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**NATIONAL REPORT ON THE STATUS OF BIODIVERSITY
IN S.TOMÉ AND PRÍNCIPE**



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ABBREVIATIONS

African Bank for Development	ABD
Arab Bank for African Development	ABAD
World Bank	WB
Center for Agricultural and Technological Research	CIAT
Ministerial Commission on Central African Forests Program for the Preservation and Use of Ecosystems	COMIFAC
Vegetable Oil Company	ECCOFAC
European Union	EMOLVE
United Nations Organization for Food and Agriculture	EU
World Environment Fund	FAO
International Fund for Agricultural Development	FEM
Government of the Democratic Republic of São Tomé and Príncipe	FIDA
German Cooperation Agency	GDRSTP
Ministry for agriculture, rural development and fishing	GTZ
Ministry for Commerce, Industry and Tourism	MADRP
Ministry for Defense and Internal Order	MCIT
Ministry for Social Facilities and the Environment	MDDI
Ministry for Foreign Affairs and Cooperation	MESA
Ministry for Public works, Infra-structures and Zoning	MNEC
Ministry for Planning and Finance	MOPIOT
Ministry for Natural Resources and the Environment	MPF
New Partnerships for African Development	MRNMA
Partnership for the Forests of the Congo Basin	NEPAD
Gross Domestic Product	PFBC
National Plan for Durable Development	GDP
United Nations Program for the Environment	PNADD
United Nations Program for Development	UNPE
Democratic Republic of São Tomé and Príncipe	UNDP
Protected Area Network of Central Africa	DRSTP
International Union for the Conservation of Nature	RAPAC
United Nations Organization for Science, Education and Culture	UICN
World Wildlife Fund	UNESCO
	WWF

EXECUTIVE SUMMARY

The Democratic Republic of S. Tomé and Príncipe, knowing that it is of the utmost importance to protect and preserve biological diversity, and concerns all of humankind, has decided to face its responsibilities and look for effective, viable solutions for sustainable development.

The present report intends to describe the actual situation of biodiversity in the archipelago and derives from the country's international commitments.

For this document to be compiled, the consultants sought advice from several persons involved in environmental issues, went on visits to specific sites, promoted 2 seminars, one of them in S. Tomé and the other one in Príncipe; researched websites that gave them access to similar studies undertaken elsewhere in the world; reviewed extant literature, including the first country report on biodiversity and the Biodiversity Action Plan, which already engages the authorities in the country.

The study on pressures and threats hanging over the many species present in the 4 ecosystems described in this study allowed us to present a few measures, herein consigned as recommendations, in order to promote the sustainability of said ecosystems, their protection and the preservation of specific and genetic biodiversity.

“Biodiversity” is a new word that stands for a degree of variety in animal, plant and microscopic species. Currently, over 1,720,000 species of living beings are known, with new species described every year. These include 40,000 vertebrates and 750,000 insects.¹

Climate change negatively impacts genetic diversity and is at the root of the disappearance of roughly one million plant and animal species. The degradation of biodiversity has grown to an alarming scale all over the world. S. Tomé and Príncipe has not been unharmed, although the loss is not yet quantifiable. Biodiversity has waned among cultivated, domesticated and other species.

Through consultation, interviews and visits, we have found the country's been looking for the means to take action on the recommendations of article 6 in the Convention, namely on strategy design and deployment, national plans and programs to protect, preserve and implement sustainable use of biodiversity; and there's been an effort to include these objectives in specific plans, sectoral and inter-sectoral. We've also realized that the means thus far available are insufficient and do not satisfy real needs when it comes to preserving and protecting the ecosystems we've studied. The 4 ecosystems are under strong anthropic pressure and do not possess reliable, durable mechanisms to ensure their balance and prevent possible catastrophes.²

The international community, fully aware of how important it is to preserve biological diversity and its intrinsic values (ecological, genetic, social, economic, scientific, educational, recreational, cultural and aesthetic), driven by an undeniable need to implement actions towards the prevention of a global catastrophe for life in the planet, has decided, through the Convention on Biological Diversity, to set forth an international legal instrument concerned with 3 fundamental objectives³:

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- Preservation of biodiversity;
- Sustainable use of its components;
- Fair and equitable sharing of benefits derived from such use.

That these objectives may bear fruit, the Convention presses for the elaboration of national and international strategies that take on the preservation and protection of nature, as well as sustainable use of biodiversity.

This report on biodiversity, to be presented to the Conference of Signatories of the Convention on Biodiversity at São Tomé and Príncipe, stems from the ineluctable need to act now and prevent a global catastrophe for life in the planet. Through reading and analysis, the report intends to foster:

- ❖ Increased dynamics in the implementation of a national strategy for adequate management of biodiversity and an action plan to protect and preserve biological diversity;
- ❖ Continued design of measures towards sustainability of biological resource use.
- ❖ More appropriate measures to allow for fair and equitable distribution of the benefits of biological and genetic resources;
- ❖ Reinforcement of ample international, regional and sub-regional cooperation to bolster studies and scientific/economic exchange of relevance in the field of biodiversity.

In order to meet the objectives set forth in the terms of reference and make the document easier to read, we've structured it into 4 chapters:

Chapter I provides an introduction and reiterates engagement from São Tomé and Príncipe concerning the Convention and international commitments towards the goals of the Convention.

Chapter II presents biodiversity in the country through descriptive approaches to the flora and fauna in the ecosystems studied herein.

Chapter III reports on current biodiversity status and indicated pressures and main threats.

Chapter IV presents our conclusions and final recommendations.

These 4 chapters are not airtight but systematically interrelated, so as to shed all the light we can on the problems of preserving biodiversity, on the achievements up to now and possible enhancements to sustainable resource management.

CHAPTER I - INTRODUCTION

1. General introduction

This report includes an updated version of the data gathered on biodiversity in the archipelago and relies on extant literature, such as the first country report on biodiversity and the biodiversity action plan which already has elicited engagement from the country's authorities.

In June 1992 STP signed the Convention on Biodiversity at the Rio de Janeiro Summit. Soon after, the country benefited from funding towards the draft of a first report on biodiversity as well as the national strategy and the biodiversity action plan (ENPAB), under article 7 of the Convention.¹

The present report builds on the first and its general goal is to study and analyze biodiversity in São Tomé and Príncipe and allow for understanding of its current state. These documents (first, second and third reports), therefore, provide the country with scientific data on current biodiversity. These should allow for minimization of threats and the implementation of responsible governance towards protection, preservation and sustainable use of resources, for sustainable development and the fight against poverty. These resources are renewable but limited. Only through better management can we secure nourishment for our population and economic and ecologic security for future generations. Therefore, biodiversity must be at the center of development programs, which so far privilege humans, the main modifiers of all ecosystems.

Also to seek funding for environmental literacy measures, which the country badly needs, our study of flora, fauna and abiotic components has taken a form that leads to actionable recommendations about the four ecosystems included in this paper: Coastal/Marine, Inland Water, Forest and Agrarian Ecosystems.

They contain a significant portion of the world's biodiversity, on which the future of humankind also depends.² Coastal and Inland Water ecosystems are particularly important to the RAMSAR Convention on humid areas of international importance, especially as places where aquatic birds may be found in their trophic context.

Therefore, the components of said ecosystems must be continually studied and protected. This will only be possible if we can rely on support from communities located near or in the ecosystems themselves. These communities must be encouraged to collaborate in the maintenance of these ecosystems. We need coherent policy based on the need to produce without depleting natural resources, to cull without replanting, to eliminate erosion and pollution, to protect what's left of the environment and the wild or domestic species that are part of it; to develop means of information to coordinate environmental data in a consistent manner; all this to support sensible decisions on the environment.

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2. Materials and methods

The method we follow in this paper attempts to draw comparisons among several previous report of this type and other types.

Taking into account the importance of nomenclature, this report presents flora and fauna according to the Linnean naming system to facilitate understanding in a scientific context.

This report includes a considerable volume of scientific information as documental groundwork was carried out by technicians with prior experience relating to STP flora and fauna and the problems of biodiversity in the country. Data came from investigative reports undertaken per the ECOFAC (Forest Ecosystems in Central Africa) program for the Conservation and Rational Use of Dense Ecosystems and the reports on preservation by several government authorities. The information available was complemented by on-site research to better understand preservation of environment and resources as well as the impact of steps already taken in São Tomé and Príncipe.

Considering that available publications are an important source of information, it was difficult to gather data for this report. Figure 7 illustrates ecosystems and habitats under threat in the archipelago.

3. Synopsis of Information on São Tomé and Príncipe

The scheme below concisely presents a descriptive overview of São Tomé and Príncipe according to ENPAB data.¹

Scheme 1



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3.1 Geographical context

São Tomé and Príncipe are the two main islands of this archipelago country located on the Gulf of Guinea. 380km off mainland Africa, the main geographical coordinates are: Latitude 0° 25'N, longitude 6° 20'E. The islands present a land surface of roughly 1,001 square kilometers (859km² for São Tomé island, 142km² for Príncipe island).

Fig. 1: Maps of the geographical situation of São Tomé and Príncipe



3.2 Origin

The islands are part of a volcanic range that includes Pagalu to the southwest and Bioko on the northeast, extending to the African mainland via Cameroon Mountain and reaching Lake T Chad. The islands have never been physically connected to each other or the African mainland.

3.3 Land forms

The archipelago has arisen from relatively old volcanic activity (3 million years). The landforms are diverse, including peaks reaching 1500 meters. The highest is the Pico de São Tomé, 2024m above sea level (see charts in annexes I and II). Most of the country, however, is under 800m.

3.4 Climate

Annual average rainfall is 2,000 to 3,000mm/year, and up to 7,000m/year in mist forests.

There is a humid tropical climate with two seasons: a hot rainy season lasting about 9 months, and a dryer season from June through September. Annual average rainfall is 2,000 to 3,000mm/year, and up to 7,000m/year in mist forests. The average annual temperature is 26° C. (see maps 7 and 8)

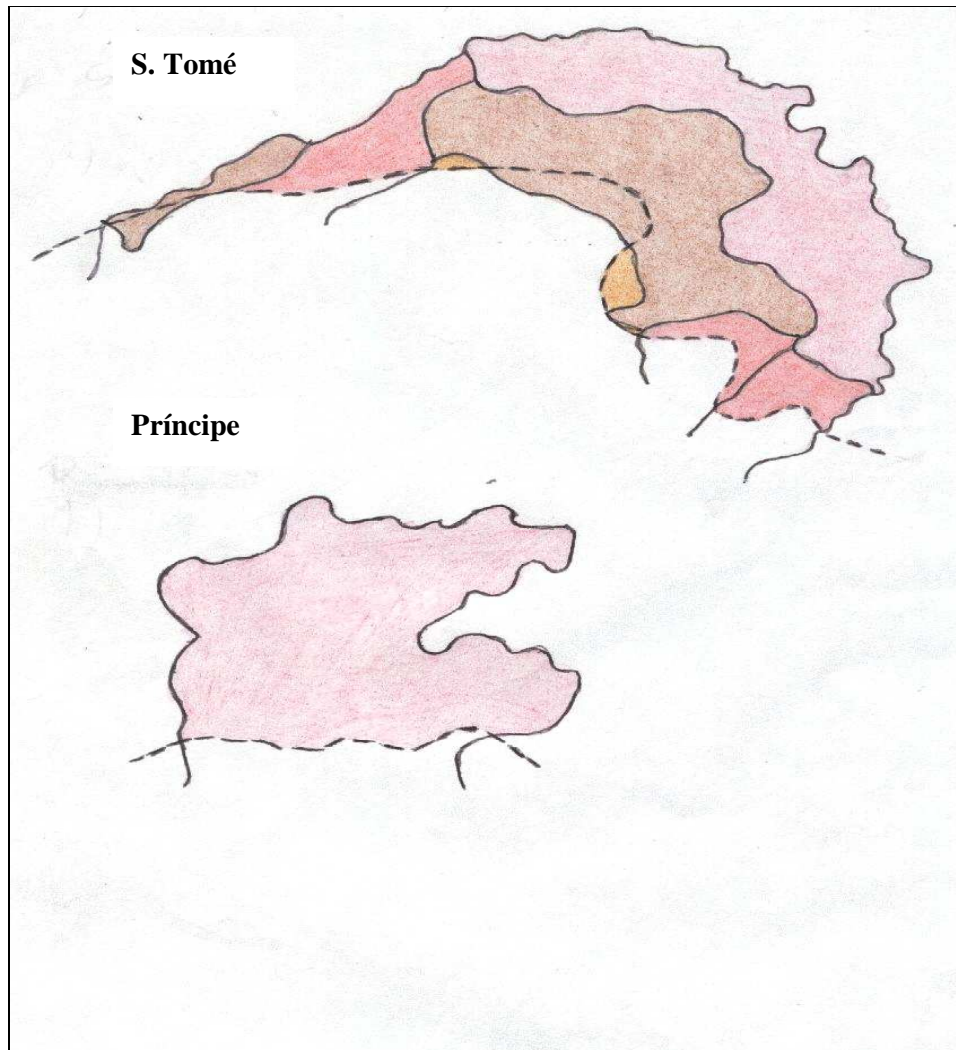
3.5 Vulnerable soil

To assess the vulnerability of soil vis-à-vis climactic changes, we must consider the following basic concepts:

- tropical soil, especially forest soil, is not very fertile — fertility is heavily dependent on vegetable covering that ensures a cycle of mineralization for organic matter;
- Besides existing nutrients, soils are fertile when they possess an optimum physico-chemical structure for the exchange of cations and the circulation of water and oxygen;
- The bio-productive potential of soil depends also on its orographic and eco-climatic situation: a mountain summit, a slope, a valley, a plains, an arid, humid or super-humid zone;
- The way soil has been used also defines its productive capability: several years of intense cultivation, or never being used for agricultural purposes, will result in different soil profiles.

Regarding the orographic and eco-climatic situation, as well as the history of soil use, the most vulnerable to climate changes are *tropical fersialitic* and *black clay* soils (see figure 2, below).

Fig. 2: Illustration of soil most vulnerable to climate change



Source: Study on vulnerability to climate changes - forest and soil sector

CHAPTER II – GENERAL DESCRIPTION

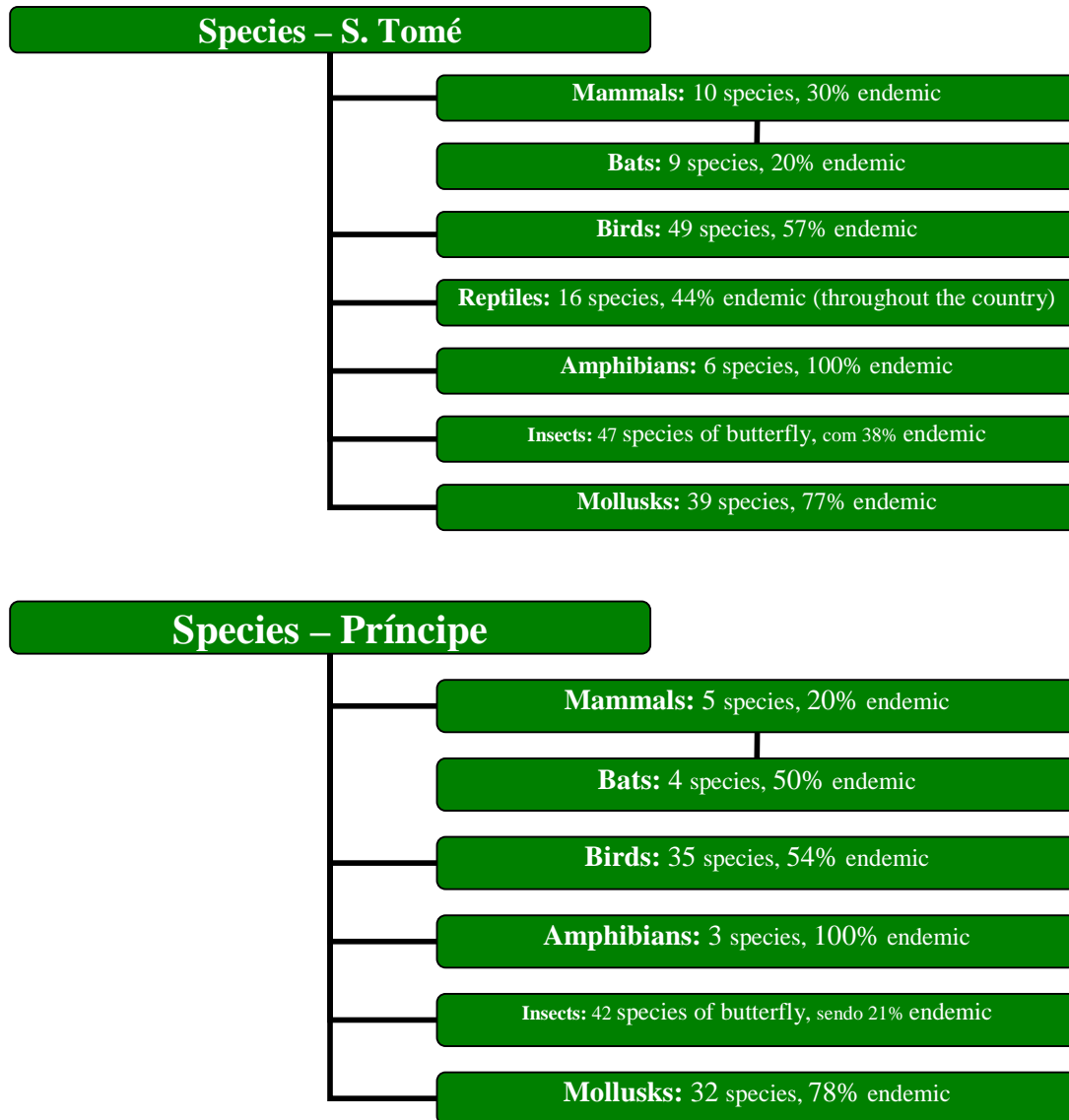
2. DESCRIPTION OF BIODIVERSITY IN THE COUNTRY

As shown in the table below, S. Tomé is home to a great number of species: birds, amphibians, superior plants, bats, reptiles, butterflies and mollusks, distributed throughout different ecosystems and habitats.

2.1. Groups of Organisms in São Tomé and Príncipe — number of non-endemic and endemic species

(Source: ENPAB-Agriculture 2002; Ogonovszky 2003, World Bank 2003).

Scheme 2:



Source: ENPAB-Agriculture 2002; Ogonovszky 2003, World Bank 2003).1

2.2 Flora

As stated above, the islands on the Gulf of Guinea are a part of the western African sub-region related to the Congo River basin, and are known for high rates of endemism.

Both São Tomé and Príncipe exhibit a rate of endemism around 14%, the highest in the Gulf of Guinea.

This is due to the following factors: small size of the islands, isolation and diverse habitats.

The most representative families in the land angiosperm groups are: Rubiaceae (27 species), Orchidaceae (35 endemic), Euphorbiaceae (11 endemic), Melastomataceae (8 endemic in a total of 17, i.e., 47% endemism), Begoniaceae (6 endemic in a total of 11, i.e., 55% endemism).¹

As for taxonomic diversity, there are pteridophytes, including ferns, lycopods, psilophytes and field horsetails. The latter group is not found in S. Tomé and Príncipe. There are a total 157 pteridophytes.² As for ferns, there are 13 endemic species on both islands (see table 2 below).

The diversity of spermatophytes comprises 113 families represented by 791 taxa at specific or intra-specific levels (10). There are 683 taxa in São Tomé and 330 in Príncipe.

Orchids are a privileged family on the islands, with a rate of endemism around 23%. The total number of species is 135, and 35 are endemic. The polystachia and bulbophyllum genera present the largest number of species.

Certain groups of organisms are better known than others, so there must be further research. The best-studied groups are vascular plants.

The list of endemic plants on both islands is comprised of 148 endemic taxa, 123 in S. Tomé and 50 in Príncipe.³

These 148 endemic taxa have been assessed with the IUCN categories adapted to the archipelago. 14,9% endemic species on São Tomé and Príncipe are deemed extinct (EX), 12,8% are critically endangered (CR), 10,8% are endangered (EN), 41,9% are vulnerable (VUD2), 12,2% are near threatened (NT) and 7,4% are of least concern (LC).

46% of species in non-protected areas of São Tomé have been deemed extinct, 41% in the buffer zone are threatened and may disappear if no action is taken, and 39% of threatened species are located within the bounds of Park Obô. The latter will be effectively protected if the park's boundaries are legalized and protected.

The number of threatened animal species is: 16 bird species, 10 insect species, 4 mollusk species and three mammal species (see table 12 below).

2.3 Brief history

Since the early days of settlement by Portuguese colonists in the 17th century, with the cultivation of sugarcane (*Saccharum officinarum*), the use of biological resources has been closely bound with the occupation of S. Tomé and Príncipe. The sustainable use

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of the country's biological diversity, to have local communities profit from it and thus combat poverty, is directly tied to its preservation.

Cocoa, *Theobroma cacao* (the country's main export) and coffee, *Coffea spp.*, throughout the 18th and 19th centuries, require maintenance of the forest mantle for shading. The shade forests that colonized the lowlands, which are choice agricultural terrain in São Tomé and Príncipe, enjoy an international reputation, as they are amenable to the preservation of tropical soil under insular conditions and the maintenance of a few forest essences.

The flora of S. Tomé and Príncipe has also drawn attention from researchers as Júlio Henriques and Arthur Exell, respectively a professor with the University of Coimbra and a scientist with the British Museum.

F. Welwitshi in 1853, and then C. Barter in 1858 and G. Mann in 1861 also gathered specimens leading to the discovery of species thereto unknown.

Auguste Chevalier visited S. Tomé in 1905, and in 1956 Théodore Monod climbed the peaks of S. Tomé and of Príncipe, culling rare endemic specimens.

Joaquim Espírito Santo discovered new species in the 1960's and 1970's, and Herder Lains e Silva undertook new research and classification of the country's flora.

Research has shown that, of the four islands on the Gulf of Guinea, Bioko, Príncipe, São Tomé and Pagalu, the Santomean archipelago presents the richest diversity of flora, with high rates of endemism.

In the past, economic goals superseded conservation efforts.

Thus the country's biodiversity has been hampered by man since the late 15th century (Hodges and Newitt, 1988), especially in the lowlands where sugarcane, cocoa and coffee were grown. Several exotic species have been introduced (Monod, 1960), disrupting equilibrium.

Human pressure on the archipelago's natural resources, and especially on the forest, takes a toll on biodiversity.

Vegetal cover takes the most damage. Wood and plant species are indiscriminately harvested around and in Park Obô. Agriculture, the introduction of exotic species or other unsound practices cause considerable harm. Over the past few years, biological diversity has waned in the archipelago's ecosystems. The standard of living has gone down for the communities that depended on harmed species, and so these communities now struggle with extreme poverty.

Non-sustainable practices are not inevitable. They arise from poor knowledge of flora and the intrinsic relationships it adheres to. The country needs effective research mechanisms to improve knowledge on the country's flora and the means to disseminate useful knowledge among the communities. The development and improvement of the Bom Sucesso Botanical Garden, under the ECOFAC project, is one of the ways to fill the lack.

The preservation of forest mantles is relevant to the country's agrarian system (regulation of rainfall, insolation and evapotranspiration), protection of hydrographic basins, protection of soil against erosion, recycling nutrients and the reconstitution of natural fertility in soils. Furthermore, as other rainforests throughout the world, Santomean forests may function as carbon dioxide regulators, contributing towards the management of climate change.

2.4 BIODIVERSITY ON LAND

The country being cut off from the African mainland, its biological diversity is unique. Isolation has brought about a high number of endemic flora and fauna (see tables 1, 2, 6 and 9 in the annex).

The scientific world recognizes this diversity and considers the Santomean rainforest as second in terms of the preservation of avian fauna, among 75 African forests (World Bank 1993).

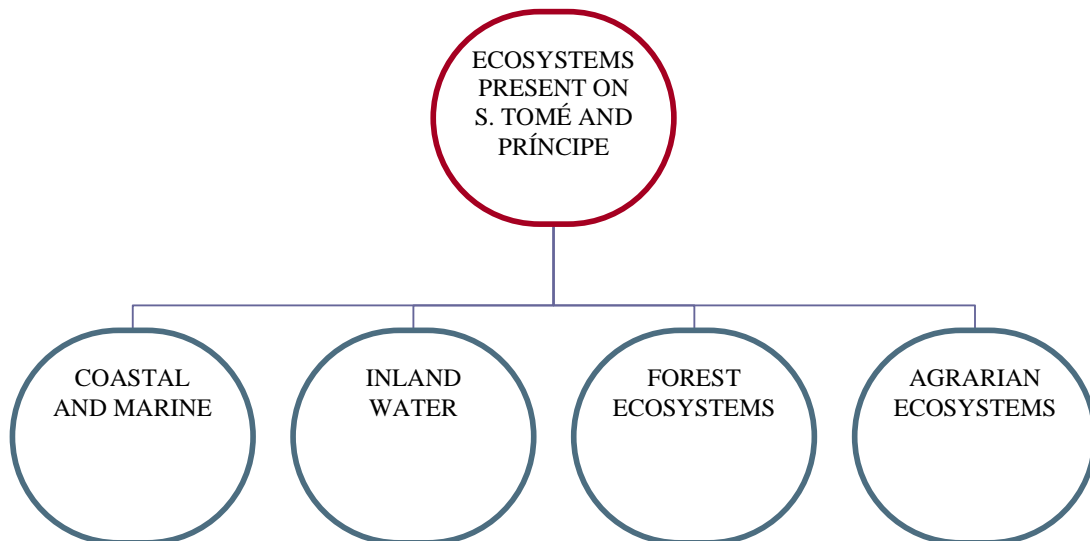
The flora of São Tomé and Príncipe is also remarkable for its high rate of endemism. The island of S. Tomé has one endemic genus and 87 endemic species. Príncipe has one endemic genus and 32 endemic species (ENPAB forests 2002).

2.5 Main ecosystems and habitats in the country

Biodiversity in São Tomé and Príncipe reveals a large variety of ecosystems in the archipelago: Natural ecosystems (forests, mangroves, inland waters, coastal and marine) and modified ecosystems (secondary forests and old plantations, shade forests, savannahs, dry forests).

An ecosystem-based approach to the biological wealth of São Tomé and Príncipe is still the most pragmatic way to build a diagnosis on biodiversity in the country and recommend specific measures for preservation and sustainable use. For the purposes of this paper, 4 main ecosystems have been defined:

Scheme 3: Types of ecosystem in S. Tomé and Príncipe



Natural ecosystems are comprised of forests, rivers, water streams and marine environments. They present a rich diversity of species and several complex ecological factors such as variations in moisture and luminosity. The abiotic environment is multistratified, containing species that compete among themselves and adapt to different conditions. These ecosystems can be found in important protected áreas: Obô nature preserve, Tinhosas islands nature preserve, and Rolas island nature preserve (source: Rapac - rede das Áreas Protegidas de África Central – Central African Network of Protected Areas).

These protected areas are home to species that are important both at the national and international levels.

There are also the following altitude forests: Low altitude forest (0-800m), mountain forest (800-1400m) and mist forest (1400-2024m).

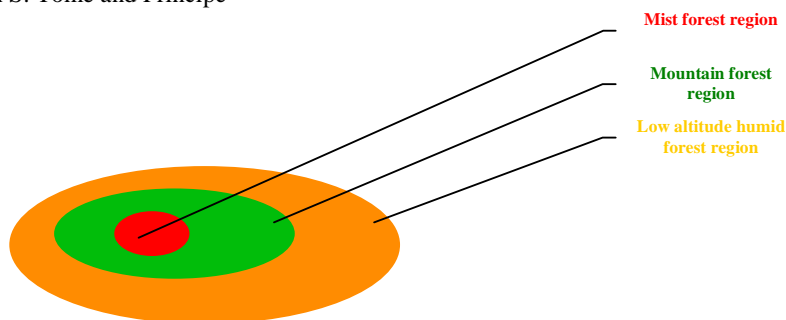
2.6 Forest ecosystem

The first and most thorough studies on Santomean vegetation were carried out in 1932 and 1933 by Exell. They were published in 1944 and 1956.

According to Exell, except for a few very small mangroves and sand dunes on the coast, São Tomé's original vegetation was composed of humid forests that covered the island uniformly, from the coast to the summit of the Pico de São Tomé. Exell defined three separate forest regions in São Tomé, indicated below.

2.7 Forest regions in São Tomé and Príncipe

Scheme 4: Forest regions in S. Tomé and Príncipe



From Exell's categories, the following can also be differentiated:

- Low altitude forest, 0-800m;
- Secondary forest;
- Dry forest;
- Shade forest for cocoa and coffee;
- Shrublands and grasslands;
- Mangroves;
- Primary altitude mountain forest, comprised of mist forest, medium altitude forest >1000 and <800m and altitude forest >1800 and <2000m.

2.7.1 Low altitude forest, 0-800m

Equivalent to the equatorial forest in the African mainland.

On S. Tomé island, its typical species are: *Rinorea chevalieri*, *Zanthoxylum thomensis*, *Drypetes glabra*, *Anisophyllea cabole* e *Sorindeia grandifolia*; on Príncipe the following species are most frequent: *Rinorea insularis*, *Ouratea nutans*, *Casearia mannii* *Croton stelluliferus* e *Erythrococca columnaris*. (Source: J. LeJoly)

According to Chevalier, primary low altitude forests have disappeared due to sugarcane, cocoa and coffee plantations. A few species have been protected and/or have benefited from

man's action: *Milicia excelsa*, *Ficus sp.*, *Pycnanthus angolensis*, *Ceiba pentandra*, (Chevalier, 1938).

2.7.2 Mountain forest, 800-1400m

Presents slow transition in species and greater variety than lower altitude formations. Trees are tall (30 to 40m) with dense canopies and the high humidity favors the epiphytes, lianas and ferns that cover the trunks of trees. Arboreal ferns are varied and plentiful. *Rubiaceae* and *Euphorbiaceae* are the most common families. Arboreal species typical of these formations are: *Trichilia grandifolia*, *Pauridiantha insularis*, *Pavetta monticola*, *Erythrococca molleri*, and *Tabernaemontana stenosphon*. These formations have been changed little by men, mostly due to their altitude.

2.7.2 Mist forest, 1400-2024m

The forest reaches the summit of the Pico and in áreas of greater altitude trees are smaller; upper layers present more clearings. Luminosity is low due to constant mist and temperatures are relatively low. Rainfall is abundant. Epiphytes become much more abundant. Samambaias are an important element of flora up to the top. Mountain grasses are not found. Access is difficult and the slopes are steep, so this habitat has not been changed by human action and remains intact.

The elements above have caused the trees to grow smaller. Araliaceae can now be found such as *Schefflera manii*, rarely growing taller than 10 meters. Epiphytes, especially orchids, and ferns of the genus *Asplenium* are quite important to these formations.

Typical trees are: *Podocarpus manii*, (Pinheiro de S.Tomé) the only endemic gymnosperm, *Baltasaria mannii*, *Ilex mitis*, *Olea capensis* (Pau Impé), *Craterispermum montanum* (Macambrará), *Trichilia grandifolia* (Cola macaco).

