Caribbean. MacMillan Press Ltd., London.

Scientific name	Common name	Area of distribution
Danaidae		
<i>Danaus plexippus</i>	Monarch	SA, SM--AM
Nymphalidae		
<i>Biblis hyperia</i>	Red Rim	SA, SE--AM
<i>Junonia genoveva</i>	Smokey Buckeye	SA, SE, SM--AM
<i>Marpesia petreus</i>	Red Dagger Wing	SA--AM
Heliconiidae		
<i>Agraulis vanillae</i>	Gulf Fritillary	SA, SE, SM--AM
<i>Dryas iulia</i>	Flambeau	SA--AM
<i>Heliconius charitonia</i>	Zebra Long Wing	SA, SE--AM
Lycaenidae		
<i>Chlorostrymon maesites</i>	Verde Azul Hairstreak	SA--WI (+ Florida)
<i>Electrostrymon angerona</i>		SA--LA
<i>Hemiargus hanno</i>		SA, SE, SM--AM
<i>Leptotes cassius</i>	Tropical Striped Blue	SA, SE, SM--AM
<i>Strymon acis</i>	Antillean Hairstreak	SA, SE, SM--WI (+Florida)
<i>Strymon bubastus</i>		SA, SE, SM--AM
Pieridae		
<i>Appias drusilla</i>	Tropical White	SA, SM--AM
<i>Ascia monuste</i>	Great Southern White	SA, SE, SM--AM
<i>Eurema lisa</i>	Little Sulfur	SA, SE, SM--AM
<i>Phoebis sennae</i>	Cloudless Sulfur	SA, SE, SM--AM
<i>Rhabdodryas trite</i>		SA--AM
Hesperiidae		
<i>Calpodus ethelius</i>	Canna Skipper	SA--AM
<i>Epargyreus zestos</i>	Rusty Skipper	SA, SM--AM
<i>Ephriades arcas</i>		SA, SE, SM--WI
<i>Panoquina sylvicola</i>	Sugarcane Skipper	SA, SE, SM--AM
<i>Polygonus leo</i>	Violet Skipper	SA, SM--AM
<i>Pyrgus oileus</i>	Tropical Checkered Skipper	SA, SE, SM--AM
<i>Urbanus obscurus</i>		SA, SE--LA
<i>Urbanus proteus</i>	Long Tailed Skipper	SA, SE--AM
<i>Wallengrenia ophites</i>		SA, SE, SM--LA