Typical shrubs are *Erica thomensis*, *Psychotria guerkeana* and *P. nubicola*, *Lobelia barnsii* (giant lobelia), endemic to S. Tomé. In the underbrush there are poaceae of the genus panicum and one endemic species of urticacea, the *Elatostema thomense*.

Lianas, or creeping vines, are frequent: *Sabicea spp.*, *Thunbergianthus quintasii*, *Tetracera alnifolia* and *Jasmin spp.*

Due to climate and steep slopes, these formations were only sporadically modified by man and have not been the subject of any kind of intensive exploitation. They are currently well preserved. There are a few invading species, like *Chinchona spp.*, which have expanded their distribution to these heights.

2.7.4 Medium altitude forest > 1000 and < 1800m

Found around Pico Cacumbé and the Lagoon. According to a 1990's survey by the ECOFAC, whose herbaria are at the center of Bom Sucesso, on the Amélia Lagoon, an extinct volcano crater, there is a unique formation to be found.

The vegetation is evergreen, composed of *Panicum hochstetteri* and *Panicum brevifolium* poaceae. Other than the poaceans, there are also the following: *Cyperus articulatus*, *Poligomum salicifoluium* and *Tristemma mauritianum*, as well as a large quantity of ferns of the family Polypodiaceae and Hymenofoliaceae. Also remarkable is the predominance of rare orchids, such as *Bulbophyllum cocleatum var. ternuicaule*,

Solenangis clavata and *Diklangella liberica* as well as small associated shrubs, *Heteradelphina paulowilhelmia*, *Rapanea melonophoeos* and *Schefflera manni*.

In the underbrush of this altitude forest are the following endemic species: *Palisota pedicellata*, *Cyperus sylvicola*, *Mapania ferruginea*, *Begonia baccata*, *Impatiens buccinalis*, *Impatiens thomensis*, *Calvoa crassinoda*, *Sabicea ingrata*, *Sabicea exellii*.

It is also comprised of the following endemic arboreal species: *Trichilia grandifolia*, *Pavetta monticola*, *Craterispermum montanum*, *Tabernaemontana stenosisiphon*, *Erythrococca molleri* and *Discoclaoxylum occidentale*.

2.7.4 Altitude forest between 1800 and 2000m.

This forest, located around regions like Mesa do Pico (1850m) and girts the Pico de São Tomé and Pico Pequeno, presents high rainfall and nearly constant mist, temperatures always low but still above freezing point. Trees do not grow tall and epiphytes are numerous. At this altitude, endemic species are *Podocarpus mannii* (Pinheiro-de-São Tomé), *Psychotria guerkeana*, *Psychotria nubicola*, the tchapo-tchapo d'ôbô (*Peddiea thomensis*), *Calvoa crassinoda*, *Pilea manniana*, *Erica thomensis* and *Lobelia barnsii*. Orchids, ferns, mosses and lichens are also frequent.

According to Tolen (1995), the most abundant trees in S. Tomé's mist forest are the *Tabernaemontana stenosisiphon* (Cata d'Ôbô), (*Pseudogrostistachys africana* Cacau d'Ôbô), *Homalium henriquensii* (Quebra machado), *Rothmannia urcelliformis* (Teiateia), *Trichilia grandifolia* (Cola macaco), *Pauridiantha floribunda* (Pau formiga) and the *Allophyllus africanus* (Pau trê).

Typical endemic plant species in this mountain ecosystem are: *Peddiea thomensis* (Tchapo tchapo d'ôbô), *Balthasaria mannii*, *Psychotria guerkeana* and *P. nubicola*.

On Príncipe island, according to a publication on preservation of forest ecosystems in the Democratic Republic of São Tomé and Príncipe ("**Conservação dos Ecossistemas Florestais na República Democrática de São Tomé e Príncipe**"), by P.J. Jones, J.P. Burlison and A. Tye, all of the northern primary forest and on the center of the island has been replaced with cocoa, coffee, coconut and banana plantations. According to the same publication, most of the primary humid forest on the island was destroyed during a campaign to eradicate sleeping sickness (African tripanosomiasis) in 1906, but recent research has shown that the efforts to this end were beyond the capabilities of control teams and most of the southern half of the island remains intact.

2.7.6 North-northeast savannas

This formation ranges from the coast near the S. Tomé airport to the Praia das Conchas (Seashell Beach), where rainfall is less than 700mm a year (sometimes 500mm a year). Soils are dark or black with rock outcropping and compact under-soil, supporting grassland and shrubland-type vegetation.

Three kinds of poaceae dominate the regions (*Panicum maximum*, *Rottoboelia esaltata* and.....). Small arboreal formations punctuate the herbal mosaic (dry, open tropical forest) which, given the absence of a continuous arboreal canopy, are in strong contrast to the rest of the country.

Especially noteworthy are the *Adansonia digitata* (Micondoeiro), alternating with *Tamarindus indica* (tamarindeiro), *Ziziphus abissinica* (zimbroeiro), *Ximenia americana*

(limoeiro da praia), *Psidium guajava* (goiabeira), *Vernonia amygdalina* (“libô mucambú”) and *Erythroxylum emarginatum*.

There are also clusters of halophytes (*Rhizophora racemosa* and *Avicennia germinans*) on the briny mud of river estuaries and waterlines.

Where salinity is less, there can be found *Hibiscus tiliaceus*, *Dalbergia ecastaphyllum* and *Erythroxylum emarginatum*.

It is believed that these formations result from massive anthropic pressure: intensive deforestation and frequent recourse to fire, in order to prepare for sugarcane cultivation, since the beginning of Portuguese settlement.

On Príncipe island there are no savannas, although some herbaceous species can be found near the airport.

2.7.7 Shade forest

This formation occupies about 32 289ha, roughly 32,9% of national territory. It tends to occupy areas where relief is smoother and a few hills, such as Muquinquim and Saccli, located on the district of Lobata, and others that do not stand above 300m in height.

This shade forest was created to serve the needs of cocoa (*Theobroma cacao*) and coffee (*Coffea sp.*) plantations, species that were introduced with exports in mind; the fixation of nitrogen in the soil allowed for the introduction of *Erythrina sp.* into these forests.

Cocoa plantations require maintenance of the forest canopy in order to provide shade for cocoa and coffee plants. It's been demonstrated that this practice helps maintain high levels of forest biodiversity in producing countries (Rice & Greenberg 2000).

2.7.8 Secondary forest (capoeira)

Occupies nearly 30% of the country's surface. On S. Tomé Island, it covers about 26,000ha and, on Príncipe, about 4,000ha.

There are secondary formations of variable age where we may still identify traces of former use, namely on account of a significant proportion of introduced species. Composition is similar to that of the shade forest, the main distinguishing factor is the presence or absence of coffee or cocoa plants. These areas have, in the past, been used for plantation and are now abandoned, as the soil is marginally apt, at best, slopes are steep and access is difficult.

The flora presents exotic, cultivated and pioneer species, of rapid growth. These form plant communities. Examples are *Bambusa vulgaris* (Bamboo), *Cecropia peltata* (Gofe), *Maesa lanceolata* (Mutopa), *Dracaena arborea* (Pau Sabão), *Ficus spp.*, (Figtrees), *Harungana madagascariensis* (Pau sangue), *Cestrum laevigatum* (Coedano) and more.

Other arboreal species are to be observed here, such as *Pycnanthus angolensis* (Pau-caixão), *Pentaclethra macrophylla* (Muandim), *Artocarpus altilis* (Fruta pão),

Artocarpus heterophylla (Jaqueira), *Treulia africana* (Izanquiteiro), *Antiaris welwitschii* (Amoreira), *Chytranthus mannii* (Pessegueiro-de-S. Tomé), among others. The most frequent vines are: lutchiga (*Urera trinervis*), *Dioscorea spp.* and *Adenia lobata*.

2.7.9 Dry forest

Occupies boundary áreas of Guadalupe, including the margins of Água Castelo, Água de Guadalupe and Rio de Ouro, occurring in the areas where rainfall is between 1000mm and 1500mm per year, with a clearcut dry period. On Príncipe island, there are no dry forests.

On the upper layer of this formation there are deciduous trees like *Milicia excelsa*, *Spondias microcarpa* (guêgue) and *Ficus mucoso* (Figo plocô). The underbrush presents shrubs often threatened by fire, like *Ophiobotrys zenkeri* (Stala-stala), *Oncoba spinosa* (malimboque) and *Ochna membranacea* (pau dumo), *Harungana madagascariensis* (Pau sangue), *Cestrum laevigatum* (Coedano), and more.

2.7.10 Mangrove

On S. Tomé, along the estuaries and riverbeds (the most important being Malanza), and on Príncipe (between Praia Grande and Praia Seca), there are halophyte forests occupying the low, flat shores, also seen around murky, shallow lagoons, separated from dry land at the estuaries. The formation occupies a transitional area between marine and land ecosystems. The vegetation, not very diverse, is dominated by: *Rhizophora mangle*, *Rhizophora racemosa* (Rhizophoraceae), both of them trees with aerial roots and *Avicennia germinans* (Avicenniaceae), which possess pneumatophores. The ecosystem may present ferns of the genera *Microsorium* and *Acrostichum aureum*, the latter being frequent in mangroves around the world.

On intertidal zones, animal life develops among tree roots. These surfaces host invertebrates such as cf. *Isognom* and the mangrove crab cf. *Aratus*, as well as cucumbas of the genus *Perioptalmos*, fish that can breath outside water as well as in.

Avian species include waterfowl (*Gallinula chloropus*), cranes (*Bubulcus ibis*), green-backed herons (*Butorides striatus*) and the kingfisher (*Alcedo spp.*).

2.7.11 Biodiversity of land flora, indigenous and introduced species

On S. Tomé and Príncipe, the predominant climax vegetation is of the humid tropical type, evergreen and heterogeneous. According to some historical data on the islands, the arrival of the Portuguese transformed the natural environments of the archipelago; forests were cut down to make way for large plantations and exotic species were introduced. These were mostly food species and pets. One might say nearly all animal and plant species on the islands were, after a fashion, introduced.

As table 7 illustrates, 297 species now grown were introduced by man. There are distributed throughout 87 families. The fabaceae, solanaceae, poaceae, malvaceae and myrtaceae are the most abundant.

Moraceae, namely *Artocarpus heterophyllus* (jaqueira), *Artocarpus comunis* (fruteira), *Treculia africana* (izaquenteiro) and Musaceae, *Musa spp.* (banana-tree) are noteworthy for their fruit, which constitute staples of the Santomean diet. In fact these species have become easily naturalized as they are capable of wide dissemination. They range from sea level to high altitudes.

Angiosperms

Given current knowledge of the country's flora, a total of 1260 plant species exist in the archipelago, of which 933 are indigenous, 297 are cultivated and 148 are endemic (see table 1 below). 14 are new to science and included in the group orchidaceae (see table 6 below).

Of the 1260 species, 105 are angiosperms, with 103 dicotyledons and 2 monocotyledons.

Among angiosperms a few are relevant to pasture and foraging, mostly the poaceae and leguminous plants.

Bryophytes

The flora of the Santomean archipelago also includes a group of non-vascular plants, the bryophytes, which are represented by circa 22,000 species in the world. Humid regions see an abundance of the genera *Marchantia*, *Anthoceros* and *Polytrichium*.

Marchantia grows close to the ground while *Campylopus* and *Polytrichium*, which appear to be the most common genera, cover rocks, logs and gulleys.

Pteridophytes

The works undertaken in São Tomé and Príncipe by national and foreign botanists on several field missions, whose data have been published, show that pteridophytes are a rather old plant group from the evolutionary point of view. In fact, ferns appeared after bryophytes.

In the Santomean archipelago, pteridophytes contribute 13 endemic species as shown in the table 2, below. (Source: Pteridophytes of São Tomé and Príncipe) They are distributed throughout 28 different families: Aspleniaceae, 24 species; aspidiaceae, 15 species; Hymenophyllaceae, 12 species; Polypodiaceae and Pteridaceae, 10 species; Thelypteridaceae, 9 species; Selaginellaceae, 8 species and Nephrolepidaceae, 6 species. Other families present a relatively low number of specific diversity. Especially noteworthy is the Cyatheaceae family, which presents arboreal species that can grow to 3 meters in height. For this reason they are known as giant ferns, a rarity in the plant world.¹

Fungi and mushrooms

1fn

The first report on biodiversity does not estimate the number of fungi and mushrooms existing on our islands, perhaps due to lack of research into this topic.

According to data published by the magazine “Atividade Rural” (“Rural Activity”), published by ADRA, an NGO, for the agrarian sector, farmers have run into problems with disease control and blights from these fungi:

- *Collectrichum coffeanum*, which causes rhizoctoniosis, a disease affecting coffee plants
- *Colletotrichum lindemuthianum*, causing anthracnosis, affecting beanstalks
- *Corn carbuncle (fungus)* affecting corn (*Zea maïs*)
- *Uromyces apendicolatus*, affecting beanstalks.

At the moment, knowledge on fungi present in the country is limited and further research is necessary.

Where mushrooms are concerned, Santomean mycology possesses great diversity. Mushrooms would seem to exist mostly in humid, shaded areas. The species found are from the genera *Lentinus* and *Termitomyces*, the latter including white mushrooms, which are abundant. Finally there is the genus *Cantharellus*, represented by several colored species. These genera probably belong to the group Basidiomycetes.

Lichens (symbiotic association of algae and fungi)

Lichens are symbiotic associations of algae, the photobiont, and fungi, the mycobiont. The genus *Usnea* grows in long strands, hanging from tree branches; widely distributed from sea level to mountaintops, where trees would seem bearded, given the profusion of said lichens. They provide accurate indicators of environmental conditions. Therefore, it would be urgent to carry out more research to inventory and describe these lichens. Only thus can we contribute towards their preservation.

2.7.12 Agro-ecological units and plant communities

According to Lains e Silva's work on the Agricultural Aptitude Chart of São Tomé and Príncipe, the country is divided into six agricultural areas. There are zones for cocoa, coffee, rubber, tea, oil palm and coconuts.

The plant communities of note are the following:

- Aquatic and semi-aquatic herbaceous associations dominated by *Struchium sparganophora* (*Libô d'água*), *Rorippa nasturtium* (*Leaf agrião*), *Pisticcia stratiotes* (*Alface d'água*) and *Costus afer* (*Uncoetê*).
- Ruderal herbaceous associations represented by *Panicum maximum*, *Boerhavia difusa*, *Cynodon dactylon* e *Eragrostis superba*, *Euphorbia hirta*, *Achyranthes aspera* and *Celosia gonfrenoides*; they grow on cultivated land, near houses.
- Post-cultivation, colonizing herbaceous associations constituted by *Panicum maximum*, *Cleome ciliata*, *Pteridium aquilinum*, *Ageratum conyzoides* and *Panicum hochstetteri*. They're found in plantations of *Manihot esculenta* (tapioca), *Xanthosoma sagittifolium* (Matabaleira), *Ananas comosus* (pineapple), *Zea mays* (corn) and *Lycopersicon esculentum* (tomato).

- Associations of vascular epiphytes constituted by *Nephrolepis biserrata* as well as strangling and/or hemiparasitic plants such as: *Cuscuta campestris*, *Ficus clamydocarpa* and *Schefflera manii*.
- Associations of coastal halophytes with typical species such as *Ipomoea pes capre*, *Altenanthera litoralis*, *Hydrocotylle bonariensis* and *Blutaporum vermicular*.

2.8 Biodiversity of land fauna

Vertebrate land animals in the country are fairly well known. However, there is a manifest lack of more profound studies of invertebrates or land/aquatic microorganisms such as hydrozoa, spongiaria, polychets, nematodes and more.

2.8.1 Land mammals

According to the data published by the National Environmental Plan for Sustainable Development (PNAAD), among land mammals we may count: Monkeys (*Cercopithecus mona*), wild pigs (*Sus domesticus*), six species of bats, *Myonycteris branchycephala*, *Hipposiderus commersoni*, *Miniopterus minor* and *Rousettus aegyptiacus*, along with mainland species like *Eidolon helvum* and *Hipposideros ruber*. Besides bats, there are two kinds of shrews, namely *Crocidura thomensis* and *Crocidura poensis*, as well as mice, *Rattus rattus* and *Rattus norvegicus*¹.

This table lists the land mammal species enjoying protection status in S. Tomé and Príncipe.

2.8.2 Birds

Sylvan avian fauna (see table 9 below) is comprised of 63 species, of which 25 are endemic, including species typical of rainforests, namely, *Lanius newtoni*, *Bostrychia bocagei*, *Amaurocichla bocagei* and *Neospiza concolor*. Other prominent species are *Columba malherbii*, *Columba thomensis*, *Treron australis virescens*, *Streptopelia senegalensis*, *Aplopelia larvata simplex* or *principalis*.

Along coastal areas, the fauna is made up mostly of birds inhabiting small islets and coastal areas away from human settlements. Main species nesting in colonies are *Phaeton lepturus* (Coonzucu), *Sula leucogaster*, *Sula dactylatra*, *Anous stolidus*, *Anous minutus*, *Sterna fuscata*, *Sterna anaethetus* and *Oceanodroma castro* (band-rumped storm-petrel). In the savannas of northern S. Tomé, there is a distinct group of birds comprised of quails (*Coturnix delegorguei*) and the African crane (*Crecopsis egregia*).

Table 9 shows the avian species protected in the archipelago. They are distributed throughout 13 different families. The order Passeriformes includes the largest number of species.

¹ Cf. Plano Nacional do Ambiente para o Desenvolvimento Durável PNAAD

2.8.3 Batrachians or amphybians

Santomean batrachian fauna is constituted by 3 families, 5 genera, and 7 species. 6 have been reported in São Tomé, 2 in Príncipe and 2 on the Ilhéu das Rolas. Distribution is as follows. A species common to all three islands, *Rhynobatrachus dispar*, one species in São Tomé and the Ilhéu das Rolas, *Schistometopum thomense*, 4 endemic to São Tomé, *Schistometopum ephèle*, *Nesionixalus mollerii*, *Nesionixalus thomensis* and *Rhynobatrachus dispar* and one on Príncipe island, *Leptopelis palmatus*. On São Tomé there are the following endemic species: Moller's gulf frog, *Nesionixalus mollerii* and the *Nesionixalus thomensis*, the São Tomé tree frog; the *Ptychadena newtoni* frog and the caecilians, *Schistometopum thomense* and *Schistometopum ephèle*. On Príncipe island there are the two frogs, *Leptopelis palmatus* and *Phrynobatrachus dispar*.

There are also apods like the bôbô snake which, although not strictly tied to aquatic environments, can be found in humid environments, building galleries after the manner of worms.

2.8.4 Land reptiles

In terms of phylogenetics, reptiles descend from amphibians. They conquered the subaerial environment after they solved reproduction problems in the Paleozoic. Their presence in the country's fauna is of great ecological worth. This class of vertebrates is represented by 16 species on the islands of São Tomé and Príncipe.¹

On the island of São Tomé the following species can be found: Geckos (*Hemidactylus greeffii*), *Panaspsis africana* lizards, the beaked snake *Rhynotyphlops newtoni* and the black cobra, *Naja melanoleuca*.

On the island of Príncipe the following species can be found: the legless lizard *Feyinia polylepis* and the snake *Typlops elegans*.

The gecko *Lygodactylus thomensis* is endemic to the islands of São Tomé and Príncipe. The order Chelonia is represented by: the swamp turtle *Pelusio castaneus* and the forest turtle *Pelusio gabonensis*. These turtles are increasingly rare in our ecosystems; their numbers tend to diminish. There is no accurate population count or information on status and distribution of either species, for which reason it is necessary to undertake studies on the taxonomy, reproductive biology and ecology of both species (ENPAB-Inland Water Ecosystems, 2002).

2.8.5 Sweet-water fish

Small fish are predominant in sweet waters, such as *Eleotris vittata* and *Pomadasys jubelini*, Plynemidae.

2.8.6 Land and sweet water mollusks

Likewise, several species of mollusks are present, such as *Neritina afra*, *Neritina manoeli*, *Bulinus forskalii* and *Schistosoma intercalum*, which is responsible for the schistosomiasis recently detected on São Tomé and Príncipe (Brown, 1991, 1994).

¹fn

2.8.7 Insects

Entomological fauna on the archipelago includes about 89 species of butterfly. São Tomé presents 47 species and Príncipe 42; rate of endemism is, respectively, 38% and 21%.

There are endangered endemic species of insects such as *Lepidoptera*, *Graphium leonidas thomasius e oelides bocagii* (ENPAB-Forest Ecosystems, 2002). Other species of butterflies (not endangered) are *Charaches*, *Dixeia piscicollis*, *Neptis eltringhami*. As stated above, these species are under constant pressure from fires, both agricultural-related and spontaneous.

Myriapods are represented by *Globanus integer* and *Blobunus marginescaber*, which are protected species.

The data included in the last biodiversity report do not mention lepidoptera or choleoptera. Bees of the genus *Apis* are honey bees and very important to impollination and fertilization of flowering plants, therefore contributing to the preservation of forested areas. The coevolutionary plant-insect relationship may be used in apiculture. Interventions in this domain must include the preservation of entomological fauna. This presupposes control, inventory and species density. The final result of the process is conservation of the environment.

In the agrarian sector, insects are pests to several cultures, such as:

- ❖ Flies, aphids, rust mites, ticks, damaging to tomato plants (*Licopersicum* spp.);
- ❖ The green scale (*Coccus viridis*) and the Leaf Miner (*Phyllocnistis citrella*), which affect citrus fruits (*Citrus* spp.);
- ❖ The crotcha, the weevil and the Noctuidae larvae threaten profitable cultivation of corn;
- ❖ Aphids causing banana tree (*Musa* spp.) spot disease;
- ❖ *Selenotrips rubrocinctus* causing low production of cocoa (*Theobroma cacao*);
- ❖ Fruit flies, named *Ceratitis coffeae* and the coffee-tree aphid, *Antestiopsis lenea ticollis*;
- ❖ Moth and red-necked peanutworm, affecting peanut plants (*Arapis hypogea*);
- ❖ Mites, aphids and silverleaf whitefly, affecting production of tapioca (*Manihot esculenta*). This culture is also affected by the diseases stemming from the action of *Bemisia tabaci*, the sweetpotato whitefly.

2.9 Coastal, marine and oceanic biodiversity

The country's coastal area is about 260km long and its exclusive economic zone is quite large. The coastal regions and the marine environment are an integrated resource and an essential component of the environment, offering invaluable possibilities to sustainable

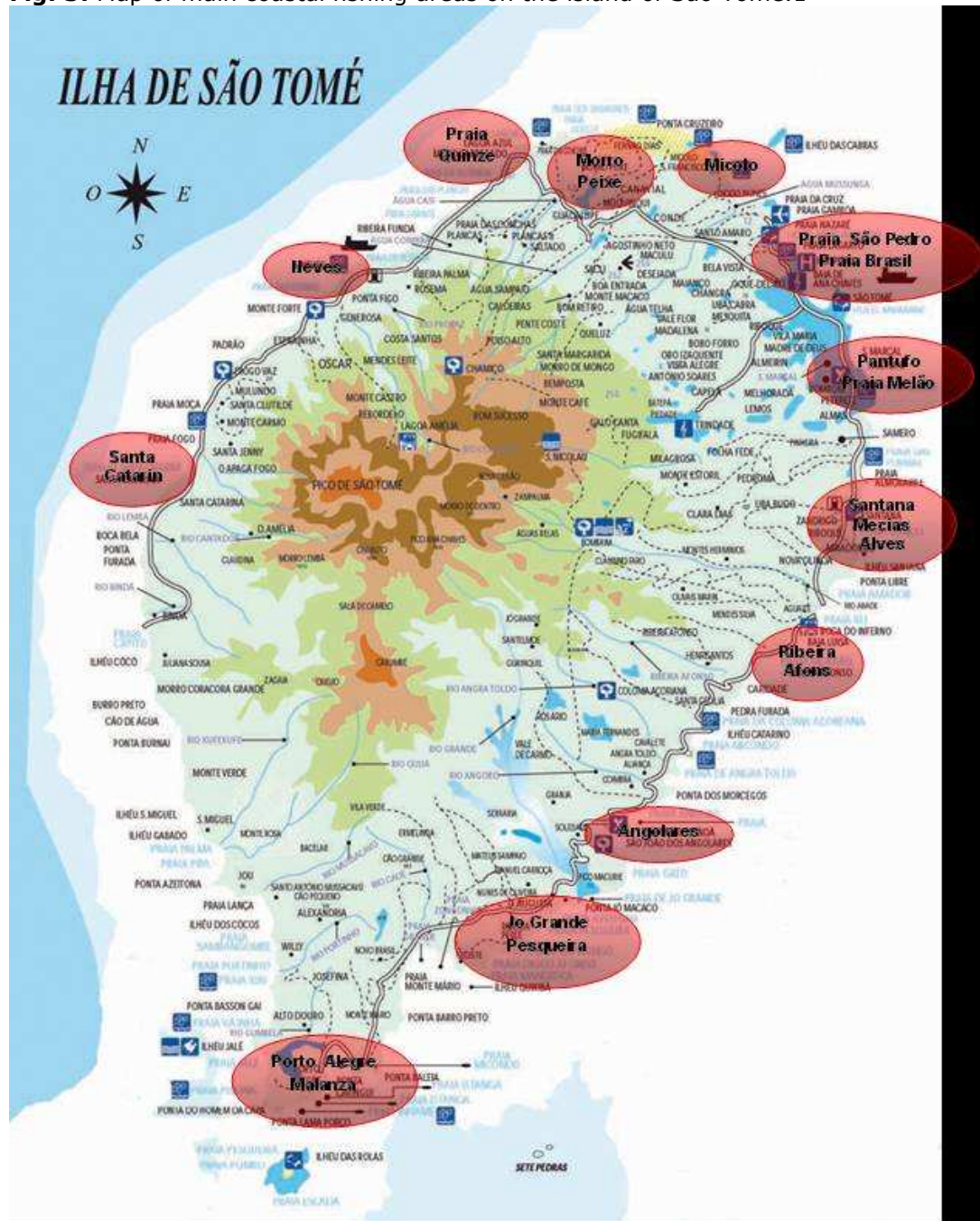
development in S. Tomé and Príncipe. Despite the interrelationship of both parts in the system, a separate analysis of same allowed for greater insight into the current state of things.

Negative impact on coastal and marine biodiversity is due to: Presence of solid and liquid chemical waste; increased water temperature; coastal erosion and estuary erosion, caused by increases in population density. There are several examples of negative impact. Fishing nets with extremely tight meshes (illegal) are being used on the territorial waters of S. Tomé and Príncipe, causing veritable ecological disasters. These nets capture growing specimens, such as the black sea bream (*Pomadasys rogeri*) of the family Haemulidae, which Santomeans have taken to calling “disaster”. Young fish of the species measure from 2 to 5cm in length, while adult fish grow to a length of 20 to 25cm, weighing 400-800g. The young weigh under 30g.

Where coastal fishing is concerned, there are 5 zones, as shown on a table, below. Throughout these zones, the concentration of fish is highly important:

- North of Neves: a zone with large and small pelagic species;
- The region of Micoló and Ribeira Afonso: small coastal pelagic;
- South of São Tomé, between Porto Alegre and Ribeira Afonso: demersal and coastal pelagic;
- Around Príncipe Island: demersal, large pelagic, and a zone with great potential for small pelagic species (sardines), not yet exploited;
- Beyond 25 nautic miles: large pelagic.

Fig. 3: Map of main coastal fishing areas on the island of São Tomé.1



2.9.1 Coastal biodiversity - Flora

Coastal flora is not very diverse and is mainly comprised of typical species in preferential habitats: There are species living in narrow sand bands, like *Ipomoea pes capre*, or *Canavalia rosea*; Others prefer transitional areas, as is the case with typical mangrove species. Savannas display significant change where coastal flora is concerned. Flora here is relatively homogeneous when compared with altitude flora that has not been subject to much anthropic pressure, as seen in S. Miguel, on the south of São Tomé, and Barriga Branca on the south of Príncipe island.¹

On the beaches, dynamic vegetation presents dominant pioneering plants like *Ipomoea pes capre* and *Canavalia rosea*. These plants form a thick mat that favors settlement by some brush vegetation like *Dalbergia ecastaphyllum*, *Conocarpus erectus*, *Baphia nitida* and *Hibiscus tiliaceus*. These pioneering species, fixating on sand, bring about coastal bands that will later be colonized by arboreal and arborescent formations. Dominant in these formations are plants of the family *Arecaceae* such as the *Cocus nucifera* (coconut tree, an introduced species) and others such as *Combretaceae*, and *Terminalia catappa*.

Coastal regions have been subject to human impact from the early days of human settlement. The main introduced species were able to occupy a range of favorable habitats, competing with native species, impoverishing endemism on the islands. This might account for the scarce number of endemic species in coastal regions (sand banks and savanna).

Currently, human pressure on plant resources is translated into the felling of coconut trees and others for the extraction of building materials, fuel and coal; also, into accelerated urban development on account of the tourist industry and other economic development plans in the country.

Relativamente as Ilhas Tinhosas, Ilhéu Boné de Jóquei, e outros adjacentes ao Arquipélago, {fragment in the original; meaningless - *the translator*}

2.9.2 Coastal biodiversity - fauna

Coastal ecosystems in S. Tomé and Príncipe are comprised fundamentally of beaches, rocky coastlines, estuaries and marshland, where different species abound. Where this ecosystem is concerned, there is no research that particularly highlights fauna. Thus the data on certain species are, in practice, insufficient.

Along coastal areas, the fauna is made up mostly of birds inhabiting small islets and coastal areas away from human settlements. Main species are presented in a diagram below, where critically endangered species are included; species like sea turtles and reptiles that spawn on the coast, the endemic bat *Tartarides thomensis*, present in the savannas of the Praia das Conchas and the Lagoa Azul, on the north coast of S. Tomé and Príncipe. There are likewise threatened endemic species of insects such as *Lepidoptera*, *Graphium leonidas thomasius* e *oelides bocagii* (ENPAB-Forest

¹fn

Ecosystems, 2002). Other species of butterflies (not endangered) are *Charaxes*, *Dixeia piscicollis*, *Neptis eltringhami*.

2.9.3 Transitional coastal areas

Here, 5 species of sea turtle occur frequently, coming to spawn on the coast. These are: *Lepidochelys olivacea* (Tatô), *Chelonias mydas* (Ambó), *Eretmochelys imbricata* (Sada) and *Dermochelys coriacea* (Ambulância), and finally, the carreta-carreta (ECOFAC). Spawning takes place from October to February, with greater frequency during November, December and January.

In S. Tomé and Príncipe, sea turtle eggs and meat are highly appreciated and an important source of animal protein, for which reason these animals are captured by the population.

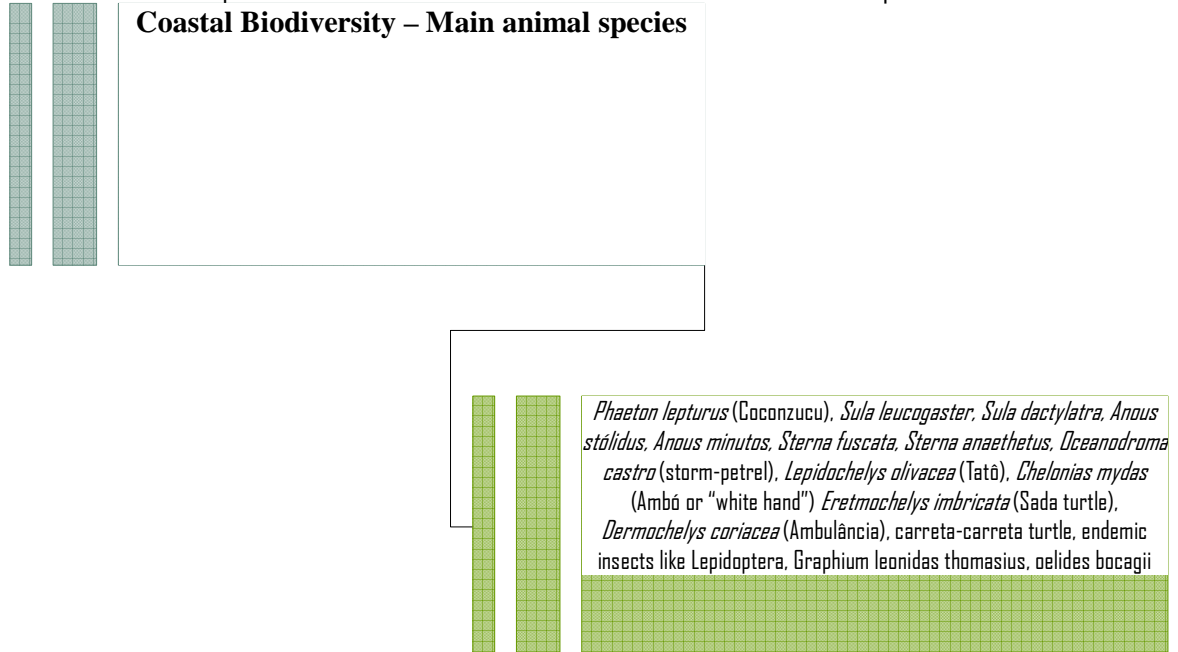
Considering their conservation status, all five are endangered (E) (ENPAB-Marine and coastal ecosystems, 2002).

Besides the turtles, there are migratory birds such as the white-tailed tropicbird, *Phaeton lepturus* and *Sula leucogaster*, the brown booby. These can be observed on the Tinhosa and Sete Pedras islets.

The north coast of S. Tomé also provides habitats for endemic reptiles.

Additionally, the savanna on Praia das Conchas and Lagoa Azul presents an endemic bat, the *Tartarides thomensis*. This winged mammal belongs to the order Chiroptera.

Scheme 5: Main species that constitute coastal fauna on S. Tomé and Príncipe



Humans have long exploited this ecosystem. Turtles are regularly sought out for meat and eggs, which are highly valued by traditional Santomean cuisine; no less importantly they're a source of animal protein. Sand banks have been exploited for sand. Last but not least, farmers have burnt down wooded areas for agricultural purposes, and there have been spontaneous fires during the dry season.

The STP ACP 019, by ECOFAC, has undertaken significant protection measures and engaged in awareness campaigns on sea turtles, but this came to an end in 1999. Fishing communities, who appeared to have become aware of the need to preserve these turtles, still capture them. However, they benefit from legal endangered status according to ENPAB-Marine and Coastal Ecosystems 2002.

2.10 Marine and oceanic biodiversity - flora

Marine flora is composed of micro-algae that form phytoplankton. Their biology is not well-known. Phytoplankton is one of the main food resources for marine vertebrates and invertebrates.

Among macro-algae, note the cyanophyceae or blue algae, that grown in filaments on the coastal rocky habitats. These prevent erosion. Also of note is *Dunaliella salin*, the most frequent green algae in the country. Other genera can be found, such as *Chloroherpeton*, *Thalassium* and *Chlorobium*.

Brown algae occur. Of these, *Fucus platycarpus* indicates good water quality, appearing on sand banks during low tide.

Algae possess high economic value. They constitute stocks of polysaccharides, fatty deposits, oils, alcohols, with ample industrial application.

2.11 Marine and oceanic biodiversity - fauna

On a relatively small maritime area, approx. 128,000 km² and a platform of 1500 km², the Santomean ocean presents a wealth of species and fishing resources, including fish, crustaceans, mollusks, reptiles, cetaceans and corals; note also the presence of echinoderms, ctenophora and cnidaria, annelids and sponges.

2.11.1 Marine ichthyofauna

The studies for identification of commercial marine fish undertaken by the Halieutic Resource Assessment Project 1993-96 allowed for a register of 105 species (ENPAB-Marine and coastal ecosystems, 2002).



Santomean ichthyofauna is comprised of large pelagic vertebrates, small pelagic vertebrates and demersals.

The halieutic resource assessment project 1993-96 of S. Tomé and Príncipe identified 88 commercial species distributed throughout 49 families. These are usually fished by traditional means. As seen on table below, the families Carangidae, Serranidae, Sparidae, Scmobridae, with 11, 9, 8 and 7 species, respectively, are those most often fished.

More recent studies, from January 31 through February 18, 2006, by Brazilian scientists, to evaluate marine resource biomass through visual census, allowed for the identification of 183 fish species distributed throughout 67 families (Afonso *et al.* 1999), of which 156 are commercial species. Although the results of this study have not yet been divulged, they allow a comparison of reef and ocean-bottom populations. Besides fish species, there are corals and crustaceans. The Fishery Board currently owns relevant samples.

Ocean pelagic species

Among great pelagic vertebrates, we may count *Istioforidae* (Andala fish), *Xiphiidae* (swordfish), *Scombridae* — mackerels, tunas, bonitos — which are migrating species.

Coastal pelagic species

Small pelagic vertebrates are represented by, among others, *Clupeidae* (sardines), small *Scombridae*, *Carangidae* (Bonito, Olho-grosso, Sêlê, Corcovado, Carapau, Oso-mole), *Mugilidae* (mulletts), *Gobiidae* (gobies), *Exocoetidae* (flying fish) and *Moreidae*.

Rocky bottom demersals

Demersals, or ocean-bottom fish, include *Serranidae*, *Holocentridae*, *Scianidae*, *Litjanidae*, *Sparidae*, *Moreidae* and some sharks.

Deep water demersals

This group is comprised of sharks and rays.

There are 3 types of cartilaginous fish (sharks) in S. Tomé territorial waters: Demersals, pelagic and semi-pelagic. Those most often captured in S. Tomé and Príncipe belong to the families *Charcharinidae*, *Hemigaleidae* and *Sphyrnidae*.

Within the framework of fishing agreements between the country and development partners, sharks are included among the species captured by their respective fishing fleets. Given financial limitations, the country has not been controlling capture

numbers, which prevents an estimate of the degree to which these species are endangered.

Benthic-demersals

Soles and rays represent this group. These species survive by staying on nutrient-rich sediment.

2.11.2 Marine reptiles

Marine reptiles are here represented by 5 species:

Lepidochelys olivacea (Tatô): Of the 5 turtle species, it is the smallest. Adults will be 60cm to 80cm long.

Santomean fishermen call it “lazy turtle”, as it is easily captured when spawning on the beach. For this reason, protection of this species is a priority.

Chelonias mydas (Ambó)

Still called “green turtle”, as it feeds mostly on algae; its body fat is green as a consequence.

Fishermen call it “white hand” as the abdomen and underside of the fins displays white coloration.

Specimens are reported on the north of S. Tomé island and near the Cabras islet. Reported measurements vary from 40cm to 115cm in length. These animals are very fast and can more easily escape hunters/fishermen. On Praia Grande (Príncipe), it is about the only species of turtle to be observed.

Eretmochelys imbricata (Sada)

Among 5 species, it is the most frequent on the southern parts of the country (Rolas islet), also reported on Príncipe island. Their shells have been used for local handicraft, which tourists used to seek out.

They tend to live on rocky bottoms, but young can be found near shore and are easily captured.

Unlike other species that find rocks hard to navigate, Sada females negotiate authentic mazes to spawn.

Dermochelys coriacea (Ambulância), Carreta-carreta.

These species are extremely rare on both islands. In November 1996, it was observed for the first time in a city market. Since 1998, only 9 other animals (6 females and 3 males) have been tagged (ECOFAC).

2.11.3. Sea mammals

Cetaceans, reported on the far south of S. Tomé, belong in the families Mysticetes and Odontocetes.

Mysticetes are filter-feeders (microphagous), feeding on plankton and especially krill. The following species have been reported: Blue whale (*Balaenoptera musculus*),

Balaenoptera borealis, *Balaenoptera acurostrata*, *Balaenoptera physalus*, *Balaenoptera nodosa* (humpback whale), *Balaenoptera edeni* (tropical only) (ENPAB-Marine and coastal ecosystems 2002).

Odontocetes are toothed cetaceans, macrophagous and feeding on fish for the most part. One of the most frequent in the country's waters is the common dolphin (*Delphinus delphis*).

2.11.4 Marine Invertebrates

Marine fauna in São Tomé includes several invertebrates at different trophic levels and water depths.

Corals

Among the marine invertebrates, corals can be observed. Between Praia das Conchas and the Lagoa Azul lies the most important coral zone to the island of S. Tomé. There are 2 endemic species, unique to this area. These being *Siderastrea siderea* and *Porites bernardi*, both of the class Anthozoa (source: PNAAD).

On Príncipe island, there are populations of the species *Montastrea cavernosa guineensis*.

There are also ramified colonies of *Echinogorgia sp.*, living on rock.

Crustaceans

According to the 2002 ENPAB report on marine and coastal ecosystems, crustaceans are present both in marine and coastal ecosystems. There are shrimps, lobsters, slipper lobsters, crabs and langoustines.

Among shrimps (swimming decapods) are found: *Penaeus sp*, *Metapenaeus sp* and *Parapenaeus sp*. Lobsters present several species: *Panulirus spp*, *Callinectes spp*, *Calappa spp*.

The *Paramola cuvieri* and *Geryon maritae* are the most frequent species of crabs. Slipper lobsters and langoustines are rare, being represented by *Nephrops spp* and *Scyllarides herklotail*, respectively.

On inland water ecosystems, there is economic exploitation of sweet-water shrimp, especially São Tomé's indigenous species, the *Macrobrachium zariquierei*.

Besides the species identified in 2006, it was possible to identify other species in our waters. Genetic mapping has not yet taken place. The species whose samples are now under the care of the Fishery Board are: *Alpheus blancheti*, *Alpheus alfeles*, *Alpheus aff crockery*, *Alpheus aff crustulifrons*, *Alpheus dentipes*, *Alpheus rugimanus*, *Alpheus fagei*, *Alpheus couvieri*, and *Alpheus Synalpheus*, fished on the north and south of the island.

Sea mollusks

There are 39 species of mollusks distributed through both islands, endemism being 77% and 78%.

As shown by table 19, taxonomic and specific diversity are noteworthy for pelecypods, cephalopods and gasteropods. 28 of these species are on the protection red list for S. Tomé and Príncipe.

Mollusks are highly valuable to the food industry. 4 classes of mollusk are economically exploited in the country: *Gasteropods*, *cephalopods*, *bivalves* and *pelecypods (lamellibranchia)*.

Gasteropods

Among gasteropods, note the whelk of the order *Buccinides* and genus *Buccinum*. Of pelecypods (lamellibranchia) or bivalves, those present in S. Tomé are of the order *Venerides*, genus *Venus*, oysters of the order *Ostreides*, genera *Ostrea* and *Crassostrea*, and one species of the order *Mytilides* and genus *Lithodomus*.

Genera mentioned above include macrophagous mollusks that feed on algae or prey on several organisms. Their shells are highly sought after by collectors.

Cephalopods

There are species like *Octopus sp*, *Sepia sp* and, from the order Decapoda, *Ommastrephes*.

Other endemic genera of sea mollusks, such as *Paradoxa*, *Scaevatula* and *Tropidorissola* can also be found on the marine waters of S. Tomé and Príncipe. They also exhibit pelagic habits.

Echinoderms {section left blank – the translator}

2.12 Oceanic ecosystems

Oceanic ecosystems can be distributed according to water depth and wealth in species: Demersal, reef and benthic.

2.13 Benthic ecosystems

Food chains starting with micro-algae (microplankton), concurrent with a number of invertebrates: hydrozoa, spongiaries, polychets and nematodes. Part of the diversity are crustaceans, mollusks, fish, reptiles and mammals.

2.14 Biodiversity of inland waters

On São Tomé and Príncipe, inland water ecosystems are closely linked with forest ecosystems and present a high degree of interaction, not only between flora and fauna but also man-ecosystem interaction. There are 50 riverbeds on the islands, with inland springs, flowing across dense forests towards the ocean. These are the rivers: Io grande,

Caué, Mussacavu, Quijá, Xuf-Xuf e Lembá, Abade, Manuel Jorge, Rio do Ouro and Contador. On Príncipe, the most prominent is Rio Papagaio.

They're divided into 3 major groups, according to the habitats they constitute:

The lotic group, including rivers, streams, springs and other flowing waters; the brackish water group, where rivers meet the ocean; and the lentic group, forming on the inside of stagnant water, such as swamps and marshes.

The flora extant at various depths is not well known. However, as these rivers display seasonal volume fluctuation, dried riverbeds are fertile ground for many arboreal and shrub seedlings from arboreal and shrub formations of surrounding areas. Thus water contributes to the spread of plant species.

The analyses of inland water fauna concentrated on 5 major animal groups, namely fish, mollusks, insects, crustaceans and planaria.

Noteworthy among ichthyofauna are: 5 species distributed throughout diverse salinity gradients, from sweet to brackish waters. On the upper and intermediate sections of rivers and streams there are small-sized fish such as *Eleotris vittata* (Charoco), *Sicydium bustamantei*, *Pomadasys jubellini* and *Aplocheilichtlys spilauchena*. There are fish belonging to the order Protoptera, such as dipnoic fish possessing gills and lungs, so they can breathe in and out of water. Their morphology means they are living fossils and a most invaluable species.

This ecosystem also features mollusk of the species *Clypeolum afra*, *Neritina manoeli*, *Bulinus forskalii*, *Sinilia senelis*, and *Pugilina morio*.

Inland water ecosystems are populated by the following classes of invertebrates: Crustaceans - *Cardisoma amatum*, of the family *Gecarcinidae*, which burrow around swamps. Two genera have been identified, *Macrobrachium* and *Atya*, comprising 4 species: *Macrobrachium zariquieyi*, *Macrobrachium raridens*, *Atya intermedia* and *Atya scabra*. The 2 species of *Macrobrachium* represent freshwater shrimp, highly sought after in the country. Also present is the *Sicydium bustamantei* and other shrimp species.

Downstream, when water volume is low, fauna includes planaria and flatworms, small-sized (1-2cm) aquatic invertebrates moving by means of cilia. They've been observed in Iô Grande river, São Tomé, and Papagaio river, Príncipe. They can easily be found in small streams. Besides these microorganisms, there are representatives of the families Gyrinidae, Scirtidae, Chronomidae, Simuliidae, Dixidae and Psychodidae.

As for avian fauna (see table 9, below), the most representative species and subspecies are: *Alcedo cristata thomensis* (São Tomé kingfisher), *Phalacrocorax africanus* (long-tailed cormorant), *Butorides striatus* (green-backed heron), *Gallinula chloropus* (common moorhen), *Bostrychia olivacea rothschildi* and *Bostrychia bocagei* (dwarf olive ibis) (Threskiornithidae), *Gallinula angulata* (lesser moorhen), *Ardea cinerea* (grey heron), *Ardeola ralloides* (Squacco heron), *Ceryle rudis* (pied kingfisher), *Alcedo leucogaster nais* (white-bellied kingfisher).

These species live by rivers that run through diverse forest formations. They are versatile and can adapt to other ecosystems. Their diet includes small fish, insects and mollusks.

As table 11 indicated, inland water avian fauna is highly diverse, with 23 bird families.

2.15 Agropastoral biodiversity

Consists in a variety of introduced plant and animal species exploited in agriculture and animal farming.

The richness of the flora on pastures is evidenced by the plant families fabaceae, mimosaceae and caesalpinaceae. The first are the best tropical forage species and are fundamental to agriculture, as they produce alimentary seeds (*Phaseolus vulgaris*, *Vicia fava*) that sustain both animal and man.

Agriculture consists mostly of cocoa and coffee plantations, their products being the country's main exports. Agriculture has created the shade forests, dominated by the genus *erythrina*. Single-species plantation is termed monoculture. Alongside monoculture there is subsistence farming, whose products are for internal consumption.

Farmers combat weeds as best they can (*Axonopus spp.*, *Paspalum spp.*, *Solanum spp.*, *Ageratum spp.*, *Cynodon dactylon*) through means including careful preparation of seed beds, species selection and other traditional means. When farmers do not get results from traditional means, they resort to pesticides and herbicides in an uncontrolled manner.

The exploitation of farmland is not always amenable to soil preservation, although many farmers opt for crop rotation.

Animal farming is a rural activity. Hens, goats, cows and pigs are raised, generally of local breeds. Often, due to lack of resources to feed the animals, these are turned loose and feed on neighbors' vegetable gardens. Cats and dogs are pets that typically do not pose danger to subsistence farming but cover wide areas that human beings also occupy and live in. These animals can turn into disease and pest vectors. Some farms still raise oxen, goats and sheep. This has led to the introduction of many forage species to ensure continued nutriment for these animals. Grazing lands commonly present the following species: *Aeschynomene indica*, *Desmodium uncinatum*, *D. intortum*, *Centrosema pubescens*, *Pueraria phaseoloides*. *Leucaena leucocephala* and *Mimosa farnesiana* are spontaneous, palatable fabaceae that occur alongside other species.

Where rainfall is highest, the most common forage species are *Commelina spp.* (Bódó-bódó) and *Setaria megaphylla* (Uagá-uagá). Farmers use also secondary forage species such as banana leaves and *erythrina*.

We next look into species and breeds of animals farmed in the country.

2.15.1. Main species and breeds raised for commercial exploitation

Imported bovine breeds are: Alentejana and Mirandesa, from Portugal, during the colonial period, or from Angola, Cape Verde and Mozambique (Alfeirão, 1973), Salamsalanquina, Charolese, Jersey, Shorthorn, Schwiitz, Hereford e Africander (Videira 1954), Holstein Friesian from Holland within the scope of the "Nova Olinda Bovine Project" in 1979, and N'Dama, from Gabon.

Horses are rare and were probably introduced into the country in 1877 (Ribeiros 1877). Goat breeds imported are: A breed from Guinea, and Anglo-Nubian, Saanen and

Toggenbough (Colson *et al.* 1994). These were imported from England in the 1980's and introduced into the center of Fernão Dias.

As for bovine cattle, the Suffolk and Djaloké breeds were imported from England and Guinea, respectively. The main breeds of pig result from continued natural interbreeding with imported breeds to increase the number of animals.

The main avian breed is an endemic, farm chicken.

Besides this breed, aviculture is oriented towards the production of chicken meat and eggs using imported species.

2.15.2. Plant species employed in forestry

Several plant species on S. Tomé and Príncipe, be they cultivated or spontaneous, demonstrate the roles of forestry and subsistence or commercial farming in our national economy. These species may be grouped, according to use, in the following manner: Industrial, alimentary, aromatic, medicinal and ornamental species (see tables 3, 4, 5 and 8 below).

Cultivated or sub-spontaneous plants with potential for exploitation are:

- .., (coffee), *Cinnamomum zeylanicum* (ceylon cinammon), *Cinnamomum burmanii* (burmese cinammon), *Vanilla* spp. (vanilla), *Cananga odorata* (Ylang-ylang) and *Piper nigrum* (black pepper).
- In all there are thirty alimentary species (see table 4, below). According to which part of the plant is consumed, they can be divided into:
Horticultural: *Lycopersicon esculentum* (tomato), *Lactuca sativa* (lettuce), *Vigna sesquipedalis* (bean), *Brassica* sp. (cole), *Allium cepa* (onion), *Allium sativum* (garlic), *Brassica rapa* (turnip), *Brassica sativus* (horseradish), *Brassica oleracea* (cabbage), *Capsicum frutescens* (pulped pepper), *Hibiscus acetosella*, (cranberry hibiscus), *Abelmoschus esculenta* (okra), and *Solanum melongena* (aubergine).

On the islands, this horticultural produce still depends on imported seeds and other products indispensable to their cultivation.

Fruit - *Carica papaya* (papaya), *Ananas comosus* (pineapple), *Mangifera indica* (mango), *Persea americana* (avocado), *Psidium guajava* (guava), *Artocarpus heterophyllus* (jackfruit), *Dacryodes edulis* (Safu), *Spondias cytherea* (ambarella).

For the most part, these species were introduced into the islands and adapted perfectly. They are now the most frequent spontaneous species, especially on the lowlands.

There have been projects by Taiwanese scientists to introduce other species or varieties of fruit plants, like the *Averrhoa carambola* or lemon trees, probably more productive than those listed above.

Tubers: *Xanthosoma sagittifolium* (matabala), *Ipomea batata* (sweet potato), *Solanum tuberosum* (potato), *Manihot esculentum* (tapioca).

Matabala is the staple tuber. It occurs spontaneously as an invading plant, or may be cultivated throughout the country, forming consociations with coffee and cocoa crops.

Potatoes are cultivated on the outskirts of Bom Sucesso. Sweet potato and tapioca are most abundant in savannas.

Cereals: *Zea mays* (corn) and *Oryza sativa* (rice).

In S. Tomé and Príncipe, corn and rice are cultivated cereals. Corn develops mostly in the north savannas, including the fields of Canavial, Fernão Dias, Praia das Conchas, Diogo Nunes, and Micoló; also on the southeast, from Pinheira to Água Izé.

Relatively to dry land rice, this stape cereal was introduced within the scope of the Project for Development of Alimentary Cultures in cooperation with Taiwan and is on trial phase at Pinheira, Água Izé, Milagrosa, Porto Alegre, Agostinho Neto and on Príncipe.

- The following aromatic plants have been inventoried, whether cultivated or sub-spontaneous: *Vanilla planifolia* (vanilla), *Cinnamomum zeylanicum* (ceylon cinnamon), *Cananga odorata* (Ylang-ylang) and *Vetiveria zizanoides* (vetiver), *Erygium foetida* (Selo-sun-zon-maia), *Cymbopogon citratus* (lemongrass), *Ocimum viride* (Ncheonwu), *Curcuma domestica* (turmeric), *Gegimber officinalis* (Gegimpre).
- These plants possess curative properties and are used in treating several diseases: asthma, malaria, wounds, coughs, diabetes, and more (see table 5 below). *Chinchona* (pau quina), *Monodora myristica* (iobò), *Voacanga africana* (Cata d'ôbô), *Morinda lucida* (Gligô), Macambará (*Crateispermum montanum*), Pau Sangue (*Harungana madagascariensis*), Pau Três (*Allophylus africanus*) provide evident examples of plant use.

In the 1980's, the Experimental Station of Pótó, now named Centro de Investigação Agronómica tropical (CIAT) – Center for Agricultural Investigation in the Tropics – sent leaf samples to a lab in Italy that found active principles of high pharmaceutical value. Much later, a Portuguese team presented data that were very encouraging about the phytotherapeutic properties of Santomean plants.

The agro-sylvan-pastoral landscape is deteriorating as a result of soil erosion, deregulated exploitation of forests, reduced fallow periods, and cultivation on vulnerable soil that is especially sensitive to erosion and loss of fertility. This situation threatens the future of land reserved for human activity. On some communities, pilot projects on environment-friendly agriculture are now on trial phase. These projects may bring about results on soil protection, an additional step towards the preservation of biodiversity. Furthermore, several species have been introduced in an attempt to reverse the situation. Reforestation projects have introduced the following species over the past few years: Gamhar (*Gmelina arborea*), common teak (*Tectona grandis*), Eucalyptus (*Eucalyptus spp*), icecream bean (*Inga edulis*), ironwood (*Casuarina equisetifolia*), silver oak (*Grevilea robusta*), *Terminalia mantalis* and *Acacia magium*. Results are not yet known, but these plants are rapid-growth species. Several acres have been planted experimentally on Pateau, Mongo and Diana. The introduction of *Flemingia macrophylla* and other nitrogen-fixating plants constitute positive measures when these are confined to agrarian environments. This is another step towards the implementation of community and agro-sylvan forests.

3. Use of Biodiversity

Biodiversity is a resource; from the biological and economic standpoints, it provides the basis for sustainable development. All along the history of S. Tomé, settlers have exploited the islands' natural resources. Utilization takes on many guises: Agriculture, fishing, extraction, medicine, recreation, cultural manifestations and tourism.

Currently, several groups and Non-Governmental Organizations (NGOs) in São Tomé and Príncipe would like the use of biodiversity to contribute towards the reduction of poverty and allow for sustainable economic and social growth, while keeping protection and preservation in sight.

Of note among forest products are:

3.1. Forest wood products

According to the data on the Proposal for Forest Development 2004-2008 (PDF), the total volume of commercial wood existing in São Tomé and Príncipe for the year 1999 was around 11-12 million cubic meters, including primary forests. This resource volume, divided over the country's wooded surface, would result in an average value of 125 m³/ha. Sustainable exploitation might yield an annual 70 to 100,000 m³ of wood for sawmills and some 40 to 65.000 m³ for fuel. However, up to the present date, wood products are exploited without handling or processing plans, without an annual cutting plan; informal exploitation is more and more frequent. Current estimates place exploitation at 9.000 m³ of commercial wood (World Bank 2003). A rather substantial part is used as fuel.

Wood produced has several applications: Construction, furniture, industry and fuel. Wood-producing species are submitted to abusive exploitation without a reconstitution plan. These are: Iroko (*Milicia excelsa*), spanish-cedar (*Cedrela odorata*), jacktree (*Artocarpus integrifolia*), *Scytopetalum klaineianum*, *Cleistanthus libericus*, west african cordia (*Cordia platythyrsa*), *Zanthoxylum gillettii*. These come from secondary and shade forests.

3.2. Traditional medicine

The flora of São Tomé and Príncipe presents a wealth of medicinal plants, possible sources of medication for conventional medicine in combating several diseases, such as malaria, dysentery, skin diseases, wounds, jaundice, hepatitis, asthma, flu and diabetes. Research from ethnobotanists has demonstrated the existence of some 300 medicinal plants. Among them are: Indian laburnum (*Cassia fistula*), bitter leaf (*Vernonia amygdalina*), air plant (*Bryophyllum pinnatum*), "Milondó-homem" (*Acridocarpus longifolium*), calabash nutmeg (*Monodora myristica*), coffee senna (*Cassia occidentalis*), teabush (*Ocimum viridis*), stlofi (*Momordica charantea*), Mussinica (*Prunus africana*) and others.

Rational exploitation of herbs, bark, roots, leaves, flowers and seeds must be backed by research, investment, and material/intellectual organization. Only then can industrial and medicinal application constitute a safe avenue and an alternative to synthesized chemicals patented all over the world.

Harvesting methods demonstrate vulnerability; in several cases, witch-doctors and sellers cut down the tree and remove all the bark, killing the plant. Examples would be the way Quina (*Cinchona pubescens*), Macambará (*Craterispermum montanum*) and Pau trêz (*Allophylus africanus*) are extracted.

3.3. Handicrafts

Several wood products in São Tomé are used for handicrafts. Wood is employed to produce cutlery, sculptures and canoes, *Cedrela odorata* being one of the woods favored in this application, Along with *Ceiba pentandra*. Bamboo (*Bambusa vulgaris*) is used for furniture and several utensils. Palm (*Elaeis guineensis*) and coconut (*Cocos nucifera*) leaves are used in basket weaving, bags, brooms. Fibers and husks from coconuts are used in making bracelets, rings, glasses, earrings, ashtrays, mats, and more. *Borassus aeaethiopum* leaves are employed to make bags in many shapes. Dry leaves of *Pandanus thomensis* are used to weave floor mats, one of the most important sources of income to southern Santomeans. Currently, a growing number of men and women have taken up handicrafts as a business.

3.4. Apiculture, dye and extraction industries

These sectors rely on non-wood forest products, such as honey, bush meat, palm wine, resins and dyes.

They do not possess solid financial or structural bases for sustainable implementation.

Regarding honey, locals have reported that some will burn the hives in order to get to the honey. In the past, attempts at structured beekeeping produced rather encouraging results. Obô honey is now available from some NGOs.

Palm wine is extracted solely from the oil palm, *Elaeis Guineensis*, throughout the country. According to data gathered on field visits, the regions of Bombaim, Nova Ceilão, and Claudino Faro now have more than 500 people working as wine extractors.

The product generates sizeable income among wine extractors and sellers. Several palm groves are exploited for palm wine, but the methods employed are cause for concern.

Palm oil is another non-wood forest product of great importance to the local economy. This oil is extracted by locals for farm use, but the company EMOLVE still produces it industrially, although production has dwindled over the years. Several factors account for this: On the one hand, the Palm groves are growing old, and on the other, the company's equipment and facilities have been deteriorating.

Dyes and resins are seldom extracted in the country. Some locals extract dyes from *Rizophora mangue* to paint canoes and houses.

3.5. Nutrition and Cuisine

Biodiversity, as is known, is the basis for agriculture and food production. As stated above, there are 30 alimentary species (see table 4 below) used as sources of energy, vitamins and minerals by the population.

However, people tend to prefer imported products, buying and consuming less local products.

Hunting and fishing provide for part of the local diet and a good deal of the animal protein. In this context, bush meat is frequently consumed. Hunted species are monkeys, lagaias, pigeons, turtledoves and other animals. Hunting is done by men who own firearms (rifles and shotguns). They also use slingshots and snares, although these are becoming outmoded. Some coastal folk use grenades and poisons to catch fish and shrimp.

Currently, studies show that halieutic resources on Santomean waters are considerable and, of the 12,000 toneladas of fish estimated by 1982 data, 8,500 are pelagic and 3500 are demersal; the autonomous Region of Príncipe presents even greater potential.

The largest fishing fleets on our waters come from the EU, under a fishing agreement. They capture mostly tuna, cuttlefish, squids and octopi.

There are insufficient means to monitor fishing activities. The maximum exploitation permissible is estimated at under 6,000 toneladas a year.

3.6. Eco-tourism

This activity is currently under-exploited. The country does not yet offer the facilities (infrastructures/services) required for this sector to expand.

The main players on the field would be the Tourist and Hotel Board, travel agencies, national entrepreneurs, foreign partners and investors, NGOs and local communities. They should make the best of the positive evolution experienced by the country over the last years.

One priority that would add value to biodiversity in São Tomé and Príncipe is the structuring and implementation of sustainable eco-tourism.

There is a wealth of land and marine fauna to attract tourists. Sports fishing can be exploited by the private sector.

Besides fauna and flora, abiotic components of Santomean ecosystems have great potential for eco-tourism.

Several tourist circuits have been created within Obô Park to develop leisure activities in a natural context.

There are waterfalls (São Nicolau, Bombaim), rivers and streams (Ió Grande, Cantador, Abade), old coffee and cocoa farms (Monte Café, Santa Margarida, Agostinho Neto), volcanic landscapes (Cão Grande, Amélia Lagoon), and more. There are also many sandy beaches like Jalé, Piscina, Governador, and Praia Banana, among others.

Santomean hospitality, culture and folklore, as well as the cuisine, provide wealth to this sector, which must abide by the principles of environment protection and cultural identity.

3.7. Ethnocultural and magic use

Santomean biodiversity is also employed by ancestral folk belief. There are incantations proffered here and there (waterfalls, hills, crossroads) as well as ritual dances to heal or prevent diseases, or even send messages. Emanations from ripe *Borassus aethiopum* fruit, as well as burnt *Croton steellifer* bark, ward off the evil eye and evil spirits; crosses made from *Zantoxylum gillettii*, placed carefully throughout one's home, protect you against witches.

As for animals, witch-doctors and healers possess considerable lore about their connection with the supernatural. Relevant animals are: The owl (*Tito alba thomensis*) and the kitolí (*Otus hartlaubi*), night birds whose cries chill the superstitious; when black cats or snakes show up at certain times of day, an enemy must be out to get you.

Associating certain persons with plants or animals is a compliment. When you call someone a lagaia, you're saying they're clever and discreet; turtles are people with ulterior motives, generally bad; "Flóli canido" is a constant no-show; "rosa bilança" for pretty girls; "safú" is for beautiful women with fiery tempers.

3.8. Ornamental use

Uses of biodiversity on São Tomé and Príncipe vary greatly. Preferred ornamental species are begónias (*Begonia sp.*), gingers (*Renealmia grandiflora*) and giant ferns (*Cyathea sp.*). Also favored are the orchids, small and discreet, that blossom in humid mountainous environments.

As shown on table 7, below, many ornamental plants were brought in from other regions. Given climate and soil fertility, many have become naturalized and frequent. These are: Anthuriums (*Anthurium sp.*), heliconias (*Heliconia sp.*), torch gingers (*Nicolaia elatior*), and more.

Animals, although protected by the CITES convention, are so highly valued that they are sold on the black market. Foremost would be: parrots (*Psittacus erithacus*), parakeets (*Agapornis pullarius*), mona monkeys (*Cercopithecus mona*) and rare butterflies.

As far as ornamental plants and flowers go, the country is showing signs of development, exporting these to European markets. This is due to the enterprising spirit of a few private companies that promote the country's image abroad.

CHAPTER III – CURRENT STATE OF BIODIVERSITY

In spite of great difficulties in quantifying the deterioration of biological diversity, it is understood that maintaining diversity on São Tomé and Príncipe is a high priority. The country has undergone massive, rapid change, and many have turned to quick profits. Poverty has been bandied about as an excuse for illegal activity and this has led to the dissemination of especially productive species to the detriment of those traditionally

domesticated or cultivated. Scarce interest in the store of knowledge, activities and traditions upheld by traditional farmers, and an agricultural policy influenced by the consequences of African swine fever and other zoonoses, have brought about a rather delicate situation.

Lack of biological technology and resources to analyze ongoing transformations and act accordingly to minimize damage has also been a factor. Demographic increase has heightened the pressure on natural resources and the damage done to ecosystems may not be reversible.







































The forestry sector is struggling with institutional, legal and logistic constraints when it comes to sustainable management of wood resources. Since the inception of the Forestry Board in 1993, this public body has not been allocated any investment funds by the Government. The Law on forestry, in force since 2001, creates a situation where most wood extraction and transformation is made illegally. The districts of Mé Zochi, Cantagalo and Lobata lead the pack when it comes to illegal exploitation of wood products and derivatives. There is no official chart to regulate plant-soil occupation.

To make up for the lack of wood, it is of the essence that replanting take place with rapid-growth species.

The agro-sylvan-pastoral landscape is deteriorating as a result of soil erosion, deregulated exploitation of forests, reduced fallow periods, and cultivation on vulnerable soil that is especially sensitive to erosion and loss of fertility.

4.1 Main dangers to diversity of fauna in São Tomé and Príncipe

Scheme 6:

		Most evident signs of danger to the diversity of animal species on S. Tomé and Príncipe
		Coastal erosion and destruction of infra-structures
		Destruction of beaches with great tourist potential
		Destruction of sea turtle breeding habitats
		Destruction of important coral reefs and endemic species
		Use of inadequate meshes on fishing nets
		Fishing with grenades
		Washing oil tankers and blowing up debris out at sea
		Dumping of oil residue on the estuary of Água Grande river
		Pollution of subterranean water with toxic products
		Farmers encroaching on nature preserves
		Indiscriminate felling of protected tree species
		Uncontrolled burning of forest areas for agriculture
		Destruction of commercially valuable species
		Destruction of vegetable covering
		Increase of erosion inland
		Loss of soil fertility
		Deregulated, year-round hunting
		Illegal trading in protected species (parrots, turtles, others)
		Horticultural development on steep slopes

The main threats to biodiversity in the country are present throughout several ecosystems and habitats and are all anthropic in origin. They can be grouped into four categories:

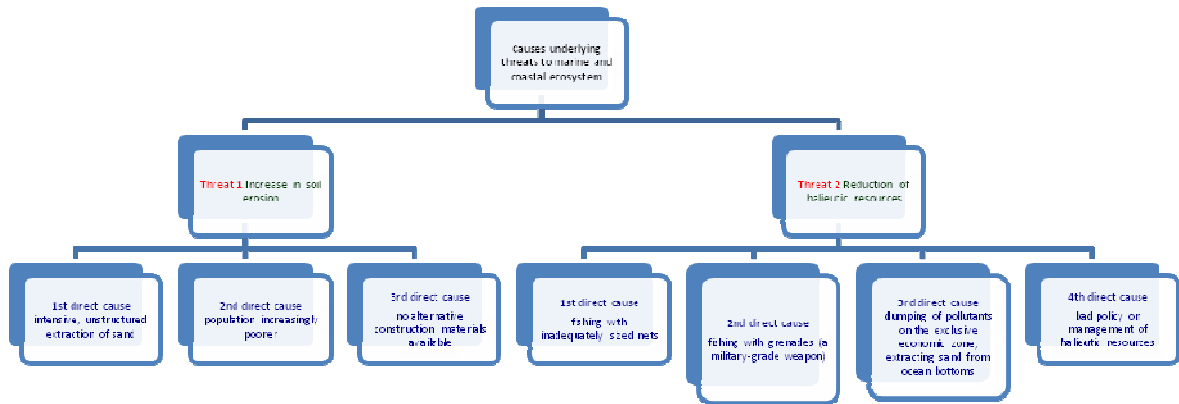
- Chemical pollution with toxic waste and residues
- Habitat destruction
- Over-exploitation of natural resources
- Introduction of animal and plant species.

The figure below lists major threats to the ecosystems studied, direct and indirect causes for them, and their effects on biodiversity:

4.2 Main causes underlying major threats to the ecosystems:

4.2.1 Coastal and marine ecosystem

Increase in coastal erosion, reduction of halieutic resources and exploitation of oil in the S. Tomé-Nigeria joint development area (see scheme 7, below).

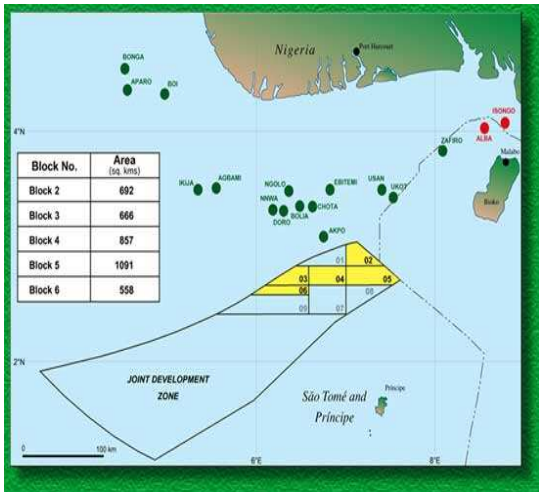


Forecast of impact caused by oil drilling.

From a strictly biological standpoint, oil drilling in the S. Tomé-Nigeria joint development area, as well as on the Santomean exclusive economic zone, will probably lead to the disappearance of species that constitute one of the rarest ecosystems in the world — the Santomean coastal and marine ecosystem — if environmental impact studies are not taken into account.

Below are maps of the STP-Nigeria joint development zone and S. Tomé's exclusive economic zone.

Fig. 5: maps of the STP-Nigeria joint development zone and S. Tomé's exclusive economic zone.



Negative impact on coastal and marine biodiversity is also due to:

Reduction of halieutic resources

Fishing nets with extremely tight meshes (illegal) are being used on the exclusive economic zones of S. Tomé and Príncipe, causing veritable ecological disasters. These nets capture growing specimens, such as the black sea bream (*Pomadasys rogeri*) of the family Haemulidae, which Santomeans have taken to calling “disaster”. Young fish of the species measure from 2 to 5cm in length, while adult fish grow to a length of 20 to 25cm, weighing 400-800g. The young weigh under 30g.

This problem most likely stems from impoverished fishermen being unable to fish very far from the coast.

Capture and consumption of endangered species, like sea turtles

Human beings will capture turtles and steal their eggs, not to mention the destruction of their breeding habitats due to lawless exploitation of beach sand.

These animals are highly valued by Santomean cuisine and a significant source of protein.

Deregulated occupation of coastal areas

Deregulated, non-sustainable occupation and exploitation of coastal areas tend to accelerate erosion, as well as biological degradation of the ecosystems.

Current airport construction projects and the establishment of tourist centers on northern São Tomé (Praia das Conchas and Lagoa Azul) completely disregard the assessment of environmental impact, given the importance of coral reefs unique to these areas.

There are projects for the building of an oil harbor and a free trade zone on Príncipe island which will doubtless generate pollution and seriously threaten local biodiversity.

Construction on coastal areas has led to the spread of concrete, defacing beaches and displacing traditional wood constructions.

Sand extraction from beaches and ocean bottoms

This sand is not only inadequate to construction but also extracting it may destroy several habitats and coastal/oceanic biotic communities.

Extraction of minerals, especially basalt, without recourse to soil preservation techniques, may lead to erosion and decline in soil productivity. There should be research to assess the impact of such extraction on the environment and propose alternatives.

Controlled fires and coal extraction

Controlled, agricultural-related fires on the north coast of S. Tomé island, especially in Lobata and Lembá districts, during the dry season, destroy a significant portion of the habitats for species mentioned above and also those of birds and other animal species.

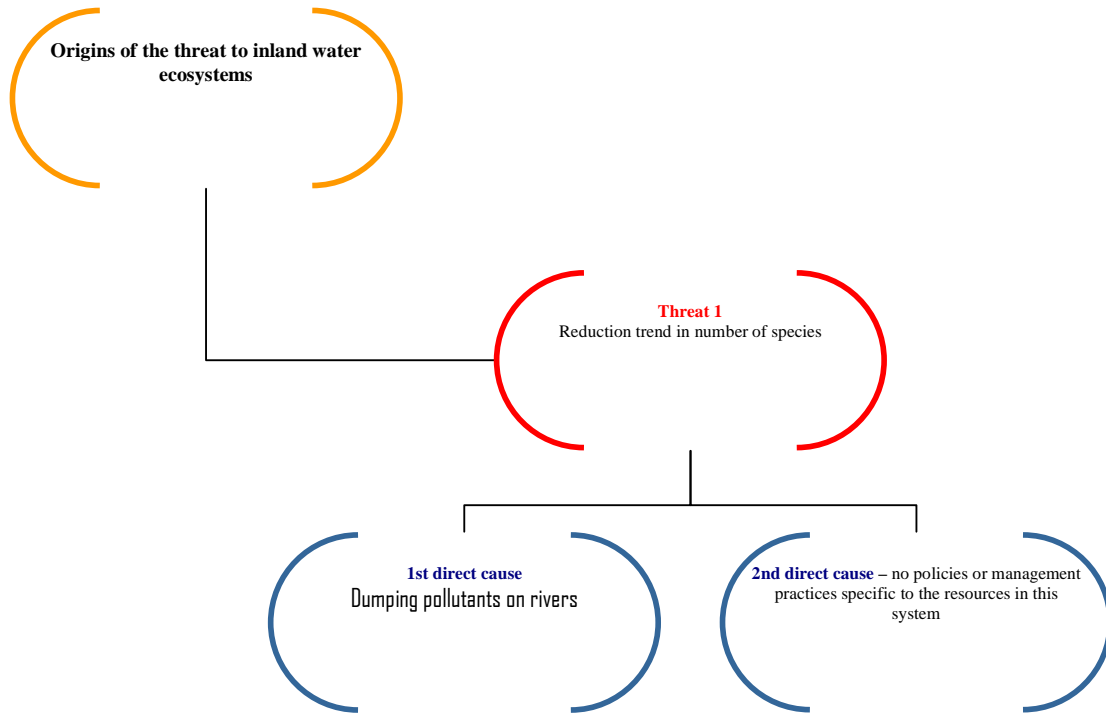
The systematic felling of tamarind trees for coal, in Praia das Conchas and Morro Peixe, on the NE of S. Tomé island, is already endangering ecological balance in the area, as these trees are vital to preventing erosion and help form dunes. In S. Nicolau, burning Pau Impé (*Olea capensis*) is a profitable activity that threatens the few mountainous African species existing on the islands.

The practice is just as common in north Príncipe (Airport, Sundy and Picão), where people make coal from *Pentaclethra macrophylla* to sell on S. Tomé island.

Two kinds of people undertake burning: Occasional and systematic. The latter live on the proceeds from coal sales, and may worsen the problems with deforestation and lack of rainfall in this part of the country.

4.2.2 Inland water ecosystems

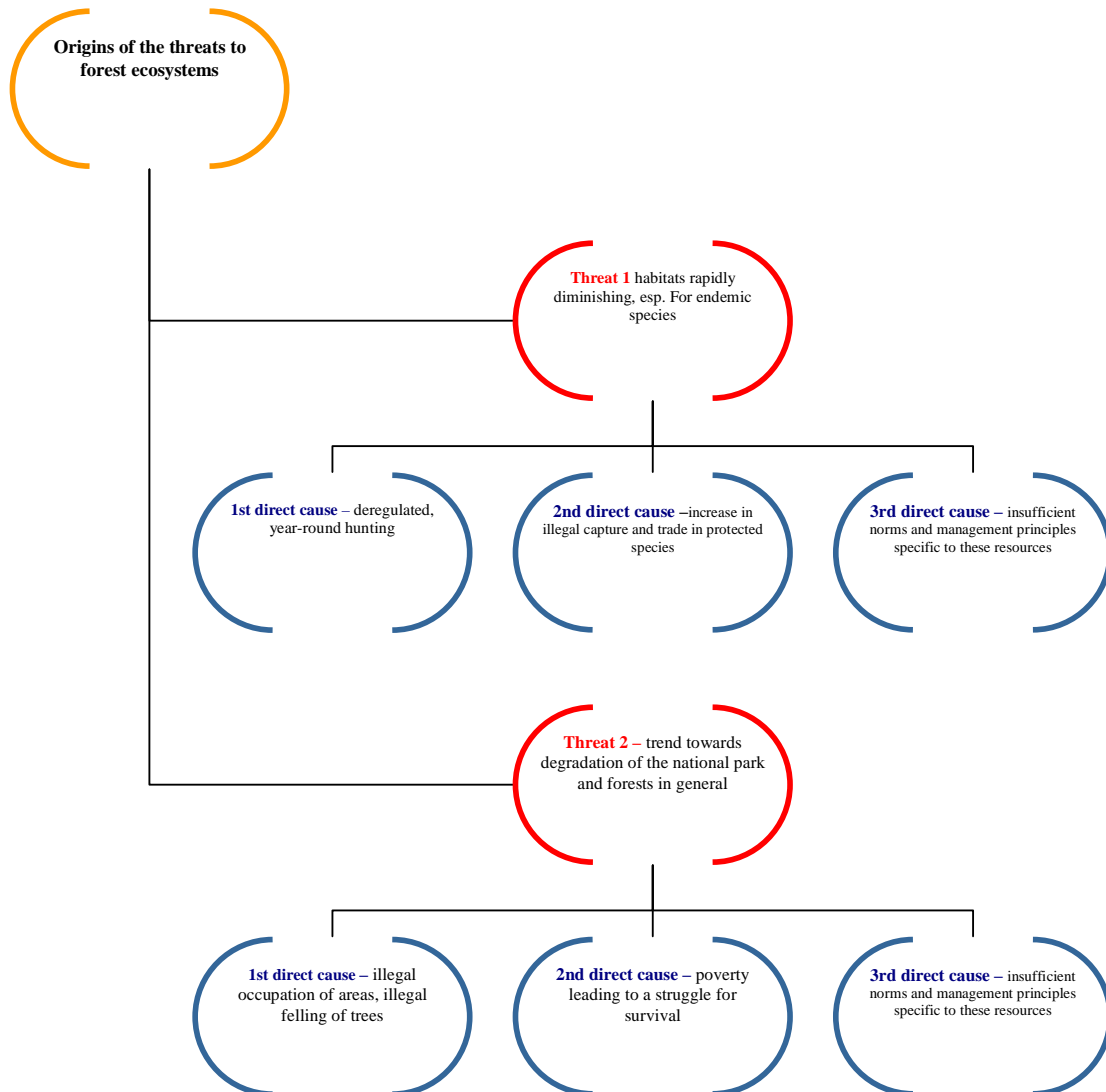
As the scheme below shows, the washing of pollutants in rivers (sanitary products, DDT and other insecticides used against malaria, chemical products like fertilizers and insecticides, oil residues and others) and the absence of monitoring policies and procedures, along with bad management of ecosystem resources, are at the base of increased vulnerability.



4.2.3 Forest ecosystem

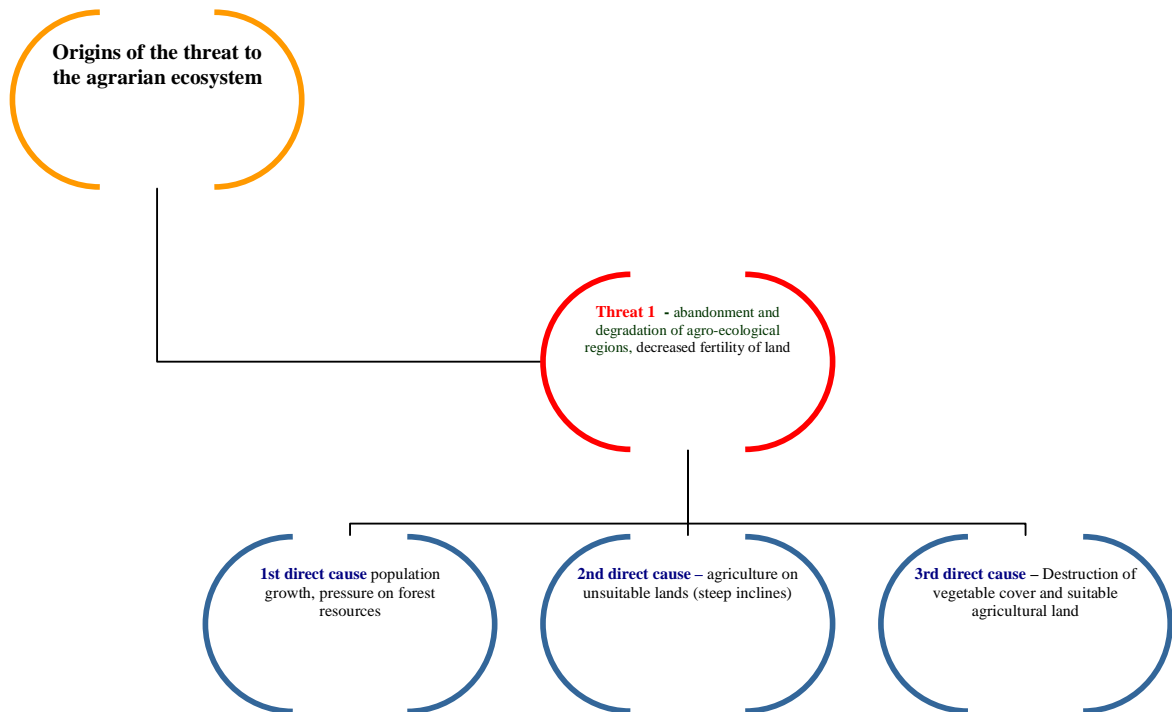
Problems identified in the country's forest ecosystems:

Deregulated encroachment of human beings on nature preserves looking for new agricultural terrain, wood and non-wood products, destructing ever more avian habitats. Endemic species are particularly threatened. (see scheme 9, below)



4.2.4 Agro-pastoral ecosystem

The abandonment of the main agro-ecological areas of the country which, in the past, drove agricultural development in the country, as well as the lack of adequate technical monitoring of the agrarian reform in progress, have led to deterioration of soil fertility. This endangers the country's food security. (see scheme 10, below)



4.3 MOST VULNERABLE FOREST ECOSYSTEMS

The most vulnerable ecosystems on S. Tomé and Príncipe islands, as shown by the map below, are the north-northwest savannas and the shade forests. The main affected species are prime quality arboreal species: *Milícia excels*, *Cedrela odorata* and *Carapa procera*. Likewise, the trees felled to make coal are also in danger. (see figure 6, below)

Fig. 6: Map of regions most affected by tree-cutting in S. Tomé

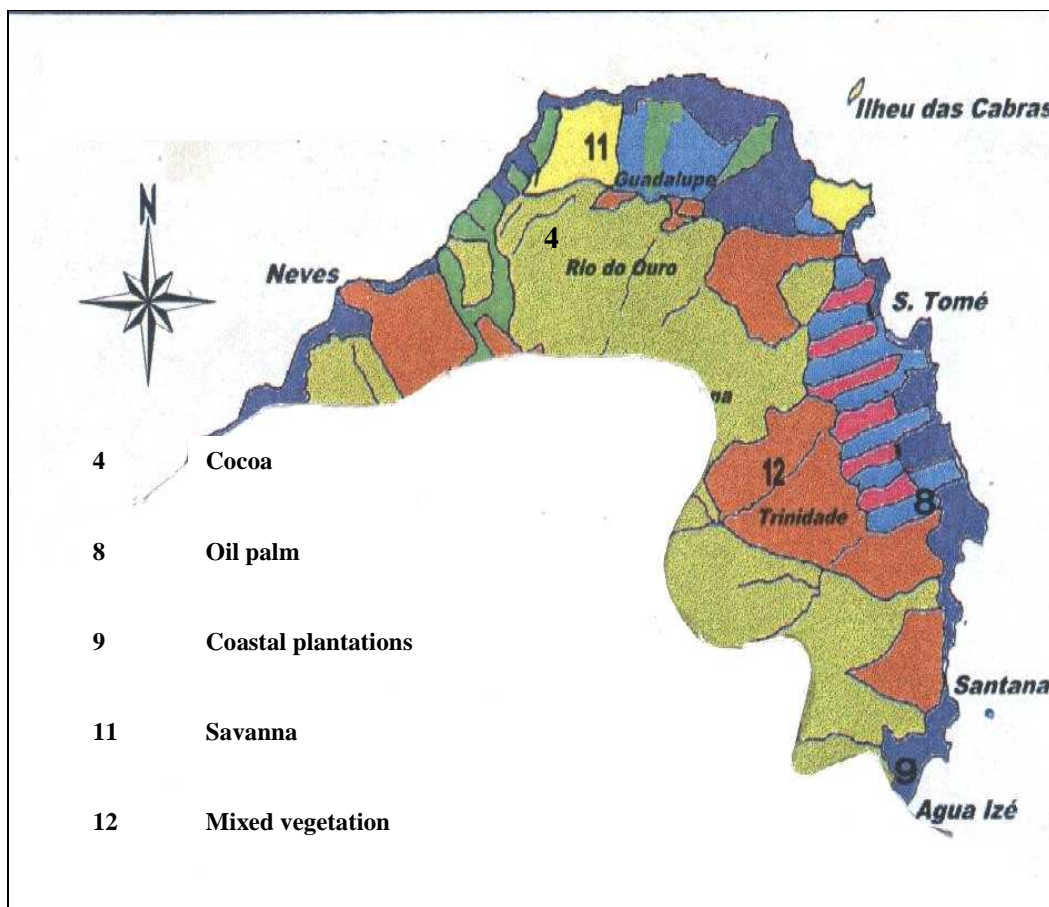


Fig. 7: Map of regions most affected by tree-cutting on Príncipe island

4.4 National programs and activities

The country has already put in place actions to preserve, safeguard and promote sustainable use of biodiversity. As signatory to the Convention on Biodiversity, the country has committed to a framework and political/institutional activities both national and international in order to devise solutions for the preservation of biodiversity. Funding mechanisms will be necessary.

Preservation of biodiversity may take place on- and off-site. There must be awareness, education and dissemination campaigns on the environment, targeted at local communities.

4.4.1 On-site preservation

Relevant action is needed for sustainable management of forests. One of the proposed measures, the Arboretum, will constitute an important step for scientific knowledge on arboreal species, namely on ecological traits of biotopes, the systematic biology of

taxonomic groups, relevant biotechnology and the socio-economic value of each species.

Besides the Arboretum, the following protected areas were created in 1993: Obô Nature Preserve Park, on both São Tomé and Príncipe islands, covering about 29,500ha, to protect major mountain and low altitude ecosystems found in São Tomé and Príncipe. These constitute the remaining dense forests of the islands. Rocky relief has made them relatively inaccessible and consequently they are not inhabited.

Later, the Tinhosa Islands Nature Preserve was created, covering 15ha, and the Rolas Islet Preserve, covering 6ha.

4 protected áreas in total, covering a land surface of 29,537ha, which correspond to about 30% of the country's surface.

These protected areas were defined to preserve and protect forest, coastal and marine ecosystems and promote orderly zoning and natural resource management so as to guarantee the continuity of evolutionary processes that have been going on for millions of years.

4.4.2 Off-site preservation

There are several means for off-site preservation available in the country: Botanical gardens, small zoological facilities, herbaria, community gardens, sheds for shading.

These infrastructures are pools for animal and plant genes that may be endangered.

The country now possesses a botanical garden with over 400 species of endemic flora, and the Herbarium, over a thousand samples of plants, gathered on several trips across the Park or to buffer areas.

The Botanical Garden is the gateway to Obo Park. It is currently located at Bom Sucesso, which used to be part of the old Monte Café farm.

The Botanical garden and Herbarium were created to educate people, and the younger generations especially, on matters of biology and systematic botany. Not only that, but also to preserve endangered species off-site, to collect living specimens and data for scientific research and finally, for touristic and recreational ends.

The Reference Herbarium is an invaluable resource to diagnostic research on pastoral resources, description and classification of natural grazing lands, to cartography and the study of plant dynamics; not to mention education on better territorial management.

Community gardens may play an instrumental role in off-site preservation as they help us learn about plant adjustment outside their place of origin, and in the conduction of tests in rural environments.

Shading sheds for certain species were created in Bom Sucesso, especially for the orchids culled in the forests of S. Tomé and Príncipe islands. These flowers were initially picked for phonological studies and are now popular tourist attractions.

As for endangered fauna (see table 10, below) breeding in captivity may prevent the extinction of certain species.

4.4.3 Information, Education, Awareness and Dissemination Campaigns

Sea turtles were a major concern with these campaigns. However, they came to a halt in 1999. Local fishermen became aware of the need to protect sea turtle species.

Discontinuing these campaigns has brought about negative consequences. Turtles are once again captured – if less frequently – by some members of fishing communities.

4.4.4 Preparation of a National Strategy and a Plan of Action

One of the major national efforts will be the preparation of a National Strategy and a plan of Action to protect and preserve biological diversity, crucial to the country's international reputation. This strategy is on the point of being adopted by the government.

The strategy will be the yardstick for fair and equitable allocation of benefits from biological and genetic resources, including biotechnology, and will facilitate ample international, regional and sub-regional cooperation as well as scientific and economic exchange regarding biodiversity and its role in ecosystems.

The preparation of a national strategy involved sectors from civil society and led to studies on biodiversity in São Tomé and Príncipe. The studies undertaken covered ecosystems (inland water, forest, marine, coastal), the agricultural and forestry sector, as well as research into the country's body of laws.

4.4.5 Implementation of the Management Plan for Obô Park

The preparation and implementation of the next management plan for Obô Park may reinforce the Botanical Garden's and the Herbarium's role as lynchpins of ecological preservation and valuable facilities for ecotourism.

4.4.5 Environment-related policy and legislation

The following laws and decrees on the preservation of biodiversity are relevant:

a) National legislation, approved and published after the country's independence from Portugal

- Foundation Law on the Environment (Law no. 10/99), published in the Diary of the Republic #15, 5th supplement, December 31. Article 5 rules on respect for limits of burdens upon ecosystems. 16 rules on objectives and measures. 20 rules on the preservation of nature. 23 rules on biological diversity and 29 rules on water.
- Law on the Preservation of Fauna, Flora and Protected Areas (11/99), published in the Diary of the Republic #15, 5th supplement, December 31. Rules on preservation of fauna, flora and protected areas as national and world patrimony, upholding sustainable social and economic use, and establishes lists of protected species, allocating areas of national territory to the preservation of habitats and biodiversity.
- Law no. 3/91 July 31, published in the Diary of the Republic #21, July 31. Rules on land ownership, identifying public and private property of the state and

establishing the Framework for distribution and use of land. This law dictates that public (state) property corresponds with riverbeds and maritime waters, islets by the shore, those grounds reserved for military and paramilitary objectives and those occupied by roads, public thoroughfares, harbors and airports. Private property of the state includes public buildings; state-run agricultural facilities; nationalized buildings or facilities; abandoned buildings and all others not owned by private citizens or corporations.

- Decree no. 63/81, of December 31, establishes the legal framework for protection, exploitation and management of maritime resources on the exclusive economic zone, which is also contemplated by
- Decree no. 15/78, June 16. A few changes were made to the December 1981 Decree by Decree no. 2/84, that updates concession taxes and fines.
- Decree no. 51/91, November 7, published in the Diary of the Republic #25, November 7, defines rules for use and principles of allotment of private state property intended for agricultural exploitation.
- Decree no. 59/93 approves the Provisional Regulation on Exploitation of Forests.
- Decree no. 35/99, November 1999, approves the regulation on extraction of aggregates, defining sand, shingle, limestone and reefs as natural resources of the state and therefore setting the conditions for grants of extraction throughout coastal areas and rivers of the Democratic Republic of São Tomé and Príncipe.

- Decree 36/99, published in the Diary of the Republic #12, November 30, establishing a mandatory record of residues and defines competence and responsibility in management of same.
- Decree no. 37/99, published in the Diary of the Republic #12, November 30, approving the Regulation on Processes for Evaluation of Environmental Impact.
- Dispatch no.1/GMAP/996, of 19.01.99, prohibiting the cutting of trees throughout national territory.
- Official Warning from the Pecuary Board, of 02.01.87, setting the limits to exports of pigeons and parrots.

- Law no. 06/2006, creating Obô Natural Park on São Tomé.
- Law no. 07/2006, creating Obô Natural Park on Príncipe.

b) Pre-independence legislation still in force

- Decree 39.931, November 24, 1954, provides a framework for forestry.
- Decree 682, July 23 1914, approves the Regulation on the protection of trees.
- Decree 18.604, July 12, 1930, prohibits cutting down iroko trees.
- Decree 40.040, January 20, 1955, on forest resources, contains norms to protect fauna and flora.
- Dispatch no. 1457, August 7, 1950, approves the Regulation on S. Tomé and Príncipe Port Captain's Office, given authority to inspect fishing activities and status as Coast Guard, based on Beach Chief action, whose duties and privileges are also established therein. Currently, this dispatch needs to be updated and adjusted; there must be a redistribution of duties between the Fishery Board and the Port Captain's Office, given the new organizational and management

framework that now guides social and economic development and the country's integration into the region.

- Articles 464 and 476 of the Penal Code punish arson in forests and the destruction of fruit trees, among others.

c) National legislation already approved, but pending publication

- Law on Fishing and Aquatic Environments, which proposes mechanisms to ensure rational management of marine halieutic resources, favoring the renewal of resources with the needs of posterity in mind.
- The Forest Law which, in the future, will make up for current lacunae, including mechanisms to ensure forest zoning, as well as the monitoring and functioning of forest management.

d) Approved, pending publication

- Decree on the Forest Development Fund.
- Regulation on Hunting.
- Decree on preservation of sea turtles.

On the equitable allocation of biological resources:

The Constitution of the Democratic Republic of São Tomé and Príncipe guarantees everyone a right to housing, a humane living environment, and a duty to defend it (article 48, paragraph 1), and the right to protect and defend their own health, (art. 49, p. 1); it is the state's responsibility to develop and implement a policy on housing that obeys territorial zoning plans (art. 48, p. 2). In the spirit of the Constitution, all laws on the environment permit citizens to access natural resources and use them for sustainable economic and social development, contributing to the acquisition of financial means to combat poverty, to preserve biodiversity and protect biological resources.

Thanks to the United Nations Convention on International Commerce of Wild Flora and Fauna Near Extinction (CITES), S. Tomé may benefit from financial assistance provided by developed countries, to implement the objectives foreseen in that legal instrument through bilateral and/or multilateral development. Still thanks to the Cites, S.Tomé and Príncipe may enjoy other advantages, including access to credit, once the necessary perquisites and formalities are attended to.

e) International legislation

Ratified and published conventions

- United Nations Convention on Maritime Law (Montego Bay, 1982), published in the Diary of the Republic.

Main goals: To create a complete legal framework for oceans and, from the environmental standpoint, establish concrete environmental norms contemplating, among other subjects, sea pollution.

- Convention on Biological Diversity (Rio de Janeiro, 1992), published in the Diary of the Republic #17/1998, May 30.

Main goals: Preserve biological diversity, promote durable use of its elements and equitable distribution of the proceeds from use of natural resources.

- Framework Convention on Climate Change (Rio de Janeiro, 1992), published in the Diary of the Republic #17/1998, May 30.

Main goals: Control emissions of greenhouse gases into the atmosphere to combat climate change. Climate change may compromise all sustainable economic development or mankind's future.

- Convention on Combat Against Desertification, in the countries affected by severed drought and/or desertification, especially in Africa. Paris 1994. Published in the Diary of the Republic #17/1998, May 30. Stockholm Convention on Persistent Organic Pollutants, signed by São Tomé and Príncipe April 2002.

Treaties S. Tomé adhered to, pending ratification

- Convention on the Protection of the Ozone Layer (Vienna, 1985), on 19.11.2001.
- Montreal Protocol on Ozone-Depleting Substances (Montreal, 1987), on 19.11.2001.

Signing onto, and ratification are recommended:

- London Amendments to the Montreal Protocol on Ozone-Depleting Substances (Montreal, 1990), on 19.11.2001.
- London Amendments to the Montreal Protocol on Ozone-Depleting Substances (Copenhagen, 1992), on 19.11.2001.
- Convention on International Commerce of Wild Flora and Fauna Near Extinction – CITES (Washington 1973).
- Convention on Preservation of Wild Migratory Species (Bonn, 1979), October 2001.
- African Convention on Preservation of Nature and Natural Resources (Algiers, 1968)
- International Convention on Protection of Birds, Paris, 1950.
- International Convention on Protection of Plants, Paris, 1951.
- Convention on Fishing and Preservation of Oceanic Biologic Resources, Geneva, 1958.
- International Convention on the Prevention of Contamination of Sea Water by Hydrocarbon, London, 1954, as well as 1962, 1969 and 1971 amendments.
- International Convention on the Preservation of Atlantic Tuna, Rio de Janeiro, 1966.
- International Convention on Responsibility for Damage Caused by Ocean Water Contamination by Hydrocarbon, Brussels, 1969.
- International Convention on the Constitution of the International Indemnity Fund for Damages Caused by Ocean Water Contamination by Hydrocarbon, Brussels, 1971.
- Convention on Humid Zones of International Importance, Especially as Habitats for Aquatic Birds – RAMSAR, 1971.
- Protocol on the RAMSAR Convention, Paris, 1982.
- Convention Creating the International Union for the Conservation of Nature and Natural Resources – IUCN, Fontainebleau, 1948.

- Memorandum of the Abidjan Agreement on Measures to Preserve Sea Turtles of the Atlantic Coast of Africa, Paris, 1994.
- Africa-Europe-Asia Agreement on Migratory Aquatic Birds.
- Basel Convention on Cross-border Transportaion of Dangerous Residue and its Elimination, Basel 1997.
- Convention on Preparation, Combat Against, and Cooperation on Hydrocarbon Pollution – OPRC, Abidjan, 1991.

f) Current problems of the present legal framework

The legal framework now in place in the DRSTP is hindered by several problems when it comes to the protection and preservation of biodiversity:

- Traditional rules are disregarded.
- Some of the norms put in place are ineffective as they do not take context into account.
- Insufficient implementation mechanisms.
- The laws in force, and their relevance, are not sufficiently well known, especially sector-specific or special-case laws.
- Human resources are scarce and, for the most part, underqualified.
- Policy-makers are hesitant, vague and lack resolve.
- New and urgent laws are approved and published at a snail's pace; existing regulations, if obsolete, remain that way for a long time.
- Insufficient knowledge of natural resources to protect by law.
- Faulty management of legal knowledge acquired and/or available.

g) Responsible bodies

Responsibility for coordinating and guiding all national policy on biodiversity management falls to two ministries: The Ministry for Natural Resources and Environment, and the Ministry for the Economy, in charge of Forestry, Agriculture, Rural Development and Fishery, Commerce, Tourism and the Hotel Industry.

h) The Ministry for Natural Resources and the Environment

This is a body with the central government administration, whose goal it is to coordinate and implement government policy on natural resources, energy and the environment. It is comprised of the following bodies and services, whose action is directly concerned with environmental protection and preservation, ecologic balance and biodiversity:

- The Environment Board, charged with programming, preparing and implementing operational measures for the protection and preservation of the environment, natural resources and nature in general.
- The Board for Natural Resources and Power, charged with promoting research on, and inventory of natural and energetic resources available, as well as preparing and presenting proposals and suggestions, both for improved use of these resources and rational, sustainable management of same.
- The Weather Institute, given administrative and financial autonomy, under guidance by the Minister, who must direct, coordinate and execute work, research, collection and processing of meteorology indispensable to aerial and

maritime navigation, as well as agriculture and fishing, use of water resources and several other scientific and economic activities.

- The Water and Power Company, EMAE, is responsible for the national management of water.

i) The Ministry for the Economy, in charge of forestry, agriculture, rural and fishing development, commerce, tourism and the hotel industry

This governing body must direct and implement government policy on agriculture, pecuary, forestry, fishing, hunting and rural development, and is composed of the following bodies and services:

- The Agriculture Planning Board is the central sector, charged with promoting studies and research necessary to the definition of general Ministry policy, based on its objectives, activity plans and evaluation of results.
- The Pecuary Board, charged with promoting the sanitary protection of animals, public and veterinarian hygiene, as well as with drafting guiding policies and providing needed technical support to regional services in order to boost animal production and achieve zootechnical improvement of species.
- The Forestry Board is charged with guiding and implementing government policy on zoning, protecting and preserving forests, developing forest/sylvan patrimony and providing technical support and coordination of action on the local and regional levels.
- The Fishery Board is charged with training and assessing seamen, drafting, ratifying and implementing norms on fishing, with a view to increase production for internal markets and promoting surplus exports; must cooperate with other inspecting bodies that monitor fishing fleets on the waters of the Exclusive Economic Zone of S. Tomé and Príncipe.
- The Tourism and Hotel Industry Board is charged with directing and implementing government policy on tourism and the hotel industry, and must create incentives to draw tourism to the islands while preserving and protecting the environmental assets of S. Tomé and Príncipe.
- The Commerce Board is is charged with directing and implementing government policy on commerce.

j) Other bodies involved

Besides the bodies indicated above, there are others more or less directly involved, as described below:

The Ministry of Health is charged with directing, implementing and controlling government policy on public health, women's health and family health, ensuring abeyance by constitutional norms on the environment. This Ministry includes:

- The Public Health Board is a ministerial body whose job it is to ensure the population's and the environment's health and hygiene.

The Ministry for Planning and Finance is charged with directing and implementing government policy on the Government Budget. This Ministry includes:

- The Budget, Treasury and Patrimony Boards are responsible for tax collection, budget implementation, acquisition and sale of government property and other patrimony.
- The Customs Board is responsible for controlling illegal entrance into, or exit from the country, of specific plant or animal species. (?)

The Ministry for Foreign Affairs and Cooperation is responsible for government policy on foreign relations and cooperation, and also for compliance with conventions and other international legal instruments.

The Ministry for Justice, State Reform and Public Administration is charged with government policy on justice, state reform, public administration, constitution of corpus delicti and social rehabilitation of convicts who've served their term in prison.

The Ministry for Defense and Internal Order is charged with directing and implementing government policy on peacekeeping and maintenance of public order through its military and police component. It is responsible for inspecting the exclusive economic zone and the territorial waters of S. Tomé and Príncipe, through the Coast Guard.

Local governing bodies are the Autonomous Region of Príncipe and local autarchies, which have their own statutes.

It is the responsibility of the Agricultural Planning Board, Pecuary Board, Forestry Board, Fishery Board and ECOFAC to implement management and protection of biodiversity, under tutelage from the Ministry for Agriculture, Rural Development and Fishing.

k) Problems relating to governing bodies

There are several institutions connected with management and preservation of biodiversity, giving rise to the following problems: Lack of coordination among agencies and governing bodies, lack of skilled human resources, lack of material and financial means and lack of all sorts of equipment.

l) Other problems

- Lack of coordination among institutional/government bodies, arising from the diversity of ecosystems
- Lack of a financial structure specific to biodiversity.
- No financial government policy on biodiversity, which is not specifically contemplated in government budgets.
- Inability to have public services enforce laws, or demand that they be enforced.
- Limited ability to enforce legal norms on preservation and use of natural resources.
- The judicial branch has limited ability to enforce law and punish offenders.
- NGOs and civil society experience difficulty in denouncing environmental offenses.

m) National, regional and international cooperation

Over the past decade, the perceived value of biological resources has grown. This does not yet reflect on the economy and has failed to generate more jobs, as the informal economy is still predominant and there is little investment or funding available.

Agrarian ecosystems play a very important role in the country's economy and supply essential resources: wood, food crops, medicine, ornamental plants, material for handicrafts, export cultures, textile plants and others.

The islands' natural forests possess a wealth of endemic flora and fauna, of high scientific value, which means access to biological resources and equitable distribution are of the utmost importance in São Tomé and Príncipe.

On the National Level

Institutional capacity to monitor and control exploitation and/or protection of sylvan-biological resources, generating more revenue for the Public Treasury, is inhibited by the lack of competent personnel, lack of technical facilities and the inadequacy of legal instruments.

Legal text has very little impact on socio-economic ordering of resource exploitation. On the one hand, this occurs because a number of them are unpublished; on the other hand, no new governing bodies are created to implement and control measures set forth in legal instruments.

There are no national mechanisms for access and equitable distribution of proceeds from sustainable use of biological resources. Government bodies are urged to contact international NGOs to procure technical and financial assistance in the drafting of legal norms to achieve this goal.

Data collected in the Forest Inventory should provide the basis for:

- Preparing a plan on forest use and preservation;
- Trial introduction of rapid-growth trees for fuel and other everyday ends;
- Preparation of studies on the viability of plantations run by large companies to supply fuel needs, both at domestic and industrial level;
- Constitution of a national forestry service;
- Evaluation of the legislation proposed by FAO (Leite-Fisher, 1985) on forest management and control, submitting it to the government for analysis, approval and promulgation;
- Preparing legislation on the preservation of primary humid forest areas (ôbô), that these may be protected by law as nature preserves;
- Conservation of shade forests and replanting to make up for cuts on cocoa plantations;
- Producing specific legislation to prevent possible environmental contamination (e.g., use of pesticides or herbicides on plantations, among other practices to be determined).
- Production of research on pesticide effects on population dynamics of endemic bird species (see table 9 below).

On the Regional Level

On the regional level, STP has signed several regional agreements and treaties, namely:

- Conference on Dense and Humid Ecosystems of Central Africa, CEFDHAC
- African Wood Organization, OAB
- Central African Network of Protected Areas, RAPAC
- Central African Botanical Garden Network, CABGAN
- Central African Regional Program for the Environment, CARPE
- New Partnerships for African Development, NEPAD
- Partnerships for Forests of the Congo Basin, PFBC
- Central African Forest Committee, COMIFAC.

On the international level

The following is a list of the most relevant cooperation programs with international partners:

- ✓ The Project for Preparation of an Agricultural and Forestry Policy (APOFA-GTZ), financed by the German Government
- ✓ The joint UNDP/PENUMA program, regarding “Environmental Institutions and Legislation in Africa”, financed by these agencies alongside the PNADD – National Environmental Plan for Sustainable Development, funded by the UNDP – United Nations Development Program
- ✓ The ECOFAC project, Rational Preservation and Use of Central African Forest Ecosystems, financed by the European Union
- ✓ The PNAPAF program, National Program to Support and Promote Family Agriculture, funded by the FIDA and the Combat Poverty Project, funded by the UNDP.

Cooperation was fundamental to the increase of knowledge on national biodiversity.

Since 1994, several scientific missions have come to the country, namely:

- Research Mission on S. Tomé and Príncipe birds – which produced a guidebook. The book is of interest to tourists and others. It details birds in the islands and raises awareness with central government about the wealth of bird species in the country; this is especially relevant to the protection of gray parrots, critically endangered on the island of Príncipe.
- Research mission on land whelks of the species *Archachatina bicarinata*
- Research mission on the biology and habits of *Cercopithecus mona*
- Research mission on the possibilities of profitable butterfly-rearing on S. Tomé island. A manual on raising lepidoptera was produced.
- Research mission from the Free University of Brussels, concentrating mostly on flowers. Scientific missions were, for the most part, concerned with the country’s flora, the study of orchidaceae and endemic plants.

The main results of such research are:

Significant contribution to the knowledge on the islands' flora;

Several dissertations and reports;

- Several research papers published, and some about to be published;
- A guide on orchidaceae;
- One botanical garden in Bom Sucesso, host to a collection of more than 1500 orchid samples and a large number of plants in local flora.

- *The Drosophylla Mission* – a recent research mission undertaken by the Museum of California that was able to identify two new species of drosophylla on both islands. They are new to science and may be valuable in treating Alzheimer's.
- *Research mission to identify reptiles, batrachians and sweet-water fishes*
Lasting three months, undertaken by a team of experts from the Museum of California.
- *Forest Inventory Mission* – working with the Forestry Board, this mission produced a number of pertinent recommendations towards a national forest development plan.
 - *Cybertracking workshops* for monitoring forest ecosystems.
 - *Training for assessment of biodiversity indicators* in the context of protected area management.
 - *Training on study procedures on forest phytogenetic resources.*

CHAPTER IV – Conclusion and recommendations on the assessment of current biodiversity in STP

5.1 REGARDING FLORA

Given the data collected through various research activities, we came to the following conclusions:

- São Tomé and Príncipe features great specific, genetic and ecosystem diversity, which are still insufficiently known, and underestimated by many sectors (policy-makers, businesses, society), although there have been efforts to reverse the situation. To this end, many laws have been either published or proposed.

Forest ecosystems

Permanent forest areas are being devastated. Wood of high commercial value is growing scarce in the country. Soil erosion is a growing concern, given current rates of deforestation.

Agricultural land being privatized, and large tracts of land being handed over to small and medium-sized owners, farmers will use the trees on their newly-acquired land as an immediate financial resource to solve their problems, and fell trees indiscriminately. This not only diminishes, in a rather dramatic way, the number of forest species of high commercial value but also accelerates erosion of arable soil through exposure to atmospheric phenomena; destruction of habitats; deterioration of hydrographic basins; reduction of rainfall and deterioration of the standard of living among rural communities, thus compromising any prospects for development.

We recommend:

- The reform of policies on forests, in order to promote and create economic opportunities that might relieve the current pressure on forests;
- and programs for sustainable management of forests, so that subsistence based on non-wood forest products may ensure continued, sustainable use.
- Reinforcement of off-site preservation activities and the creation of an arboretum, as well as replanting in degraded areas;
- Creation of a seed bank dedicated to indigenous and endemic species;
- Promotion of adequate cultivation techniques and use of plants for medicinal ends;
- Monitored research and inventory of damage to forests;
- Information, education, awareness and training on non-wood forest products;
- Reforestation with rapid-growth species such as *Ceiba pentandra*, *Olea capensis*, *Prunus Africana*, *Rauvolfia macrophylla*; both for construction and energetic needs (coal production). This may, on the medium- and long-term, minimize pressure on the iroko tree (*Milicia excelsa*), the *Cedrela odorata* or the *Carapa procera*. Replanting these species is something farmers might easily do, as well as other community members, involving the young, and drawing support from private entities as well as the government.

Where coastal and marine ecosystems are concerned, vulnerability and frailty have reached alarming proportions, so that, to begin with, there must be regular, adequate patrolling on the Exclusive Economic Zone; also, exploitation of marine resources must be carefully monitored.

Agropastoral Ecosystems

These ecosystems are dedicated to agricultural and pecuary activities, which provide income to a sizeable portion of the country's citizens, and so is one of the bases for the fight against poverty.

These are the major concerns in relation to this specific ecosystem:

1. A tendency to introduce improved species (Chinese apples, guava trees, lemon trees, tomato plants, papaya trees, potatoes, carambolas, species from Gabon, and more) to the detriment of traditional culture, which brings about some genetic

impoverishment and the disappearance of traditional knowledge attached to earlier cultures.

2. A tendency to introduce alien species, if indirectly: *Leucaena leucocephala*, *Mimosa polydacthyla*, *Mimosa pudica*, *Desmanthus virgatus*, *Adenanthera pavonina* – all of them impact agricultural soil and forest areas. These plants increase the volume of nitrogen in the soil, but displace native species.

There are also populations of *Cinchona spp.*, introduced in the mid-1400s to help fight malaria. This species proliferates on agricultural and forest areas, at several altitudes.

Species like *Pistia stratiotes*, *Acanthus montanus*, or *Tithonia diversifolia*, can be a hindrance to other plants when they mature, and thus constitute a serious threat to biodiversity.

3. Felling and milling certain fruit trees, like the *Artocarpus heterophylla*, *Mangifera indica*, *Cola acuminata*, *Dacryodes edulis*, *Treulia Africana* or the *Monodora myristica*, in order to obtain second- and third-rate wood for construction, may represent a serious loss of genetic resources, biodiversity and a risk to sustainable development.

4. The implementation of conventional agriculture, employing chemically treated seeds, usually with Thirame or Malathion, which resist certain blights and diseases, may constitute a handicap if we are to implement a national, biological agriculture.

5. Several cattle-raising projects are based on importing new breeds to the detriment of local, rustic breeds.

One example of this problem might be the introduction of live birds into the country, possibly allowing avian flu in as well. This might jeopardize the role of aviculture in the country's food security plans.

6. Illegal trade in biological products. This informal activity is an environmental crime. In fact, animal species, like monkeys (*Cercopithecus mona*), parrots (*Psittacus erithacus*) and sometimes parakeets (*Agapornis pullarius*), alongside plant products like bark, medicinal roots, orchids and rhizomes of ornamental species are sold illegally and exported to Portugal and other European countries.

7. The market cannot absorb and/or transform agricultural surplus. During times of abundance fruit will go to waste. This occurs with the following species: *Averrhoa carambola*, *Mangifera indica*, *Artocarpus heterophyllus*, *Passiflora quadrangularis*, *Rubus rosifolius*, *Citrus spp.*, *Citrus aurantium*, *Psidium guajava*, *Eugenia brasiliensis*, *Spondias cytherea* and *Eugenia uniflora*.

We recommend:

- Undertaking an inventory of local species and breeds;
- Building national capacity for the transformation and industrial preservation of foodstuffs and fruits;
- Incentives to biological agriculture, in connection with new theories on food security and networking among farmers;
- Preservation of seed resources for present and future generations.

5.2 REGARDING FAUNA

It is our finding that, regarding fauna, on- and off-site preservation absolutely must be reinforced; likewise, the preservation and sustainable use of biological resources would benefit from a greater perceived value of biodiversity. {sentence fragment; meaningless - *the translator*} On all four ecosystems that have been the object of our research, interventions must take the form described below:

Regarding preservation of coastal and marine ecosystems

Human pressure has put pressure on coastal areas, making them more vulnerable and frail; this is immediately apparent.

Government and scientists are greatly concerned with the management of coastal and marine resources.

{sentence fragment; meaningless – *the translator*} Sound management of these resources will allow for the estimate of an optimum capture ratio per each species in order to determine {unfinished sentence – *the translator*}

Awareness campaigns on sea turtles, which came to an end in 1999, appeared to have worked, and to have sufficiently divulged the need to protect these creatures among the general population.

For all these reasons, we recommend:

- Reinforcement of on-site preservation activities comprising coastal zoning, sustainable management of coastal resources,
- Educational and awareness campaigns on best environmental practices targeted at the young,
- Reinforcement of off-site preservation activities, including the creation of a National Marine Park, differentiated studies on halieutic resources, both coastal and marine, sustainable management of the exclusive economic zone and protection of sea turtles.
- Undertaking environmental impact assessment (*sine qua non*) before committing to economic projects, such as oil drilling or the establishment of free trade zones
- Creation of a Coast Preservation Committee
- Research would permit determination of the balance between growth of fish stock, anthropic pressure and natural predatory action, so as to optimize income without disrupting natural balance.

Regarding inland water ecosystems

Some economic activities have endangered aquatic ecosystems, encroaching upon biologic resources and putting pressure on endemic species. We also find that information and research on inland water biological resource is greatly lacking, which hinders any sustainable management policies we might think of.

We recommend:

- Reinforcement of actions leading to on-site preservation, including the preservation of biodiversity in inland water ecosystems (these actions will forcibly entail, among other activities, research on fauna, as well as drafting a management plan for marshlands), and;
- Reinforcement of intersectoral institutional frameworks where preservation and sustainable management of inland water ecosystems are concerned.

Regarding the Forest Ecosystem

Abusive human intervention has rendered this ecosystem more vulnerable and frail; habitats have been destroyed and animals are hunted year-round, in contempt of legal norms.

The absence of reliable data on the distribution and population counts for several animal species, as well as strong anthropic pressure, has so far been in the way of better sustainable management policies.

We recommend:

- Reinforcement of on-site preservation activities;
- Awareness campaigns targeted at communities on the outskirts of protected areas; monitoring actions to preserve and protect protected areas;
- The establishment of clear and coherent policies, and well as funding specifically allocated to maintenance of protected areas;
- Protection and preservation of the breeding habitats used by endemic species.

Regarding the Agropastoral Ecosystem

We recommend:

- Reinforcement of action conducive to on-site preservation of animal and plant species, including the establishment of a national collection of species, bearing in mind their preservation and sustainable use, as well as the controlled preservation of species in their natural habitat;
- Taking inventory of species near extinction;
- Information, Education and Communication targeted at technicians and farmers;
- The creation of a Center for Research and Development in the Pecuary Sector, dedicated to the preservation of biodiversity and sustainable management of biological resources;
- Reinforcement of actions conducive to off-site preservation of plant and animal species belonging to this ecosystem, including the enrichment of germoplasm fields through contribution of foreign genes and those from other local varieties.

Concerning the perceived value of plant biodiversity, we recommend:

- Implementing actions against erosion, and the establishment of food crops in appropriate areas;
- Fostering biological production of cocoa and other agricultural export products, and promoting food crops in order to ensure food security;
- Developing the potential of ornamental plants and animals, including market research, and
- Creating research centers to study biological countermeasures against blights and diseases.

Regarding the perceived value of animal diversity, we recommend:

- Foster the raising of more common animal species (swine, oxen, sheep, goats, birds, rabbits), increase the number of sheep, reinforce control of animals to be slaughtered and create processing units.

5.3 FINAL CONCLUSION

In order to create a future different to the current panorama our ecosystems have to offer and to open new vistas to sustainable development, any and all programs for the preservation of biodiversity must be founded on these priorities:

- Adoption, by the government, of the Strategic Plan of Action on Biodiversity;
- Preparation of the Management Plan for the Obô National Parks on São Tomé and Príncipe islands;
- Reinforcement of human and institutional capacity, especially the promotion of positive gender roles in preservation and rational use of natural resources;
- Reinforcement of environmental monitoring to detect violations and threats;
- Getting local communities involved, especially local government, in management and preservation policies;
- Increasing the perceived value of folk wisdom and traditional practices regarding use of natural resources (water, soil, fauna, flora, etc.);
- Creation of a Center for the Study of Biodiversity, drawing contributions from biologists, ecologists, economists, zoologists, entomologists, geneticists, foresters, sociologists, veterinarians, both national and foreign;
- Promoting economic development, based on the execution of sustainable activities vis-à-vis contemporary challenges (globalization, climate changes, illegal commerce, and so on); promoting fairness and justice so that all the country's resources may serve the combat against poverty;
- Creating long-lasting, dynamic funding mechanisms to implement preservation and protection programs.
- Creation of an Information Center on Biodiversity -
To disseminate information on biodiversity, devastated or deteriorated areas, number of trees felled, changes in flora or fauna, monitoring of water, soil, emission quality, and more.

The center will provide information on possible environmental impact.

- Investigating conservation possibilities and reexamining the use of genetic varieties, whether of species already cultivated, or of autochthonous species and varieties that have been abandoned, and/or species for prospective introduction into food production and industrial use.
- Create a website.

The website will feature a databank on biodiversity so as to make information available to the public domain.

- Naming a Clearing House Mechanism focal point for Bio-security.
The focal point will liaise among Biodiversity conventions, the Cartagena Protocol and national/regional institutions on matters of biological preservation and security measures within the scope of the Millennium Goals.

On the international level

- To proceed with adherence to, and ratification of, multilateral conventions and agreements on the environment, and turning commitments to concrete action via dynamic resource mobilization;
- Implementation of the COMIFAC convergence plan;
- Implementation of the sub-regional action plan against land degradation and desertification.

VI. Bibliography

1. NOVA, A. V.; (2002). ENPAB-Agricultura; Monografia sobre os Ecossistemas Agrícolas, produzida por, no quadro do Projecto de Elaboração da Estratégia Nacional e Plano de Acção da Biodiversidade em S.Tomé e Príncipe.
2. BONFIM, V. M. S.; (2002). ENPAB- Águas Interiores; Monografia sobre a os Ecossistemas das Águas Interiores, produzida por, no quadro do Projecto de Elaboração da Estratégia Nacional e Plano de Acção da Biodiversidade em S.Tomé e Príncipe.
3. OLIVEIRA, F. C N; (2002). ENPAB-Florestas; Monografia sobre os Ecossistemas Florestais produzida por, no quadro do Projecto de Elaboração da Estratégia Nacional e Plano de Acção da Biodiversidade Relatório em S.Tomé e Príncipe.
4. BANDEIRA, J. A. V. C.; (2002). ENPAB-Jurídico Institucional; Monografia sobre a Legislação e Instituições, produzida por, no quadro do Projecto de Elaboração da Estratégia Nacional e Plano de Acção da Biodiversidade em S.Tomé e Príncipe
5. TEIXEIRA, M. C. N. D'ALVA; (2002). ENPAB- Marinho e Costeiro; Monografia sobre a os Ecossistemas Marinhos e Costeiros, produzida por, no quadro do Projecto de Elaboração da Estratégia Nacional e Plano de Acção da Biodiversidade em S.Tomé e Príncipe.
6. BONFIM, F. L. B.; (2002). ENPAB-Pecuária. Monografia sobre a Pecuária, produzida por no quadro do Projecto de Elaboração da Estratégia Nacional e Plano de Acção da Biodiversidade em S.Tomé e Príncipe.
7. SABINO, P. C.; (2002). ENPAB-Silvicultura. Monografia sobre a Silvicultura, produzida por, no quadro do quadro do Projecto de Elaboração da Estratégia Nacional e Plano de Acção da Biodiversidade em S.Tomé e Príncipe.
8. Ogonovszky, M. (2003). Endémisme et phytogéographie des plantes de São Tomé et Príncipe. Travail de fin d'études présenté en vue de l'obtention du grade de Bio-Ingénieur en Agronomie Tropicale, Ecole Interfacultaire de Bio ingénieurs, Université Libre (ULB) de Bruxelles
9. World Bank 1993. Democratic Republic of São Tomé and Príncipe. Country Economic Memorandum and Key Elements
10. Environmental Strategy. Volume II. Report No. 10383-STP. Western Africa Department. The World Bank, Washington, DC.
11. ECOFAC, Novembro 1995. Os recursos de coral em S. Tomé, um plano de acção
12. EXCELL, A.W. (1944). Catalogue of vascular plants of S. Tomé (with Principe and Annobon). British Museum (Natural History), London. Xi + 426 pp.
13. EXCELL, A.W. (1956). Supplement to the catalogue of vascular plants of S. Tomé (with Principe and Annobon). British Museum (Natural History), London. 58 pp.
14. FAO, 1988. National Parks planning: a manual with annotated exemples. FAO Conservation Guide 17. Rome, 105 pp.

15. INTERFOREST AB, draft 1990. Study of supply and demand for primary forest products
16. INTERFOREST AB, (1990 a). Republica Democrática de São Tomé e Príncipe- Estudo do suprimento e demanda de produtos florestais primários. São Tomé. 42 pp. e 9 ap.
17. INTERFOREST, (1990 a). Republica Democrática de São Tomé e Príncipe – Resultados do Inventario Florestal Nacional São Tomé. 19 p + 4 Ap.
18. JOFFROY G. (1999/2000). Etude des Plantes endémiques de Sao Tomé et Príncipe. (Travail de fin étude)
19. JONES, P. J. BURLISON, J. P. Et TYE A., 1991. Conservação dos ecossistemas florestais na Republica Democrática de São Tomé e Príncipe. UICN – CEE, Gland. 78 pp.
20. JONES, P. J. BURLISON, J. P. Et TYE A., (1991). Conservação dos ecossistemas florestais na Republica Democrática de São Tomé e Príncipe. UICN – CEE, Gland. 78 pp.
21. JUSTE, B. J. (mars 1994). Etude de support à l'aménagement et la gestion de la zone écologique, Projet ECOFAC. AGRECO-CTFT Unpubl. Gland. 67 pp.
22. JUSTE, B. J., (octobre 1994). Etudes d'appui à l'aménagement et à la gestion des zones écologiques de Sao Tomé et Principe, 2 éme Délimitation de la zone écologique de Principe et correction des limites de Sao Tomé, Project AGRECO-CTFT
23. LAINS e SILVA, H. (1958 b). Esboço da carta de aptidão agrícola de São Tomé e Príncipe. Garcia de Orta 6: 61-86.
24. LAINS e SILVA, H. 1959. Nomes vulgares de algumas plantas de São Tomé e Príncipe (com notas sobre a origem dos nomes e a utilidade das plantas).
25. LEBLANC, P. (1994). Etude touristique écologique: programme de développement du tourisme écologique.
26. LEJOLY J. (1995). Suivi des programmes d'étude de la biodiversité végétale dans la zona ecológica de São Tomé, Groupement AGRECO-CTFT
27. LEJOLY J. e OLIVEIRA F. (1998). Inventário de colheitas botânicas efectuadas em Sao Tomé e Príncipe no quadro do Programa ECOFAC
28. LEJOLY J. JOFFROY G. STEVART T. (2000). Synthèse des inventaires de Botanique Floristique effectués dans le cadre du Programme Ecofac à Sao Tome et Principe, Groupement AGRECO. G.E.I.E.- SCETAGRI - SECA - CIRAD Forêt en association avec Faune et Flora International.
29. CARVALHO, S. e VAZ, H. Estudo de Vulnerabilidade e Adaptação às mudanças Climáticas – Sector de Florestas e Solos, Projecto de Comunicação Nacional STP 01 /G31, Junho de 2003.
30. CARVALHO, S. VAZ, H. e OLIVEIRA, F. (Junho de 2003), Etude sur la Situation des Ressources Génétiques Forestières de la République Démocratique de São Tomé et Príncipe. Document de travail FGR/63F FAO, Rome, Italie

31. LIBERATO, M. C. And ESPIRITO SANTO, J. (1972-1982). Flora de São Tomé e Príncipe. Jardim e Museu Agrícola do Ultramar, Lisboa
32. LOPES ROSEIRA, L. (1984). Plantas úteis da flora de São Tomé e Príncipe - medicinais e industriais. 100 pp.
33. MATOS, G. C. (mai 1994). Mission d'expertise " Biodiversité floristique et écologie" , rapport préliminaire, Groupement AGRECO-CTFT-STP ECOFAC
34. MENDES FERRAO, J.E. 1979). Flora de São Tomé e Príncipe "Ácidos gordos e proteínas de algumas sementes". Archives historiques de STP
35. MESA PNUD Capacidade 21. Plano distrital do ambiente para o desenvolvimento durável. PDADD, versão preliminar (11/1998).
36. PNUD, 1994. Global conference on the sustainable development of small island developing states. Final declaration. Unpl. Report, 48 pp.
37. PNUD et al., 51994). Elementos de reflexão para o desenvolvimento sustentado de São Tomé e Príncipe
38. STEVART T. (1998). Etude sur les orchidées de São Tome et Principe: (Travail de fin d'étude, ULB)
39. STEVART T e OLIVEIRA F. (2000). Guia das Orquídeas de São Tomé e Príncipe
40. TOELEN, P. (1995) Inventaire, biodiversité, structure des peuplements et biomasse ligneuse dans Iles forets d'altitude de São Tomé (travail de fin d'étude, ULB).
41. VAN ESSCHE, K. (1995) Mise en place de transects en vue des inventaires de biodiversité dans la zone écologique de Sao Tomé (missions 29/03 – 04/05 et 12/07 17/08 1994).

VII- ANNEXES – figures and tables

Figure 8 - Isohyets of S. Tomé island

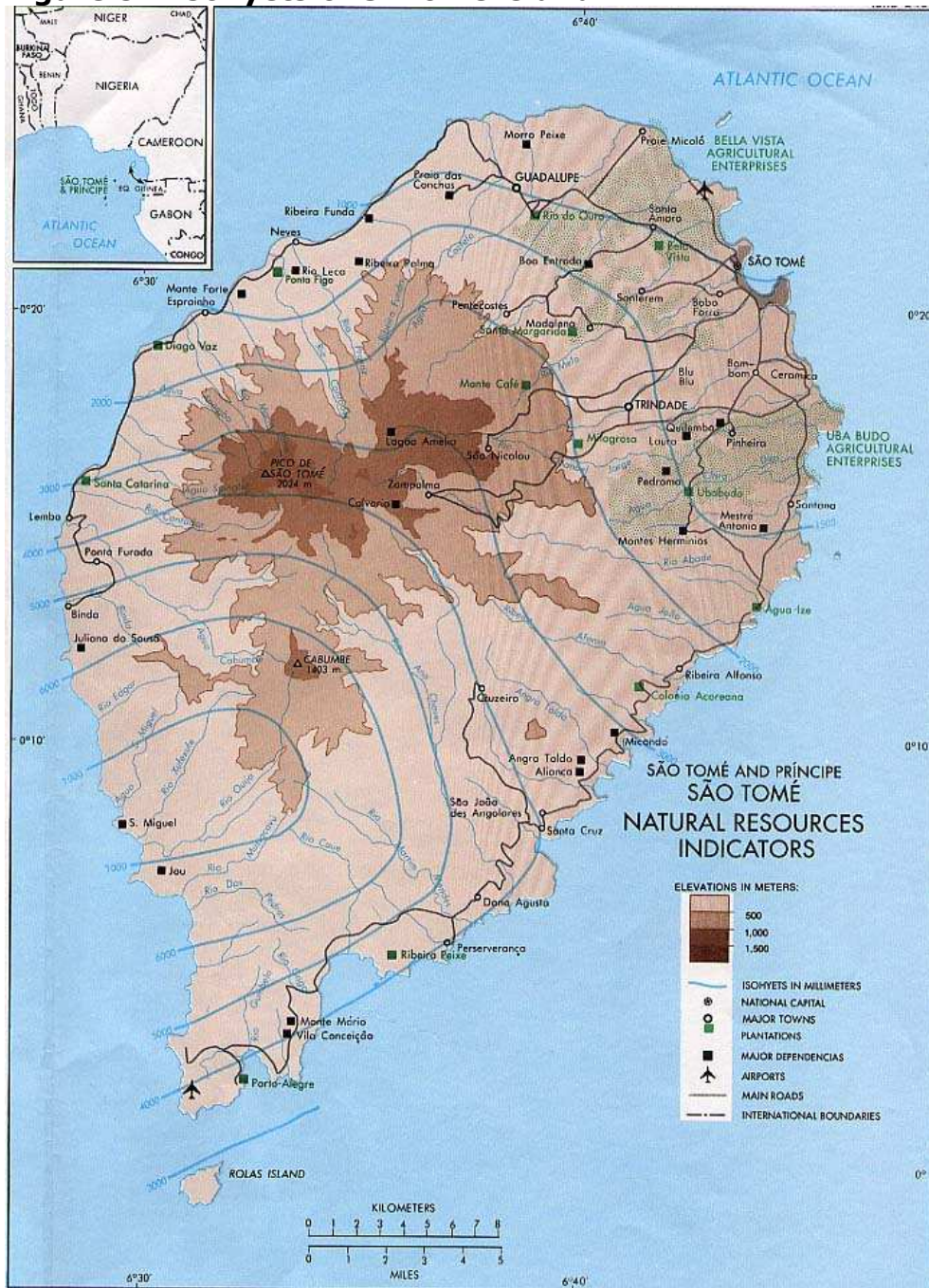


Figure 9 - Isohyets of the Autonomous Region of Príncipe

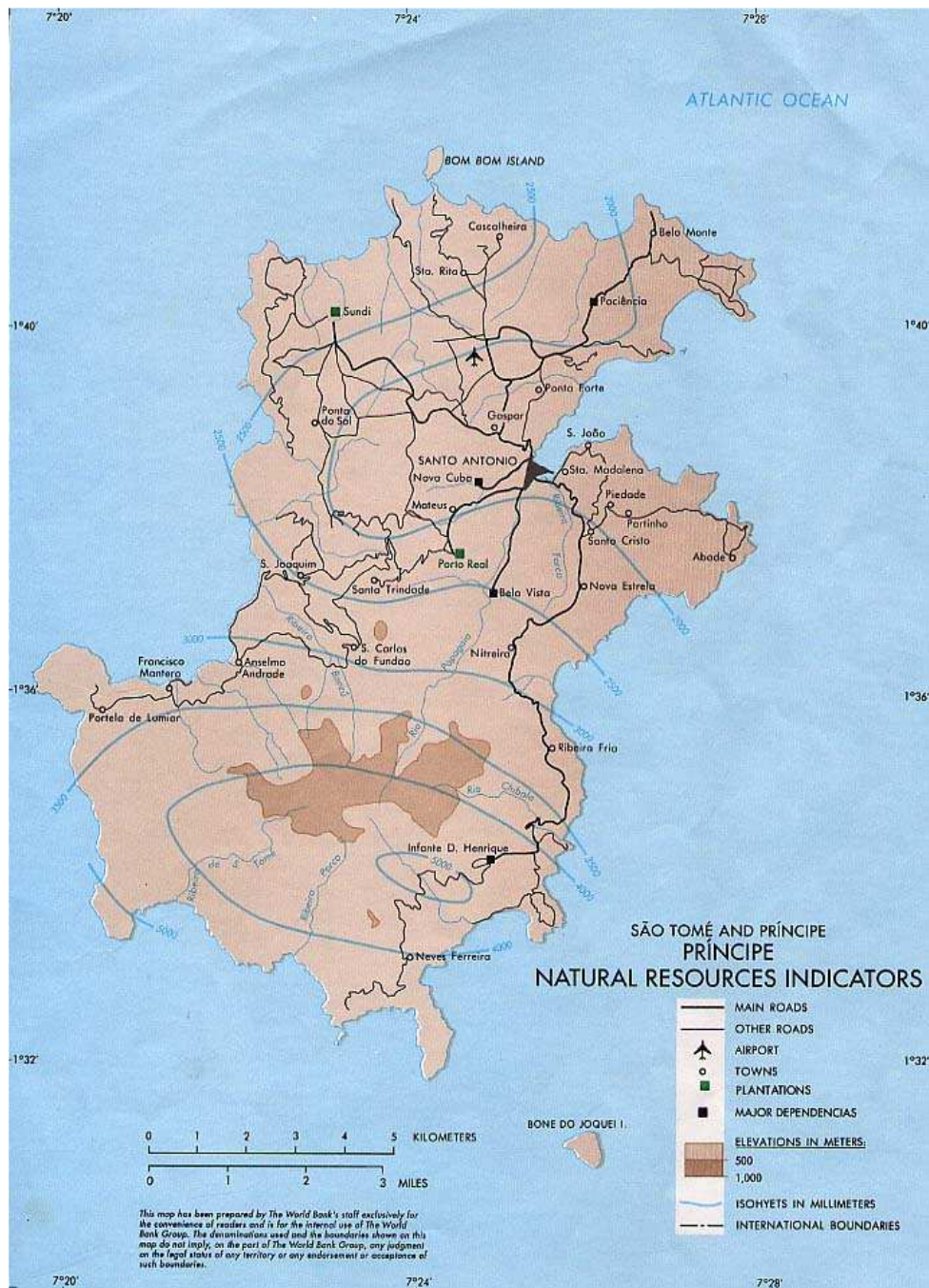
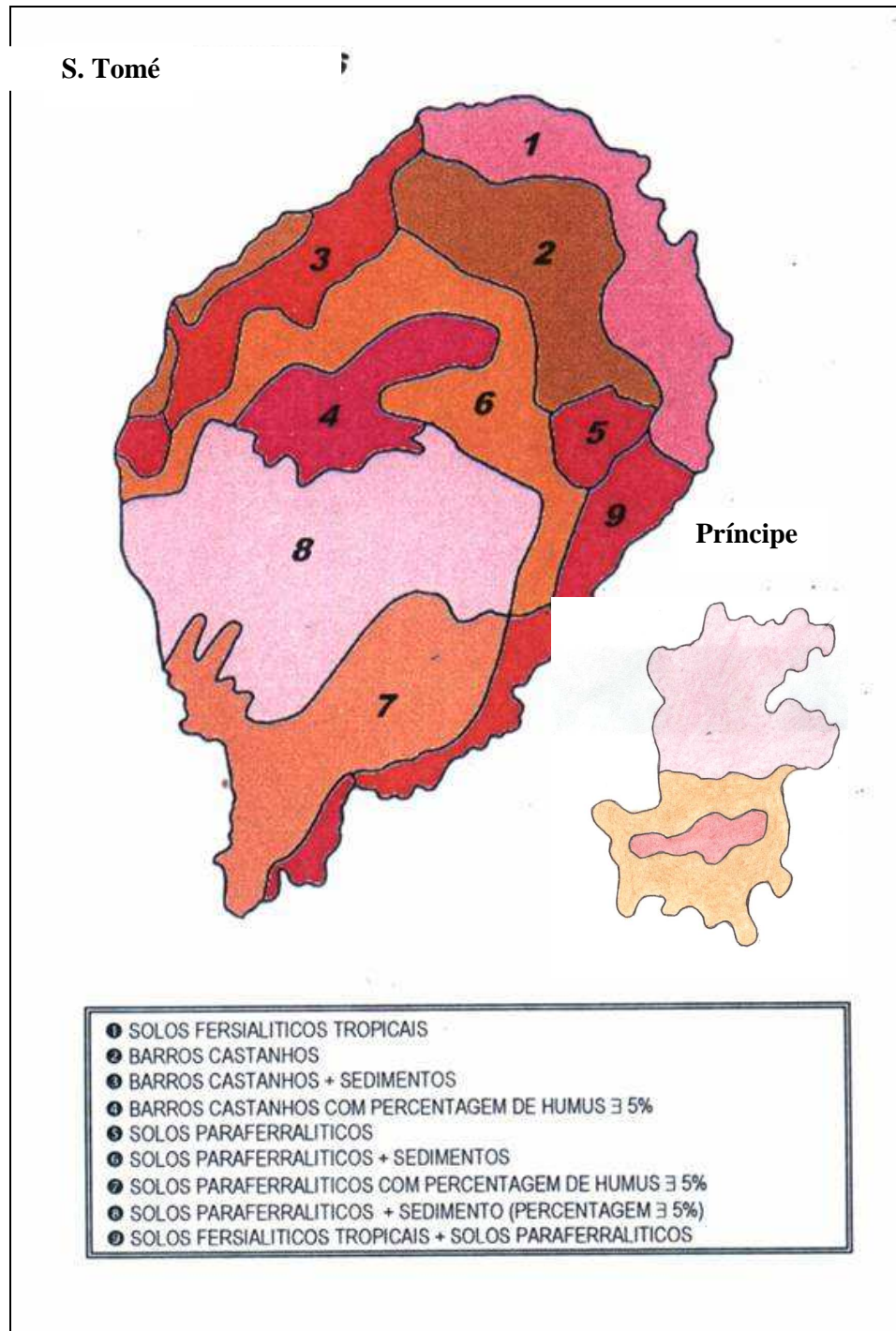


Figure 10: Soil chart for S.Tomé and Príncipe



Source: Proposed Management Plan for Obô National Park, S.Tomé and Príncipe (1999).

Figure 11:
Soil occupation on S. Tomé – Location of main forest ecosystems

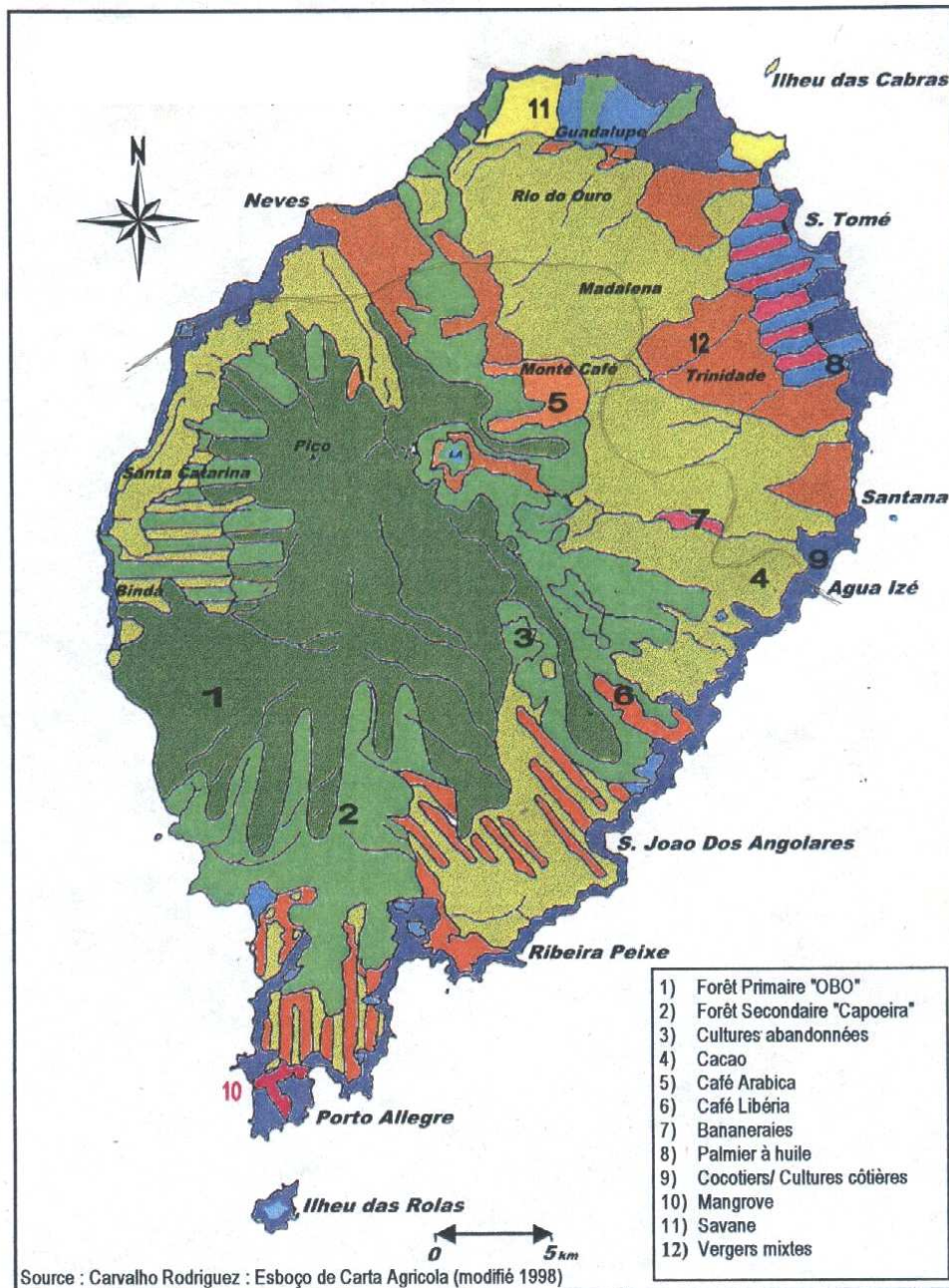


Table 1 - Inventory of plants endemic to S. Tomé and Príncipe (excluding orchidaceae):

Classified in alphabetical order, per family name

OR: Ex= Exell (1973), ES=Espírito Santo, Fi= Figueiredo, IF= Inst. Floret, Li= Liberato (1973),

SI= Silva, Wh=White, D: geographical distribution. E= endemic to the Gulf of Guinea, S= São Tomé, P= Príncipe, A= Anobom, B= Bioco

Family	Latin name	Local name	OR	D	Comments
Acanthaceae	<i>Brachystephanus occidentalis</i>		Ex	ES	White flowers
Acanthaceae	<i>Heteradelphia paulowilhelmia</i>			ES	Shrub, violet flowers
Acanthaceae	<i>Justicia thomensis</i>		Ex	ES	
Anisophylleaceae	<i>Anisophyllea cabole</i>	Pau caboré, cabolé	Es,	ES	shrub, 3m.
Apocynaceae	<i>Tabernaemontana sp. aff.</i>		Ex	EP	
Apocynaceae	<i>Tabernaemontana</i>	Cata d'obô	Ex	ES	Tall tree 15m; white latex
Araliaceae	<i>Polycias quintasii</i>	Guêguê fasso, Vela	Ex	ESP	tree
Asclepiadaceae	<i>Marsdenia exellii</i>		Ex	ES	
Balsaminaceae	<i>Impatiens buccinalis</i>	Shrimp	Ex	ES	
Balsaminaceae	<i>Impatiens manteroana</i>		Ex	EP	
Balsaminaceae	<i>Impatiens thomensis</i>		Ex	ES	
Begoniaceae	<i>Begonia baccata</i>	Fia boba vermelha	Ex	ES	Tall plant 1,5 m; wooden caul; white flowers
Begoniaceae	<i>Begonia crateris</i>	Fia boba d'obo	Ex	ES	
Begoniaceae	<i>Begonia fusialata var.</i>			EP	
Begoniaceae	<i>Begonia loranthoides subsp.</i>			ESP	
Begoniaceae	<i>Begonia molleri</i>		Ex	ES	
Boraginaceae	<i>Ehretia scrobiculata</i>		Ex	EP	
Celastraceae	<i>Maytenus monodii Exell</i>		Ex	ES	
Commelinaceae	<i>Palisota pedicellata</i>		Ex	ESPA	Tall grass 2m; white flowers
Cyatheaceae	<i>Cyathea welwitschii</i>				Tree fern
Cyperaceae	<i>Carex leptocladus</i>		Ex	ES	Herbaceous species
Cyperaceae	<i>Cyperus sylvicola</i>		Ex	ES	Herbaceous species
Cyperaceae	<i>Hypolytrum grande</i>		Ex	EP	Herbaceous species
Cyperaceae	<i>Mapania ferruginea</i>		EX,	ESP	grass 50cm height
Dichapetalaceae	<i>Dichapetalum bocageanum</i>	Melambo	Ex	ES	
Ericaceae	<i>Erica thomensis</i>	Urze	Ex	ES	underbrush; 1m
Euphorbiaceae	<i>Croton stellulifer</i>	Cubango, Cobango	EX,	ESP	tree 30m; little branching; elliptic leaves
Euphorbiaceae	<i>Discoclaoxylon occidentale</i>	Quina no. 2	Ex, Fi	ESP	tree
Euphorbiaceae	<i>Drypetes glabra</i>	Mamon d'obô	Ex, Fi	ES	tree
Euphorbiaceae	<i>Drypetes henriquensii</i>	No-no, Mamon	Ex, Fi	ES	tree
Euphorbiaceae	<i>Erythrococca columnares</i>		Ex	EP	tree
Euphorbiaceae	<i>Erythrococca molleri</i>	Coedano no. 2	Ex, Fi	ES	Tall shrub 20m; red-orange fruit when mature
Euphorbiaceae	<i>Grossera elongata</i>		Ex	EP	

Euphorbiaceae	<i>Maesobotrya glabrata</i>		Ex	EP	Shrub or small tree, reddish fruit when mature
Euphorbiaceae	<i>Phyllathus physocarpus</i>		Ex	EP	tree
Euphorbiaceae	<i>Thecacoris manniana</i>	Pau figado	Ex	ES	Small tree
Euphorbiaceae	<i>Thecacoris membranacea</i>		Ex	ES	tree, S1-24
Flacourtiaceae	<i>Casearia mannii</i>			ESP	
Flacourtiaceae	<i>Homalium henriquesii</i>	Quebra machado	Ex, Fi	ES	Tall tree 10m; greenish flower
Hemandiaceae	<i>Hemandia beninensis</i>	Bungá, pau candeia	Ex, Fi	ESB	tree
Leeaceae	<i>Leea tinctoria</i>	Celé-alé, Celé-celé	Ex, Fi	ES	shrub 2-3 m, orange fruits
Lobeliaceae	<i>Lobelia barnsii</i>		Ex	ES	Tall grass 2 m; violet flowers in clusters
Melastomataceae	<i>Calvoa confertifolia</i>			ES	
Melastomataceae	<i>Calvoa crassinoda</i>			ES	
Melastomataceae	<i>Calvoa grandifolia</i>		Ex	ESP	Tall grass 1 m; rosey leaves
Melastomataceae	<i>Calvoa integrifolia</i>			ES	
Melastomataceae	<i>Calvoa sinuata</i>			EP	
Melastomataceae	<i>Tristemma litorale</i> Benth.			ES	
Melastomataceae	<i>Tristemma mauritianum</i> var.			ES	
Melastomataceae	<i>Tristemma mauritianum</i> var.			ES	
Meliaceae	<i>Trichilia grandifolia</i>	Cola de macaco	Ex	ES	vine, composite leaves, brownish fruits 4cm across
Moraceae	<i>Ficus chlamydocarpa</i> subsp.	Figo obato	Ex, Fi	ES	Strangling fig, fruit 4 cm across
Miristicaceae	<i>Staudtia pterocarpa</i>	Pau vermelho	ES, Fi	ES	tree 10-15m tall, whole leaves
Ochnaceae	<i>Campylospermum vogelii</i>	Pau dumo	Ex	ESP	Shrub, yellow flowers
Ochnaceae	<i>Ouratea nutans</i>		Ex	EP	
Ochnaceae	<i>Rhabdophyllum amoldianum</i>		Ex	ES	tree
Oleaceae	<i>Jasminum thomense</i>		Ex	ES	vine
Pandanaceae	<i>Pandanus thomensis</i>	Pau esteira	Ex	ES	tree, long segmented leaves
Piperaceae	<i>Peperomia thomeana</i>		Ex	ES	grass
Podocarpaceae	<i>Podocarpus mannii</i>	Pinheiro de S. Tomé	Ex	ES	tree 30m; green male flowers
Rhamnaceae	<i>Lasiodiscus rozeirae</i>		Ex	ES	
Rhizophoraceae	<i>Cassipourea glomerata</i>		Ex	ES	tree
Rubiaceae	<i>Aidia quintasii</i>	Muindo	Ex	ES	tree
Rubiaceae	<i>Aidia wattii</i>	Inhé muela	Ex	ES	
Rubiaceae	<i>Aulacocalyx pallens</i> subsp	Teia-teia pequena	Ex	ES	tree, white flowers
Rubiaceae	<i>Belonophora coffeoides</i>		Ex	ES	
Rubiaceae	<i>Bertiera pedicellata</i>		Ex	ESP	shrub 30 m; terminal, white flowers
Rubiaceae	<i>Craterispermum montanum</i>	Macambará	Ex, Fi	ESPA	tree 6m, greenish-white flowers underbrush, white flowers. Culled on Príncipe at 550 m altitude
Rubiaceae	<i>Ecpoma cauliflorum</i>		Ex	ES	
Rubiaceae	<i>Lasianthus africanus</i>		Ex	ESP	tree, coriaceous leaves, purple flowers

Rubiaceae	<i>Mussaenda tenuiflora</i> var.		Ex	EP	Yellow-flower vine
Rubiaceae	<i>Mussaenda tenuiflora</i> var.		Ex	ES	White-flower vine
Rubiaceae	<i>Pauridiantha composii</i>		Ex	ES	tree
Rubiaceae	<i>Pauridiantha insularis</i>		Ex	ES	tree
Rubiaceae	<i>Pavetta monticola</i>		Si, Ex	ESA	shrub 3 m, white flowers
Rubiaceae	<i>Psychotria guerkeana</i>		Ex	ES	Small tree
Rubiaceae	<i>Psychotria molleri</i>	Pau duno	Ex	ES	shrub
Rubiaceae	<i>Psychotria nubicola</i>		Ex	ES	shrub
Rubiaceae	<i>Psychotria principensis</i>	Café silvestre	Ex	EP	Small tree
Rubiaceae	<i>Psychotria thomensis</i>		Ex	ES	shrub
Rubiaceae	<i>Sabicea exellii</i>		EX	ES	5m vine; white flowers; flowers on stem, or at limb joints
Rubiaceae	<i>Sabicea ingrata</i>		Ex	ES	vine
Rubiaceae	<i>Sabicea ingrata</i> var. <i>insularis</i>		Ex	ESA	vine
Rubiaceae	<i>Sabicea thomensis</i> sp. nov.			ES	vine
Rubiaceae	<i>Tarenna nitiduloides</i>		Ex, Fi	ES	shrub shrub 6m. flower and fruit at base of trunk; creamy-white
Sapindaceae	<i>Chytranthus mannii</i>	Pessegueiro	Ex	ESP	flower
Sapotaceae	<i>Chrysophyllum calophyllum</i>		Ex	EP	tree
Sapotaceae	<i>Chrysophyllum henriquensii</i>		Ex	EP	tree
Sapotaceae	<i>Vincentella densiflora</i>		Ex	ES	tree
Scrophulariaceae	<i>Thunbergianthus quintasii</i>	Musa fria	Ex, Fi	ES	vine, rosey flowers
Theaceae	<i>Balthasaria mannii</i>		Ex	ES	
Thymelaeaceae	<i>Dicranolepis thomensis</i>		Ex	ES	Shrub or small tree; white then yellow flower
Thymelaeaceae	<i>Peddiea thomensis</i>	Tchapo d'obô	Ex	ES	shrub 5m. brownish-red flowers
Ulmaceae	<i>Celtis pratii</i>	Quaco branco	Ex	ESPA	tree
Urticaceae	<i>Elastostema thomense</i>		Ex, Fi	ES	Short grass, white flowers in clusters underbrush, small white flowers
Violaceae	<i>Pilea manniana</i>		Ex	ES	
Violaceae	<i>Rinorea chevalieri</i>		Ex, Fi	ES	shrub 1,5m. Frequent.
Violaceae	<i>Rinorea insularis</i>		Ex	EP	
Violaceae	<i>Rinorea thomensis</i>	Tesse	Ex, Fi	ES	
Vitaceae	<i>Cissus curvipoda</i>		Ex	ES	
Zingiberaceae	<i>Renealmia grandifolia</i>		Ex	ES	Rhizomatic grass

Source: ECOFAC inventory data, adapted.

Table 2: Inventory of endemic pteridophytes on São Tomé and Príncipe; classification of families in alphabetical order

Family	Scientific Name	S	P	D
Aspidiaceae	<i>Trioplophyllum principis</i>	0	1	E
Aspidiaceae	<i>Trioplophyllum fraternum</i> var. <i>elongatum</i>	0	1	E
Aspleniaceae	<i>Asplenium eurysorum</i>	1	1	E
Aspleniaceae	<i>Asplenium exhaustum</i>	1	0	E
Aspleniaceae	<i>Asplenium megalura</i> var. <i>molleri</i>	1	0	E
Cyatheaceae	<i>Cyathea camerooniana</i> var. <i>currori</i>	0	1	E
Cyatheaceae	<i>Cyathea welwitschii</i>	1	0	E
Grammitaceae	<i>Grammitis molleri</i>	1	0	E
Grammitaceae	<i>Grammitis thomensis</i>	1	0	E
Selaginellaceae	<i>Selaginella mannii</i>	1	1	E
Selaginellaceae	<i>Selaginella monodii</i>	0	1	E
Thelypteridaceae	<i>Pseudophegopteris henriquensii</i>	1	0	E
Thelypteridaceae	<i>Sphaerostephanos elatus</i>	1	0	E

Source: Figueiredo Estrela, 2002 – *Pteridófitos de São Tomé e Príncipe*.

Table 3: Inventory of major industrial species on São Tomé and Príncipe: Classification of families in alphabetical order

Family	Scientific Name	local name	Distribution
Anacardiaceae	<i>Pseudopondias microcarpa</i>	Zenzém	Secondary forest
Anisophylleaceae	<i>Anisophyllea cabole</i>	Pau cabore, cabolé	Dense forest
Arecaceae	<i>Elaeis guineensis</i>	Palmeira	Secondary forest
Boraginaceae	<i>Cordia platythyrsa</i>	Tabaque	Secondary forest
Caesalpiniaceae	<i>Albizia lebbek</i>	Acacia	Secondary forest
Caesalpiniaceae	<i>Albizia molucana</i>	Acácia	Secondary forest
Clusiaceae	<i>Symphonia globulifera</i>	Oleo barão, pau amarelo	Altitude forest
Euphorbiaceae	<i>Bridelia stenocarpa</i>	Muindo	Secondary forest
Euphorbiaceae	<i>Cleistanthus sp.</i>	Viro	Secondary forest
Euphorbiaceae	<i>Hevea brasiliensis</i>	Borracha	Secondary forest
Euphorbiaceae	<i>Margaritaria discoidea</i>	Pau-ferro	Secondary forest
Euphorbiaceae	<i>Phyllanthus discoideus</i>	Pau-ferro	Secondary forest
Euphorbiaceae	<i>Sapium ellipticum</i>	Pau-maria	Altitude forest
Euphorbiaceae	<i>Scytopealum kamerunianum</i>	Vilo branco, Viro-branco	Altitude forest
Euphorbiaceae	<i>Tetrorchidium didymostemon</i>	Pau mole, Branco, Pó	Secondary forest
Euphorbiaceae	<i>Uapaca guineensis</i>	Nespla d'obô, mangue	Altitude forest
Fabaceae	<i>Erythrina sp.</i>	Eritrina	Shade forest
Flacourtiaceae	<i>Homalium henriquensis</i>	Quebra machado	Altitude forest
Hypericaceae	<i>Harungana madagascariensis</i>	Pau sangue	Secondary forest
Lauraceae	<i>Cinnamomum burmanni</i>	Canela brava	Secondary forest
Meliaceae	<i>Carapa procera</i>	Gôgô	Shade forest
Meliaceae	<i>Cedrela odorata</i>	Cedrela	Shade forest
Meliaceae	<i>Trichilia grandifolia</i>	Cacau do mato, Cola-de-	Altitude forest
Mimosaceae	<i>Pentaclethra macrophylla</i>	Muandim, Sicupira, Uba	Agrarian-related forest
Mimosaceae	<i>Pentaclethra macrophylla</i>	Muandi	Shade forest
Moraceae	<i>Artocarpus altilis</i>	Fruteira	Agrarian-related forest
Moraceae	<i>Artocarpus heterophyllus</i>	Jaqueira	Agrarian-related forest
Moraceae	<i>Artocarpus heterophyllus</i>	Jaqueira	Agrarian-related forest
Moraceae	<i>Clorophora excelsa</i>	Amoreira	Shade forest
Moraceae	<i>Ficus mucoso</i>	Figo ploco, Figo porco	Secondary forest
Moraceae	<i>Milicia excelsa</i>	Amoreira, molela	Agrarian-related forest
Myristicaceae	<i>Pycnanthus angolensis</i>	Pau caixão	Secondary forest
Myristicaceae	<i>Staudtia pterocarpa</i>	Pau vermelho	Altitude forest
Myrsinaceae	<i>Pycnanthus angolensis</i>	Pau Caixão	Secondary forest
Myrtaceae	<i>Psidium guyava</i>	Goiabeira	Secondary forest
Myrtaceae	<i>Syzygium quineense</i>	Matchanzochi	Altitude forest
Podocarpaceae	<i>Podocarpus mannii</i>	Pinheiro da terra	Altitude forest
Rubiaceae	<i>Canthium glabiflorum</i>	Nono	Altitude forest
Rubiaceae	<i>Hymenodicton biafranum</i>	Pau claudina	Altitude forest
Rubiaceae	<i>Pauridianha floribunda</i>	Nicolau	Altitude forest
Rutaceae	<i>Fagara macrophylla</i>	Marapião	Shade forest
Sapotaceae	<i>Gambeya africana</i>	Zamumo	Altitude forest
Sapotaceae	<i>Gambeya albida</i>	Untueiro	Secondary forest
Sapotaceae	<i>Mammea africana</i>	Magloso, Oba, Pau	Secondary forest
Sapotaceae	<i>Manikara multinervis</i>	Azeitona	Secondary forest
Sterculiaceae	<i>Theobroma cacao</i>	Cacaueiro	Secondary forest
Ulmaceae	<i>Celtis mildbreadii</i>	Pó capiton	Secondary forest
Ulmaceae	<i>Celtis prantlii</i>	Quaco branco	Secondary forest
Ulmaceae	<i>Tremna orientalis</i>	Pau cabra	Altitude forest

Source: ECOFAC inventory data, adapted.

Table 4: Inventory of main alimentary species of Santomean flora: Classification by {Portuguese} alphabetical order of vernacular names.

VERNACULAR NAME	SCIENTIFIC NAME
Avocado	<i>Persea americana</i>
Pineapple	<i>Ananas comosus</i>
Banana	<i>Musa sp.</i>
Ambarella	<i>Spondias cytherea</i>
Cashew	<i>Anacardium occidentale</i>
Cinnamon	<i>Cinnamomum zeilanicum</i>
Carambola	<i>Averrhoa carambola</i>
Onion	<i>Allium cepa</i>
Coconut	<i>Cocos nucifera</i>
Cabbage	<i>Brassica oleracea</i>
Bean	<i>Vicia sp.</i>
Breadfruit	<i>Artocarpus altilis</i>
Guava	<i>Psidium guyava</i>
Grumichama	<i>Eugenia brasiliensis</i>
Yam	<i>Dioscorea sp.</i>
Jackfruit	<i>Artocarpus heterophylla</i>
Lemon	<i>Citrus aurantium</i>
American nightshade	<i>Solanum americanum</i>
Manihot	<i>Manihot esculentum</i>
Mango	<i>Mangifera indica</i>
Eggplant	<i>Solanum macrocarpum</i>
Matabala	<i>Xanthosoma sp.</i>
Corn	<i>Zea mais</i>
Strawberry	<i>Rubus rosifolius</i>
Oil palm	<i>Elaeis guineensis</i>
Papaya	<i>Carica papaya</i>
Pitanga	<i>Eugenia uniflora</i>
Peach	<i>Chytranthus mannii</i>
Pulped pepper	<i>Capsicum frutescans</i>
Safu	<i>Dacryodes edulis</i>
Tomato	<i>Lycopersicon esculentum</i>

Source: ECOFAC inventory data, adapted.

Table 5 – Main medicinal species of Santomean Flora: in alphabetical order, per local name

Local Names	Scientific Name	UTILIZATION	Part utilized
Abobora		earaches	
Alho	<i>Allium cepa</i>	Diarrhoeia	
Alho d' obô	<i>Psychotria peduncularis</i>	Infections	Leaf
Ananás	<i>Ananas comosus</i>	Abortifacient	
Arruda	<i>Ruta chapelensis</i>	Against roundworms	Leaf infusion
Bananeira	<i>Musa paradisiaca</i>	Diarrhoeia	
Bengue	<i>Alchomea cordifolia</i>	Diarrhoeia	Leaf
Cacueiro	<i>Theobroma cacao</i>	Malaria	
Cajueiro	<i>Anacardium occidentale</i>	Diarrhoeia	Bark and roots
Cana Macaco	<i>Costus giganteus</i>	Renal infections	Caul
Capim- d'água	<i>Commelina difusa</i>	Eye trouble	Caul, leaf
Caroceiro	<i>Terminalia catappa</i>	Diarrhoeia	bark
Cata-grande	<i>Rauvolfia dichotoma</i>	Malaria	bark
Cedrela	<i>Cedrela odorata</i>	Malaria	bark
Chimon-coiá	<i>Lagenaria siceraria</i>	Rheumatism	Fruit
Coedano	<i>Cestrum laevigatum</i>	Against mange	Leaf
Coleira	<i>Cola acuminata</i>	Eye and ear trouble	bark
Eritrineira	<i>Erythrina sp.</i>	Against bleeding	bark
Fiá-alfabaca	<i>Pepromia pellucida</i>	Venereal diseases	Caul, Leaf and flower
Fiá-budo	<i>Elephantopus mollis</i>	Diarrhoeia	Bark and roots
Fiá-pleto	<i>Datura metel</i>	Rheumatism	Leaf and flower
Fiá-salacontá	<i>Canna indica</i>	mange	
Fiá-sanzom	<i>Momordica charantia</i>	Aphrodisiac, Abortifacient	Leaf
Figo-obata	<i>Ficus chlamydocarpa</i>	Diarrhoeia	bark
Fissanjá	<i>Adenia cissampeloides</i>	Massage	Leaf
Leaf ponto	<i>Achyranthes aspera</i>	Against bleeding	Leaf
Leaf-da-mina	<i>Bryophyllum pinnatum</i>	Bruises or cuts	Leaf
Goiabeira	<i>Psidium guajava</i>	Diarrhoeia	Bark and roots, tender leaf
Ipé	<i>Olea capensis</i>	Aphrodisiac	Bark and roots
Libô muncambú	<i>Vernonia amygdalina</i>	Malaria	Tender leaf
Limão	<i>Citrus aurantium</i>	Malaria	Green fruit
Macambrará	<i>Craterispermum montanum</i>	Aphrodisiac	Bark and roots
Maioba	<i>Cassia occidentalis</i>	Malaria	Bark and roots
Mamoeiro	<i>Carica papaya</i>	Aphrodisiac	Fruit
Mamonó	<i>Ricinus communis</i>	Earache	Leaf
Mangueira	<i>Mangifera indica</i>	Diarrhoeia	Bark and roots
Maquequé	<i>Solanum macrocarpum</i>	Rheumatism	
Marapião	<i>Fagara macrophylla</i>	Toothache	Bark

Matabala	<i>Xanthosoma sagittifolium</i> .	Eye pain	Leaf
Matchanzoche	<i>Syzygium guineense</i>	Aphrodisiac	Bark and roots
Matruço	<i>Chenopodium</i>	Diarrhoeia, Massage	Leaf, caul
Micocó	<i>Ocimum gratissimum</i>	fever, Aphrodisiac	Leaf
Muandí	<i>Pentaclethra macrophylla</i>	Rheumatism	Bark
Mucumbli	<i>Lannea welwitschii</i>	kidneys, bruising	Bark and roots, tender leaf
Muindo	<i>Bridelia micrantha</i>	Massage	
Mussandá	<i>Ficus kamerunensis</i>	conjunctivitis	Bark and roots, tender leaf
Mutopa	<i>Maesa lanceolata</i>	Urinary tract	Leaf and bark
Nicolau	<i>Pauridiantha floribunda</i>	Anemia	Leaf and bark
Olhadató	<i>Centella asiatica</i>	Earache	
Palmeira-de-andim	<i>Elaeis guineensis</i>	Against mange	Oil from seeds
Pau cabra	<i>Tremna orientalis</i>		Leaf
Pau-caixão	<i>Pycnanthus angolensis</i>	Toothache, against bleeding	Bark
Pau-óleo	<i>Santiria trimera</i>	Purgative	Casca
Pau-purga	<i>Croton dracnopsis</i>	Purgative	Bark
Pau-quina	<i>Cinchona sp.</i>	Malaria, bruise, Abortifacient	Bark
Pau-salá		Aphrodisiac	Leaf
Pau-sangue	<i>Harungana</i>	Tonic	Bark
Pau-três	<i>Allophyllus africanus</i>	Aphrodisiac, Malaria	Bark and roots
Pau-três	<i>Allophyllus grandifolius</i>	Stomachache	Bark and roots
Pimpenela	<i>Sechium edule</i>	Diarrhoeia	Fruit
Pinincano	<i>Leonitis nepetifolia</i>	Stomachache	Leaf and flower
Selo-sum-zom-maia	<i>Erygium foetidum</i>	Stomachache	Leaf, tender caul
Tichile-blanco	<i>Drymaria cordata</i>	Diarrhoeia	Leaf, tender caul
Ucuetê	<i>Costus giganteus</i>	Rheumatism	Caul
Zagrimá		Aphrodisiac	

Source: ECOFAC inventory data, adapted.

Tabela 6 – Inventory of major orchidophile species endemic to São Tomé and Príncipe

D: Distribution E: Endemic S: São Tomé P: Príncipe

Family	Species	D
Orchidaceae	<i>Aerangis flexuosa</i>	ES
Orchidaceae	<i>Angraecopsis dolabriformis</i>	ES
Orchidaceae	<i>Angraecum astroarche</i>	ES
Orchidaceae	<i>Angraecum doratophyllum</i>	ESP
Orchidaceae	<i>Brachycorythis basifoliata</i>	ESP
Orchidaceae	<i>Bulbophyllum lizae</i>	ES
Orchidaceae	<i>Bulbophyllum luciphilum</i>	ES
Orchidaceae	<i>Bulbophyllum mediocre</i>	ESP
Orchidaceae	<i>Calanthe sylvatica</i> var <i>geerinckiana</i>	ES
Orchidaceae	<i>Chamaeangis thomensis</i>	ES
Orchidaceae	<i>Chamaeangis vagans</i>	EP
Orchidaceae	<i>Cribbia pendula</i>	ES
Orchidaceae	<i>Cribbia thomensis</i>	ES
Orchidaceae	<i>Diaphanthe acuta</i>	ES
Orchidaceae	<i>Dioaphanthe brevifolia</i>	ES
Orchidaceae	<i>Diaphanthe papagayi</i>	EP
Orchidaceae	<i>Liparis rosseelii</i>	ES
Orchidaceae	<i>Orestias stelidostachia</i>	ESP
Orchidaceae	<i>Polystachya albescens</i> s. <i>principensis</i>	EP
Orchidaceae	<i>Polystachya biteuai</i>	ES
Orchidaceae	<i>Polystachya distichia</i>	ES
Orchidaceae	<i>Polystachya expansa</i>	ES
Orchidaceae	<i>Polystachya parviflora</i>	ES
Orchidaceae	<i>Polystachya ridleyi</i>	ESA
Orchidaceae	<i>Polystachya setifera</i>	EP
Orchidaceae	<i>Polystachya thomensis</i>	ES
Orchidaceae	<i>Trydactyle</i> sp. A	ES
Orchidaceae	<i>Trydactyle</i> sp. B	EP
Orchidaceae	<i>Trydactyle</i> sp. C	ES

Source: Lejoly J. 1995- Suivi des programmes d'étude de la Biodiversité végétale dans la zone écologique de São Tomé adaptados.

Tabela 7 – Inventário das Espécies introduzidas : classificação por ordem alfabética das famílias

Or: Ex=Exell (1973), ES= Espirito Santo, Fi= Figueiredo, IF= Instit. Forest., Li= Liberato (1973),

Si= Silva, Wh= White (1983-84), Ecofac= espécie que ainda não tinha sido conhecida

ST: planta presente (1) ou ausente (0) na ilha de São Tomé

P: planta presente (1) ou ausente (0) na ilha do Príncipe

D:Geographical distribution **C:** cultivated

Family	Latin name	Local name	OR	ST	P	D
1 Acanthaceae	Grathophyllum pictum		Ex	1	1	C ornamental
2 Acanthaceae	Thunbergianthus alata		Ex	1	0	C ornamental
3 Agavaceae	Agave sisalana	Sisal	Ex	1	0	C Industrial
4 Agavaceae	Furcraea foetida		Ex	1	0	C ornamental
5 Apiaceae	Alium cepa	Cebola	Ex	1	0	C produce
6 Apiaceae	Alium sativum	Alho	EX	1	0	C produce
7 Amaranthaceae	Gomphrema globosa		Ex	1	0	C ornamental
8 Amaranthaceae	Iresine herbstii	Lírio	Ex	1	0	C ornamental
9 Amaryllidaceae	Crinum asiaticum	Lírio	Ex	1	0	C ornamental
10 Amaryllidaceae	Crinum jagus		Si	1	0	C ornamental
11 Anacardiaceae	Anacardium occidentale	Cajueiro	ES	1	1	C fruit
12 Anacardiaceae	Mangifera indica	Mangueira	Ex	1	1	C fruit
13 Anacardiaceae	Spondias cytherea	Cajamangueira	ES	1	1	C fruit
14 Anacardiaceae	Spondias mombin	Guêgue	Ex	1	1	C fruit
15 Annonaceae	Annona cherimola	Crimola	ES	1	0	C fruit
16 Annonaceae	Annona muricata	Sapo sapo	ES	1	1	C fruit
17 Annonaceae	Annona reticulata	Fruta conde	ES	1	1	C fruit
18 Annonaceae	Annona squamosa	Fruta Pinha	Ex	1	0	C fruit
19 Annonaceae	Annona odorata		Ex	1	0	C fruit
20 Annonaceae	Asimina triloba		Ex	0	1	C fruit
21 Annonaceae	Cananga odorata		Ex	1	0	C industrial
22 Apiaceae	Eryngium foetidum	Selo-sun-zon-maia	Ex, ES	1	1	C aromática
23 Apiaceae	Petroselinum crispum		Ex	1	0	C aromática
24 Apocynaceae	Catharanthus roseus		Ex	1	0	C ornamental
25 Apocynaceae	Ervatamia divaricata		Ex	0	1	C ornamental
26 Apocynaceae	Landolphia dawei		Ex	1	0	C ornamental
27 Apocynaceae	Nerium oleander		Ex	1	0	C ornamental
28 Apocynaceae	Plumeria rubra		Ex	1	0	C ornamental
29 Araceae	Caladium bicolor		Ex	1	1	C ornamental
30 Araceae	Colocasia exculenta		Si, Ex	1	1	C tuber
31 Araceae	Xanthosoma saittifolium	Matabala	Si, Ex	1	1	C tuber
32 Araliaceae	Hedera helix	Hera	Si	1	0	C ornamental

33	Arecaceae	Araucaria sp.	Araucaria	Si	C ornamental
34	Arecaceae	Oreodoxa regia	Palmeria-régia	Si	C ornamental
35	Arecaceae	Butia ereospatha		Ex	1 0C ornamental
36	Arecaceae	Caryota urens		Ex	1 0C ornamental
37	Arecaceae	Cocos nucifera	Coqueiro	Ex	1 1C industrial
38	Arecaceae	Phoenix dactylifera		Ex	1 0C ornamental
39	Asclepiadaceae	Asclepia curassavica		Ex	1 0C ornamental
40	Asparagaceae	Asparagus officinalis		Ex	1 0C aromática
41	Asteraceae	Acanthospermum hispidum	Mosquito dia	Ex, ES	1 1C ornamental
42	Asteraceae	Chrysanthemum indicum		Ex	1 0C ornamental
43	Asteraceae	Cichorium intybus		Ex	1 0C ornamental
44	Asteraceae	Epaltes brasiliensis		Ex	1 0C ornamental
45	Asteraceae	Galisonga parviflora		Ex	1 0C ornamental
46	Asteraceae	Zinnia peruviana		Ex	1 0C ornamental
47	Balsaminaceae	Impatiens balsamina	Balsamina	EX, Si	1 1C ornamental
48	Basellaceae	Basella alba	Fia tataluga	Ex	1 0C produce
49	Begoniaceae	Begonia sp.		Ex	1 0C ornamental
50	Bignoniaceae	Jaracanda mimosifolia		Ex	1 0C ornamental
51	Bignoniaceae	Spathodea nilotica		Ex	1 0C ornamental
52	Bixaceae	Bixa orellana	Giclo, Ginclo, Urucu	Si,	C ornamental
53	Boraginaceae	Cordia gerascanthus		Ex	1 0C ornamental
54	Brassicaceae	Brassica juncea		Ex	1 0C produce
55	Brassicaceae	Capsella bursa-pastoris		Ex	1 0C produce
56	Brassicaceae	Coronopus didymus		Ex	1 0C produce
57	Brassicaceae	Diplotaxis tenuisiliqua		Ex	1 0C produce
58	Brassicaceae	Lobularia maritima		Ex	1 0C produce
59	Brassicaceae	Raphanus sativus	Nabo-macaco	Ex, Si	1 0C produce
60	Brassicaceae	Rorippa indica			C produce
61	Brassicaceae	Rorippa nasturtium-aquaticum	Agriao, Fia guion	ES, Ex	1 0C produce
62	Bromeliaceae	Ananas comosus	Ananas	Ex	1 1C fruto
63	Buxaceae	Buxus sempervirens			C ornamental
64	Caesalpinaceae	Bauhinia purpurea		Ex	1 0C forage
65	Caesalpinaceae	Bauhinia tomentosa		Ex	1 0C forage
66	Caesalpinaceae	Caesalpinia pulcherrima		Ex	1 1C ornamental
67	Caesalpinaceae	Cassia alata		Ex	1 0C ornamental
68	Caesalpinaceae	Cassia javanica v. javanica		Li	1 0C ornamental
69	Caesalpinaceae	Cassia occidentalis	Maioba	Ex	1 1C ornamental
70	Caesalpinaceae	Cassia septemtrionalis		Ex	1 0C ornamental
71	Caesalpinaceae	Cassia siamea		Ex	1 0C ornamental
72	Caesalpinaceae	Cassia sophera	Maioba beni	ES	1 1C ornamental
73	Caesalpinaceae	Cassia spectabilis		Ex	1 0C ornamental
74	Caesalpinaceae	Ceratonia siliqua	Alfarrobeira	Si	1 0C ornamental
75	Caesalpinaceae	Delonix regia		Ex	1 0C ornamental

76	Caesalpinaceae	Haematoxylum campechianum		Ex	1 0C	ornamental
77	Caesalpinaceae	Peltophorum pterocarpum		Li	1 0C	ornamental
78	Caesalpinaceae	Tamarindus indica	Tamanha	ES	1 1C	fruit
79	Cannabaceae	Cannabis sativa	Liamba	Ex	1 0C	industrial
80	Cannaceae	Canna indica	Fia salaconta	Ex	1 1C	ornamental
81	Caprifoliaceae	Sambucus mexicana		Ecofac	1 0C	ornamental
82	Caricaceae	Carica papaya	Mamoeiro	ES	1 1C	alimentary
83	Caryophyllaceae	Stellaria media		Ex	1 0C	ornamental
84	Chenopodiaceae	Chenopodium ambrosioides	Matluço	ES	1 1C	aromatic
85	Clusiaceae	Garcinia mangostana	Mangostao	Ex	1 0C	fruto
86	Clusiaceae	Platonia insignis	Bacuri, Bacurizeiro	Si	1 0C	ornamental
87	Combretaceae	Quasqualis indica		Ex	1 0C	ornamental
88	Combretaceae	Terminalia catappa	Amendoeiro da India	Ex	1 1C	ornamental
89	Commelinaceae	Rhoeo spathacea		Ex	1 1C	ornamental
90	Commelinaceae	Zebrina pendula		Ex	1 1C	ornamental
91	Convolvulaceae	Ipomoea alba		Ex	1 1C	ornamental
92	Convolvulaceae	Ipomoea hederifolia		Ex	1 1C	ornamental
93	Convolvulaceae	Ipomoea setifera		Ex	1 0C	ornamental
94	Crassulaceae	Bryophyllum pinnatum	Fia damina	Ex	1 1C	produce
95	Cucurbitaceae	?	latanga	Si	C	produce
96	Cucurbitaceae	Curcumis sativus		Ex	1 0C	produce
97	Cucurbitaceae	Sechium edule	Pimpinela	Ex	1 0C	produce
98	Cyperaceae	Cyperus luzulae		Ex	1 0C	ornamental
99	Dilleniaceae	Dillenia indica		Ex	1 0C	fruit
100	Dioscoreaceae	Dioscorea alata	Inhame gudu	Ex	1 0C	tuber
101	Dioscoreaceae	Dioscorea cayanensis	Inhame branco	Ex	1 1C	tuber
102	Ericaceae	Rhododendron mucronatum		Ex	1 0C	ornamental
103	Erythroxylaceae	Erythroxylum coca		Ex	1 0C	industrial
104	Euphorbiaceae	Breynia disticha v. disticha f. nivosa	Filanto	Ex, Si	1 0C	ornamental
105	Euphorbiaceae	Codiaeum variegatum		Ex	1 0C	ornamental
106	Euphorbiaceae	Croton dracnopsis	Pau purga	Ex	1 0C	ornamental
107	Euphorbiaceae	Hevea brasiliensis	Borracha	Si	1 0C	industrial
108	Euphorbiaceae	Hevea guianensis		Ex	1 0C	industrial
109	Euphorbiaceae	Jatropha curcas	Glon, Pau pixe,	Ex, Si	1 0C	industrial

110	Euphorbiaceae	Jatropha multifida	Glom-congo	ES	1 1C	leaf
111	Euphorbiaceae	Manihot esculenta	Mandioca	Ex	1 0C	tuber
112	Euphorbiaceae	Manihot glaziovii		Ex	1 1C	tuber
113	Euphorbiaceae	Ricinus communis	Ricino, Mamona	Si, Ex	1 1C	industrial
114	Fabaceae	Arachis hypogaea	Gumba	ES	1 0C	Industrial forage
115	Fabaceae	Cajanus cajan	Fezom congo	ES	1 1C	legume
116	Fabaceae	Calapogonium mucunoides		Ex	C	legume
117	Fabaceae	Canavalia ensiformis		Ex	1 0C	legume
118	Fabaceae	Centrosema plumieri		Ex	1 0C	legume

119	Fabaceae	Centrosema pubescens		Ex	1	0C	legume
120	Fabaceae	Clitorea ternatea		Ex	1	0C	legume
121	Fabaceae	Desmodium tortuosum		Ex	1	0C	legume
122	Fabaceae	Erytrina droogmansiana		Ex	1	0C	ornamental
123	Fabaceae	Erytrina poeppigiana		Li	1	0C	ornamental
124	Fabaceae	Erytrina umbrosa		Ex	1	0C	ornamental
125	Fabaceae	Erytrina variegata	Eritrina	Si, Li	1	1C	ornamental
126	Fabaceae	Erytrina velutina		Ex	1	0C	ornamental
127	Fabaceae	Glicine wightii		Ex	1	0C	legume
128	Fabaceae	Ormosia dasycarpa		Ex	1	0C	legume
129	Fabaceae	Phaseolus vulgaris	Feijao	Ex	1	0C	legume
130	Fabaceae	Pterocarpus indicus		Ex	1	0C	legume
131	Fabaceae	Pueraria phaseoloides v. javanica		Ex, LS	1	0C	legume
132	Fabaceae	Tephrosia candida		ES	1	0C	ornamental
133	Fabaceae	Vicia faba	Faveira	Si	1	0C	legume
134	Fabaceae	Vigna unguiculata s. dekindtiana	Feijao-do-mato	Si, Li	1	0C	legume
135	Fumariaceae	Fumaria muralis		Ex	1	0C	ornamental
136	Hydrangeaceae	Hydrangea sp.		Ex	1	0C	ornamental
137	Iridaceae	Neomarica caerulea		Ex	1	1C	ornamental
138	Lamiaceae	Mentha piperita	Hortela, Letrao	Si		C	aromatic
139	Lamiaceae	Mentha rotundifolia		Ex	1	0C	aromatic
140	Lamiaceae	Ocimum basilicum		Ex	1	0C	aromatic
141	Lamiaceae	Ocimum gratissimum		Ex	1	0C	aromatic
142	Lamiaceae	Salvia coccinea		Ex	1	0C	aromatic
143	Lamiaceae	Stachys arvensis		Ex	1	0C	aromatic
144	Lauraceae	Cinnamomum burmanni	Canela brava	Ex	1	0C	aromatic
145	Lauraceae	Cinnamomum canphora	Canforeira	Ex	1	0C	aromatic
146	Lauraceae	Cinnamomum zeylanicum	Canela	Ex	1	1C	aromatic
147	Lythraceae	Lawsonia inermis		Ex	0	1C	ornamental
148	Malvaceae	Abelmoschus esculentus	Quiabo, Iquiabo	Ex, ES	1	1C	produce
149	Malvaceae	Abutilon grandifolium		Ex	1	0C	produce
150	Malvaceae	Abutilon venosum		Ex	1	0C	produce
151	Malvaceae	Gossypium hirsutum	Algodao	Ex, Si	1	0C	produce
152	Malvaceae	Hibiscus acetosella	Fia mussua			C	produce
153	Malvaceae	Hibiscus mutabilis		Ex	1	1C	ornamental
154	Malvaceae	Hibiscus rosa-sinensis		Ex	1	1C	ornamental
155	Malvaceae	Hibiscus sabdariffa		Ex	1	0C	ornamental
156	Malvaceae	Malvastrum coromandelianum		Ex	1	1C	ornamental
157	Marantaceae	Maranta arundinacea		Ex	1	1C	ornamental
158	Meliaceae	Cedrela odorata	Cedrela	Si	1	0C	industrial
159	Meliaceae	Melia azedarach	Lilas do Cabo	Ex	1	1C	industrial
160	Meliaceae	Toona ciliata	Pau alho	ES	1	0C	industrial
161	Mimosaceae	Acacia farnesiana	Bana muala	Ex, ES	1	0C	industrial

162	Mimosaceae	Acacia nilotica s. indica		Li	1	0C	industrial
163	Mimosaceae	Adenantha pavonina	Acacia-coral	Ex, Si	1	0C	ornamental
164	Mimosaceae	Albizia falcataria	Molucana	Si	1	0C	ornamental
165	Mimosaceae	Albizia lebeck		Ex	1	0C	ornamental
166	Mimosaceae	Albizia procera		Ex	1	0C	forage
167	Mimosaceae	Desmanthus virgatus	Po fuguete	Ex, ES	1	0C	forage
168	Mimosaceae	Faidherbia albida		Li	1	0C	forage
169	Mimosaceae	Inga edulis	Cajaseiro, Ingaseiro	ES, Ex	1	0C	forage
170	Mimosaceae	Inga sp.	Ingazeiro	Ex	1	0C	forage
171	Mimosaceae	Leucaena leucocephala	Leucena	Si	1	1C	forage
172	Mimosaceae	Mimosa polydacthyla	Fissopé	Si	1	1C	forage
173	Mimosaceae	Mimosa pudica v. hispida	Fia malicha	ES, Li	1	0C	forage
174	Moraceae	Artocarpus altilis	Fruta pao	Ex	1	1C	alimentary
175	Moraceae	Artocarpus heterophylla	Jaqueira	ES	1	1C	alimentary
176	Moraceae	Castilloa elastica		Ex	1	1C	ornamental
177	Moraceae	Cecropia peltata		Ex	1	1C	ornamental
178	Moraceae	Ficus carica	Figueira	Si	1	0C	Fruit
179	Moraceae	Ficus elastica		Ex	1	0C	industrial
180	Moraceae	Ficus pumila		Ex	1	0C	ornamental
181	Musaceae	Musa paradisiaca	Bana pom	ES	1	1C	Fruit
182	Musaceae	Musa paradisiaca v. sapietum	Quitxiba	ES, Ex	1	1C	Fruit
183	Musaceae	Musa paradisiaca v. vittata		Ex	1	0C	Fruit
184	Musaceae	Musa rosacea		Ex	1	0C	ornamental
185	Musaceae	Musa ventricosa		Ex	1	0C	ornamental
186	Myristicaceae	Myristica fragans		Ex	1	0C	Fruit
187	Myrtaceae	Eucalyptus sp.	Eucalipto	Si	1	0C	ornamental
188	Myrtaceae	Eugenia brasiliensis	Comoxama,	Si, Ex	1	0C	Fruit
189	Myrtaceae	Eugenia dombeyi		Ex	1	0C	Fruit
190	Myrtaceae	Eugenia uniflora	Pitangueira	ES	1	1C	Fruit
191	Myrtaceae	Melaleuca leucadendron		Ecofac	1	0C	Fruit
192	Myrtaceae	Myrciaria cauliflora	Jaboticabeira	Si	1	0C	Fruit
193	Myrtaceae	Psidium guajava	Goiabeira	Ex	1	1C	Fruit
194	Myrtaceae	Syzygium aromaticum		Ex	1	0C	Fruit
195	Myrtaceae	Syzygium jambos	Pau-jambre	Si	1	1C	Fruit
196	Nyctaginaceae	Boerhavia paniculata		Ex	1	0C	ornamental
197	Nyctaginaceae	Bougainvillaea spectabilis	Bungavila	Si	1	1C	ornamental
198	Nyctaginaceae	Mirabilis jalapa	Rosa bilança	Ex	1	0C	ornamental
199	Oleaceae	Olea europaea		Ex	1	0C	industrial
200	Orchidaceae	Vanilla crenulata		Ex	0	1C	industrial
202	Orchidaceae	Vanilla planifolia		ES	1	1C	industrial
203	Oxalidaceae	Averrhoa carambola	Caramboleira	ES, Ex	1	0C	Fruit
204	Oxalidaceae	Oxalis corymbosa	Lamera	Si, Ex	1	1C	ornamental
205	Papaveraceae	Argemone mexicana	Cundu de muala vé	ES	1	0C	ornamental

206	Passifloraceae	Passiflora edulis	Maracuja-pequeno	Si, Ex	1	0C	Fruit
207	Passifloraceae	Passiflora foetida	Maracuja de mato	ES	1	1C	Fruit
208	Passifloraceae	Passiflora quadrangularis	Maracuja-grande	Si	1	1C	Fruit
209	Plantaginaceae	Plantago major		Ex	1	1C	
210	Plumbaginac.	Plumbago auriculata		Ex	1	0C	
211	Plumbaginac.	Plumbago zeilkanica		Ex	1	0C	
212	Poaceae	Axonopus compressus		Ex	1	0C	
213	Poaceae	Bambusa vulgaris		Ex	1	1C	
214	Poaceae	Coix lacryma-jobi		Ex	1	0C	
215	Poaceae	Cymbopogon citratus	Capim do Gabão	Ex, ES	1	1C	aromatic
216	Poaceae	Hordeum vulgare		Ex	1	0C	cereal
217	Poaceae	Oryza sativa		Ex	1	0C	cereal
218	Poaceae	Saccharum officinarum	Cana-de-açúcar	Si, Ex	1	1C	industrial
219	Poaceae	Secale cereale		Ex	1	0C	cereal
220	Poaceae	Sorghum drummondii		Ex	0	1C	cereal
221	Poaceae	Triticum aestivum		Ex	1	0C	cereal
222	Poaceae	Zea mays	Milho	Ex, Si	1	1C	cereal
223	Portulacaceae	Talinum triangulare	Bodlega glandje	ES	1	0C	produce
224	Proteaceae	Grevillea robusta	Grevilia	Si	1	1C	ornamental
225	Punicaceae	Punica granatum	Romanzeiro	Si	1	0C	Fruit
226	Rosaceae	Cydonia oblonga		Ex	1	0C	Fruit
227	Rosaceae	Eriobotrya japonica		Ex	1	0C	Fruit
228	Rosaceae	Malus sylvestris	Pommier	Ex	1	0C	Fruit
229	Rosaceae	Prunua africana	Mussinika	Ex	1	0C	industrial
230	Rosaceae	Prunus cerasus		Ex	1	0C	Fruit

231	Rosaceae	Prunus domestica		Ex	1	0C	fruit
232	Rosaceae	Prunus dulcis		Ex	1	0C	fruit
233	Rosaceae	Prunus persica		Ex	1	0C	fruit
234	Rosaceae	Rosa chinensis		Ex	1	0C	ornamental
235	Rosaceae	Rosa laevigata		Ex	1	0C	ornamental
236	Rosaceae	Rubus rosifolius	Murango	Si, Ex	1	1C	fruit
237	Rubiaceae	Cinchona ledgeriana		Si, Ex	1	0C	industrial
238	Rubiaceae	Cinchona pubescens		Ex	1	0C	industrial
239	Rubiaceae	Cinchona sp.	Quina	Ex	1	0C	industrial
240	Rubiaceae	Coffea arabica	Cafezeiro arabico	ES, Ex	1	1C	industrial
241	Rubiaceae	Coffea canephora	Café robusta, cafeeiro	Si, Ex		C	industrial
242	Rubiaceae	Coffea dewevrei	Café excelsior	Si		C	industrial
243	Rubiaceae	Coffea liberica	Cafeeiro liberico	ES, Ex	1	1C	industrial
244	Rubiaceae	Coffea racemosa	Caçé Inhambane	Si		C	industrial
245	Rubiaceae	Coffea stenophylla	Cafeeiro	ES	1	0C	industrial
246	Rubiaceae	Ixora coccinea		Ex	1	1C	ornamental
247	Rutaceae	Citrus aurantifolia		Ex	0	1C	fruit
248	Rutaceae	Citrus aurantium	Lanza mato	Ex	1	0C	Fruit

249	Rutaceae	Citrus maxima	pamplemousse	Ex	1	0C	leaf
250	Rutaceae	Citrus reticulata	mandarine	Ex	1	0C	leaf
251	Rutaceae	Citrus sp.	Lanza mucambu	Ex	1	C	leaf
252	Rutaceae	Citrus sp.	Limoeiro bravo		1	C	leaf
253	Rutaceae	Ruta chapelensis	Lurda	Ex, Si	1	0C	leaf
254	Scrophulariac.	Russelia equisetiformis		Ex	1	1C	leaf
255	Simaroubaceae	Quassia amara		Ex	1	0C	leaf
256	Solanaceae	Browalia americana		Ex	1	0C	leaf
257	Solanaceae	Brunfelsia uniflora	Manaca	Ex	1	0C	leaf
258	Solanaceae	Capsicum frutescens	Malagueta-tuatua	Si, ES	1	1C	leaf
259	Solanaceae	Cestrum laevigatum v. puberulum	Pau fede, Coedano	Si, ES	1	1C	leaf
260	Solanaceae	Cyphomandra betacea	Tomate-do-mato	Si	1	0C	produce
261	Solanaceae	Datura candida		Ex	1	0C	ornamental
262	Solanaceae	Datura metel	Fia pleto	ES	1	0C	industrial
263	Solanaceae	Lycopersicum esculentum v. cerasiforme		Ex	1	1C	fruit
264	Solanaceae	Nicandra physaloides	Pupupléla	ES	1	1C	fruit
265	Solanaceae	Nicotina tabacum	Tabaco	Si, Ex	1	0C	industrial
266	Solanaceae	Physalis angulata		Ex	1	1C	fruit
267	Solanaceae	Solanum melongena		Ex	1	0C	produce
268	Solanaceae	Solanum tuberosum		Ex	1	0C	root
269	Solanaceae	Solanum wrightii		Ecofac	1	0C	ornamental
270	Sterculiaceae	Theobroma cacao	Cacueiro	ES	1	1C	industrial

271	Theaceae	Camelia japonica		Ex	1	0C	industrial
272	Theaceae	Camelia sinensis	Pau cha	Si	1	0C	industrial
273	Urticaceae	Boehmeria nivea	Rami	Si	1	0C	industrial
274	Verbenaceae	Clerodendrum japonicum		Ex	1	0C	ornamental
275	Verbenaceae	Clerodendrum speciosissimum		Ex	1	0C	ornamental
276	Verbenaceae	Duranta repens		Ex	1	0C	ornamental
277	Verbenaceae	Lantana camara	Micoco-campo	ES	1	0C	ornamental
278	Verbenaceae	Priva lappulacea		Ecofac	1	0C	
279	Vitaceae	Vitis vinifera	Videira	Si, Ex	1	0C	industrial
280	Zingiberaceae	Curcuma domestica	Açafrão da India	Ex	1	1C	aromatic
281	Zingiberaceae	Elettaria repens		Ex	1	0C	aromatic
282	Zingiberaceae	Hedychium coronarium		Ex	0	1C	aromatic
283	Zingiberaceae	Zerumbet speciosum		Ex	1	0C	aromatic
284	Zingiberaceae	Zingiber officinale	Gigimple	ES	1	1C	aromatic

Source: Lejoly J. 1995- Suivi des programmes d'étude de la Biodiversité végétale dans la zone écologique de Sao Tomé adapté.

Table 8 - Inventory of main ornamental plant species in S. Tomé and Príncipe: in alphabetic order, by family name

Family	Scientific Name	Local name
Acanthaceae	<i>Heteradelphia paulowihelmia</i>	Heteradelfia
Araceae	<i>Anthurium andreanum</i>	Antúrio
Balsaminaceae	<i>Impatiens buccinalis</i>	Shrimp
Begoniaceae	<i>Begonia baccata</i>	Begónia, Leaf-boba
Begoniaceae	<i>Begonia subalpestris</i>	Begónia-gigante
Cyatheaaceae	<i>Cyathea mannii</i>	Feto gigante
Cyatheaaceae	<i>Cyathea welwistchii</i>	Feto gigante
Dracaenaceae	<i>Dracaena arborea</i>	Pau-sabão
Dracaenaceae	<i>Dracaena laurentii</i>	Língua-de-sogra
Dracaenaceae	<i>Dracaena trisfasciata</i>	Língua-de-sogra
Ericaceae	<i>Phillipia thomensis</i>	Erica
Malvaceae	<i>Hibiscus rosa-sinensis</i>	Hibisco
Maranthaceae	<i>Iresini herbstii</i>	Coração-magoado
Melastomataceae	<i>Calvoa grandifolia</i>	Calvoa
Melastomataceae	<i>Tristemma mauritianum</i>	Tristema
Musaceae	<i>Heliconia rostrata</i>	Bico-de-papagaio
Nyctaginaceae	<i>Mirabilis jalapa</i>	Losa-bilança
Orchidaceae	<i>Cyrtorchis henriquensiana</i>	Fia-língua-de-vaca
Orquidaceae	<i>Calanthe sylvatica</i>	Calante
Orquidaceae	<i>Phaius mannii</i>	
Orquidaceae	<i>Maniella gustavii</i>	
Orquidaceae	<i>Nervilia bicarinata</i>	
Orquidaceae	<i>Solenangis clavata</i>	
Orquidaceae	<i>Bulbophyllum</i>	
Pandanaceae	<i>Pandanus thomensis</i>	Pau-esteira
Rosaceae	<i>Rosa sp.</i>	Roseira
Scrophulariaceae	<i>Thunbergianthus quintasii</i>	Musa-fria
Zingiberaceae	<i>Renealmia grandiflora</i>	Renealmia
Zingiberaceae	<i>Nicolaia elatior</i>	Rosa-porcelana
Zingiberaceae	<i>Hedychium coronarium</i>	

Table 9 - Inventory of main avian species endemic to the Santomean archipelago

Local Name	Scientific Name
SAO TOME	
Kitoli	<i>Otus hartlaubi</i>
Enjoló	<i>Neospiza concolor</i>
Olho-grosso	<i>Speirops lugubris</i>
Camussela	<i>Ploceus grandis</i>
Selele-mangotchi	<i>Dreptes thomensis</i>
Papafigo	<i>Oriolus crassirostris</i>
Sêlele	<i>Nectarinia newtonii</i>
Tchin-tchin-xolo	<i>Thomasophantes sanctithomae</i>
Truqui	<i>Prinia mollerii</i>
Tomé-gága	<i>Terpsiphone atrochalybeia</i>
Cessa	<i>Treron sanctithomae</i>
Pombo-do-mato	<i>Columba thomensis</i>
PRÍNCIPE	
Tordo	<i>Turdus olivaceofuscus</i>
Estorninho	<i>Lamprotornis ornatus</i>
Merlo	<i>Ploceus princeps</i>
Chibi	<i>Nectarinia hartlaubii</i>
Tchiliquito	<i>Speirops leucophaeus</i>
Tchili-tchili	<i>Zosterops ficedulinus</i>
Chibi-fixa	<i>Horizorhinus dohmi</i>
Rabo-de-peixe	<i>Dicrurus modestus</i>
Rola	<i>Columba malherbii</i>
Chota café	<i>Serinus rufobrunneus</i>

Table 10 - Inventory of threatened animal species in S. Tomé and Príncipe

Source: Red list of threatened animals in STP

Scientific name	Class	Order	Family	Common name	Conservation status
<i>Paradxa thomensis</i>	Gastropoda	Neogastropoda	Buccinidae	Mollusk	V
<i>Chelonia mydas</i>	Reptilia	Testudines	Cheloniidae	Ambo turtle	E
<i>Eretmochelys</i>	Reptilia	Testudines	Cheloniidae	Sarda turtle	E
<i>Lepydochelys</i>	Reptilia	Testudines	Cheloniidae	Oliver Ridley turtle	E
<i>Columba thomensis</i>	Aves	Columbiformes	Columbiidae	Maroon pigeon	V
<i>Dermochelys</i>	Reptilia	Testudines	Dermochelyidae	Ambulancia turtle	E
<i>Globanus sp.</i>	Insecta		Diplopoda	Millipede	K
<i>Neospiza concolor</i>	Aves		Fringilidae	Grosbeak	E
<i>Poliospiza</i>	Aves		Fringilidae	Seedeater	E
<i>Coeliades bocagii</i>	Insecta	Lepidoptera	Hesperiidae	S.Tomé butterfly	V
<i>Lanius newtoni</i>	Aves	Passeriformes	Laniidae	Fiscal	E
<i>Trithemis nigra</i>	Insecta	Odonata	Libellulidae	Príncipe dragonfly	I
<i>Epamera bellina</i>	Insecta		Lycaenidae		EX
<i>Leptotes terrenus</i>	Insecta		Lycaenidae		I
<i>Chilades</i>	Insecta		Lycaenidae		I
<i>Tadarides tomensis</i>	Mammalia	Chiroptera	Molossidae	bat	I
<i>Amaurocichla</i>	Aves		Muscicapidae		V
<i>Nectarinia thomensis</i>	Aves		Nectariniidae	S.Tomé mangotchi	R
<i>Neritina manoeli</i>	Gastropoda	Archaeogastropoda	Neretidae	Príncipe sweet-water mollusk	E
<i>Charaxes defolvata</i>	Insecta		Nymphalidae		EX
<i>Pseudacrea gamae</i>	Insecta		Nymphalidae		I
<i>Oriolus crassirostris</i>	Aves		Oriolidae	São Tomé oriole	R
<i>Graphium leonidas</i>	Insecta		Papilionidae		E
<i>Graphium leonidas</i>	Insecta		Papilionidae		E
<i>Pterodroma madeira</i>	Aves	Procellariiformes	Procellariidae		E
<i>Psittacus erithacus</i>	Aves	Psittaciformes	Psittacidae	Parrot	V
<i>Myonycteris</i>			Pteropodidae	Guémbu	V
<i>Teinostoma</i>	Gastropoda	Archaeogastropoda	Skeneidae	Príncipe sea mollusk	V
<i>Teinostoma</i>	Gastropoda	Archaeogastropoda	Skeneidae	Príncipe sea mollusk	V
<i>Crocidura thomensis</i>	Mammalia	Insectivora	Soricidae	Shrew	K
<i>Crocidura poensis</i>	Mammalia	Insectivora	Soricidae	Shrew	K
<i>Otus hartlaubi</i>	Aves	Strigiformes	Strigidae	Kitoli	R
<i>Sula leucogaster</i>	Aves	Pelecaniformes	Sulidae	Brown booby	E
<i>Bostrychia bocagei</i>	Aves	Ciconiformes	Threskiornithidae	S.Tomé dwarf olive ibis	E
<i>Bostrychia olivacea</i>	Aves	Ciconiformes	Threskiornithidae	Príncipe olive ibis	E
<i>Speirops</i>	Aves		Zosteropidae	Príncipe Tchiliquito	R
<i>Zosterops ficedulinus</i>	Aves		Zosteropidae	Príncipe Tchili-tchili	E
<i>Zosterops ficedulinus</i>	Aves		Zosteropidae	S.Tomé Tchili-tchili	R

(Ex=extinct; E= endangered; V=vulnerable; R=Rare; I=Indeterminate K=insufficiently known; CT=Commercially threatened)

Table 11 - Inventory of Inland Water Fauna on S.Tomé and Príncipe

Classification according to status of resident, indigenous or endemic species

Family	Portuguese name	STP name	Scientific name
	Codomizão-aficano	-	<i>Crecoptis egregia</i>
**Columbidae	Pombo marreta	Pombo, Pombo-do-mato	<i>Columba thomensis</i>
*Laridae	Gaivina-preta	-	<i>Chilidonias niger</i>
"	Andorinha	-	<i>Hirundo rustica</i>
"	-	-	<i>Amaurocichla bocagei</i>
"Threskiornithidae	Ibis-de-São Tomé	Galinholá	<i>Bostrychia bocagei</i>
Accipitridae	Milhafre-preto, rabo-de-	Falcão	<i>Milvus migrans</i>
Alcedinidae	Guarda-rios, Pica-peixinho-de-	Conóbia, Pica-peixe	<i>Alcedo cristata thomensis</i>
Alcedinidae	Guarda-rios, Pica-peixinho-de-	Conóbia, Pica-peixe	<i>Alcedo leucogaster nais</i>
Alcedinidae	Pica-peixe-de-peito-azul	Chau-chau, Chó-chó	<i>Halcyon malimbica dryas</i>
Alcedinidae	Pica-peixe-malhado	-	<i>Ceryle rudis</i>
Anatidae	Pato-de-carúncula, Pato-de-	-	<i>Sarkidiomis melanotos</i>
Apodidae	Ferreiro-espinhoso, rabo-	Andorinha	<i>Zoonavena thomensis</i>
Apodidae	Guincho-da-Europa	-	<i>Apus apus</i>
Apodidae	Guincho-pequeno	Andorinha	<i>Apus affinis hannermani</i>
Ardeidae	Garçenho-pequeno-africano	-	<i>Ixobrychus minutus</i>
Ardeidae	Garça-caranquejeira, Papa-	-	<i>Ardeola ralloides</i>
Ardeidae	Garça; Garça-boieira,	Garça	<i>Bubulcus ibis</i>
Ardeidae	Garça-de-cabeça-negra	Chuchu, Tchongo, Tchonzé	<i>Butorides striatus</i>
Ardeidae	Garça-preta, Garça-ardósia	-	<i>Egretta ardesiaca</i>
Ardeidae	Egreta-pequena, Garça-	-	<i>Egretta garzetta</i>
Ardeidae	Garça-marinha	Garça	<i>Egretta gularis</i>
Ardeidae	Garça-purpúrea, Garça-	-	<i>Ardea purpurea</i>
Ardeidae	Garça-real, Garça-cinzenta	-	<i>Ardea cinerea</i>
Charadriidae	Borrelho-de-coleira	-	<i>Charadrius hiaticula</i>
Charadriidae	Tambola-cinzenta	-	<i>Pluvialis squatarola</i>
Ciconiidae	Flamengo, Falso-flamingo	-	<i>Mycteria ibis</i>
Columbidae	Pombo-de-nuca-bronzeada	Rola, Lola	<i>Columba malherbii</i>
Columbidae	Pomba-preta	Munquê, Muquê, Monquem	<i>Aplopelia larvata simplex</i>
Cuculidae	Cuco-jacobino	-	<i>Clamator jacobinus</i>
Glareolidae	Perdiz-do-mar, Pratincola-de-	-	<i>Glareola nordmanni</i>
Hirudinae	-	-	<i>Riparia cincta</i>
Nectariniidae	Beija-flor-do-Príncipe	Chibi, Chibi-barbeiro, Chibi-	<i>Nectarinia hartlaubi</i>
Phalacrocoracidae	Corvo marinho-africano	Pato-marinho, Corvo	<i>Phalacrocorax africanus</i>
Phoenicopteridae	Flamingo-menor	-	<i>Phoeniconaias minor</i>
Psittacidae	Periquito-de-bico-vermelho	Periquito	<i>Agapornis pullarius</i>
Rallidae	Franço-d'água	-	<i>Rallus caeruleus</i>
Rallidae	Sultana-preta, galinha-sultana-	-	<i>Porphyryla alleni</i>
Rallidae	Galinha-d'água-africana,	Galinha d'água	<i>Gallinula chloropus</i>
Rallidae	Galinha-d'água-pequena,	-	<i>Gallinula angulata</i>
Scolopacidae	Fuselo, Parda	-	<i>Limosa lapponica</i>
Scolopacidae	Meio-maçarico, Coco-piloto,	-	<i>Numenius phaeopus</i>
Scolopacidae	Pássaro-bique-bique	-	<i>Tringa ochropus</i>
Scolopacidae	Maçarico-silvestre	-	<i>Tringa glareola</i>
Scolopacidae	Maçarico-das-rochas	-	<i>Actitis hypoleucos</i>
Scolopacidae	Pilrito-de-rabadilha-branca	-	<i>Calidris ferruginea</i>
Strigidae	Mocho-de-São-Tomé	Kitoli	<i>Otus hartlaubi</i>
Sylviidae	-	Truqui, Traquê, Bate-asas	<i>Prinia malleri</i>
Threskiornithidae	Ibis-do-Príncipe	Diógo, Corvão	<i>Bostrychia olivacea rothschildi</i>
Timalidae	Rouxinol-do-Príncipe	Tchibi-fixa	<i>Horrorhinus dohmi</i>

Turdidae	-	Tordo	<i>Turdus olivaceofuscus</i>
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Tab 12: Inventory of S. Tomé and Príncipe land mammals

Class	Order	Family	Scientific name	Vernacular name
Mammalia	Insectivora	Soricidae	<i>Crocidura thomensis</i>	S. Tomé shrew
Mammalia	Insectivora	Soricidae	<i>Crocidura poensis</i>	Príncipe shrew
Mammalia	Chiroptera	Molossidae	<i>Tadarides thomensis</i>	S. Tomé bat
Mammalia	Chiroptera	Pteropodidae	<i>Myonycteris brachycephala</i>	S. Tomé Guembú
Mammalia	Chiroptera	Vespertilionidae	<i>Pipistrellus sp. nov.</i>	Príncipe bat
Mammalia	Chiroptera		<i>Eidolon helvum</i>	
Mammalia	Chiroptera		<i>Hipposideros ruber</i>	
Mammalia			<i>Hippodiderus commersoni</i>	
			<i>Miniopterus minor</i>	
			<i>Rousettus aegyptiacus</i>	
Mammalia	Rodentia		<i>Rattus rattus</i>	
Mammalia	Rodentia		<i>Rattus norvegicus</i>	

Tab 13: Inventory of protected bird species in the Santomean archipelago

Ordem	Família	Nome científico	Nome vernacular
Ciconiformes	Threskiornithidae	<i>Bostrychia olivacea</i> <i>rothschildii</i>	Príncipe Olive Ibis
Ciconiformes	Threskiornithidae	<i>Bostrychia bocagei</i>	S. Tomé dwarf olive ibis
Columbiformes	Columbidae	<i>Columba thomensis</i>	Pombo do Mato (S. Tomé)
Procellariiformis	Procellariidae	<i>Pterodroma madeira</i>	Oceanito de castro
Pelecaniformes	Sulidae	<i>Sula leucogaster</i>	Pato marinho
Psittaciformes	Psittacidae	<i>Psittacus erithacus</i>	Papagaio cinzento do Príncipe
Strigiformes	Strigidae	<i>Otus hartlaubi</i>	S. Tomé Kitoli
Passeriformes	Laniidae	<i>Lanius newtoni</i>	S. Tomé Fiscal
Passeriformes	Muscicapidae	<i>Amaurocichla bocagei</i>	Nasica de bocage
Passeriformes	Turdidae	<i>Turdus olivaceofuscus</i>	Tordo
Passeriformes	Nectariniidae	<i>Nectarina thomensis</i>	Selelé-mangotchi
Passeriformes	Zosteropidae	<i>Speirops leucophaeus</i>	Tchliquito
Passeriformes	Zosteropidae	<i>Zosteros ficedulinus</i> <i>ficedulinus</i>	Tchili-tchili, Príncipe
Passeriformes	Zosteropidae	<i>Zosteros ficedulinus feae</i>	Tchili-tchili, S. Tomé
Passeriformes	Fringillidae	<i>Neospiza concolor</i>	Pardal de S. Tomé
Passeriformes	Fringillidae	<i>Polisospiza rufobrunnea</i> <i>fradei</i>	Chotacafé (Boné de Joquei)
Passeriformes	Oriolidae	<i>Oriolus crassirostris</i>	S. Tomé oriole

Tab. 14 : The 3 families of batrachians or amphibians in S. Tomé and Príncipe

Family	Genera	Species	Vernacular	ST	P	R
Caeciliidae	<i>Schistometopum</i>	<i>Schistometopum ephale</i>	cecíli	1	0	0

		<i>Schistometopum thomense</i>	cecili	1	0	1
Hyperoliidae	<i>Leptopelis</i>	<i>Leptopelis palmatus</i>	raine	0	1	0
	<i>Nesionixalus</i>	<i>Nesionixalus mollerii</i>	raine	1	0	0
	<i>Nesionixalus</i>	<i>Nesionixalus thomensis</i>	raine	1	0	0
Ranidae	<i>Ptychadena</i>	<i>Ptychadena newtoni</i>	frog	1	0	0
	<i>Rhynobatrachus</i>	<i>Rhynobatrachus dispar</i>	frog	1	1	1

Source: ENPAB-Forests 2002, adapted

Tab 15: Inventory of marine ichthyofauna of S. Tomé and Príncipe

Large pelagic vertebrates		
N.º	Designation	Obs.
1	<i>Istiophoridae</i> (Peixe Andala)	
2	<i>Xipiidae</i> (Peixe Fumo)	
3	<i>Scombridae</i> (Olêdê, Judeu, Olho Grosso)	
4	Large tunids	Migrating species.
Small pelagic vertebrates		
1	<i>Clupeidae</i> (sardines)	
2	<i>Scombridae</i> (small tunids, fulufulu, cavala, peixe serra)	
3	<i>Carangidae</i> (bonito, olho grosso, sêlêlê, corcovado, carapau, osso mole)	
4	<i>Mugilidae</i> (tainhas)	
5	<i>Gobiidae</i> (peixinho)	
6	<i>Exocetidae</i> (flying fish)	
7	<i>Moreidae</i> (Moray)	
Demersal fishes		
1	<i>Serranidae</i> (cherne, badejo, bacalhau e peixe sabão)	
2	<i>Holocentridae</i> (caqui)	
3	<i>Scianidae</i> (corvina)	
4	<i>Litjanidae</i> (vermelho fundo, vermelho terra e pargo)	
5	<i>Sparidae</i> (vermelho sangue, vermelho sol, malagueta)	
6	<i>Moreidae</i> (Moray)	

Source: Dados adaptados do relatório ENPAB-Marinho e Costeiro .

Tab. 16 - Species identified in 2006 by Brazilian scientists in STP				
Habitat	Non-commercial species	Commercial species		Species total
		wanted	Highly wanted	
Demersal	14	41	10	65
Reef	9	34	25	68
Pelagic	3	18	11	32
Batipelagic	1	12	5	18
Total	27	105	51	183

Source: data adapted from ENPAB-Coastal and marine 2002.

Tab. 17 : Inventory of most-often captured commercial fish species

Nº	Família	Nome científico	Local name
1		<i>Tylurus acus rafale</i>	Agulha quio/Zarve
2		<i>Sardinella maderensis</i>	
4	ACANTHURIDAE	<i>Prionuris biafraensis</i>	Asno cota
5	ALBULIDAE	<i>Albula vulpes</i>	Colepinha malabo
6	BALISTIDAE	<i>Balistes punctatus</i>	Asno
7	BELONIDAE	<i>Ablennes hians</i>	Agulha espada
8	BOTHIDAE	<i>Bothus guibeii</i>	Linguado
9	BRANCHIOSTEGIODAE	<i>Branchiostegus</i>	Peixe-cabra
10	CARANGIDAE	<i>Elagatis bpimulata</i>	Alada
11	CARANGIDAE	<i>Trachinotus ovatus</i>	Bebeca
12	CARANGIDAE	<i>Caranx crysos</i>	Bonito
13	CARANGIDAE	<i>Decapterus punctatus</i>	Carapau
14	CARANGIDAE	<i>Selar crumenoptalmus</i>	Carapau
15	CARANGIDAE		Cavala
16	CARANGIDAE	<i>Caranx hippos</i>	Corcovado
17	CARANGIDAE	<i>Urapsis secunda (ou heidi</i>	Osso mole
18	CARANGIDAE	<i>Blepharis crinitus</i>	Pata Pata
19	CARANGIDAE	<i>Selene dorsalis</i>	Pata Pata
20	CARANGIDAE	<i>Caranx hippos</i>	Peixe olho grosso
21	CLUPEIDAE	<i>Sardinella aurita</i>	Longo
22	CLUPEIDAE	<i>Sardinella cameronensis</i>	
23	CORYPHAENIDAE	<i>Coriphaena e quiselis</i>	Colombeta
24	CYNOGLOSSIDAE	<i>Cynoglossus senegalensis</i>	Linguado
25	DACTYLOPTERIDAE	<i>Dactylopterus volitans</i>	Concon
26	DREPANIDAE	<i>Drepane Africana</i>	Cozinheiro
27	ECHENEIDAE	<i>Remora brachyptera</i>	Peixe pilota
28	ELOPIDAE	<i>Elops senegalensis</i>	Colepinhã balabo
29	EMMELICHTHYIDAE	<i>Erythrocles monodi</i>	
30	EXOCETIDAE	<i>Cypselurus melanurus</i>	
31	FISTULARIDAE	<i>Fistularia petimba</i>	Agulha buzina
32	GERRIDAE	<i>Eucinostomus</i>	Parente
33	GRAMMISTIDAE	<i>Rypticus saponaceus</i>	Peixe sabão
34	HEMIRAMPIDAE	<i>Hemiramphus balao</i>	Maxipombo
35	HOLOCENTRIDAE	<i>Holocentrus ascencionis</i>	Caqui
36	HOLOCENTRIDAE	<i>Sargocentron hastatus</i>	Caqui (mãe)
37	HOLOCENTRIDAE	<i>Myripristis jacobus</i>	Mãe de caqui
38	ISTIOPHORIDAE		Peixe Andala
39	KUHLIDAE	<i>Parakuhlia macrophthalmus</i>	Bujigo
40	HAEMULIDAE	<i>Pomadasys peroteti</i>	
41	KYPHOSIDAE	<i>Kyphosus incisor</i>	
42	LABRIDAE	<i>Bodianus speciosus</i>	Bulhão
43	LABRIDAE	<i>Xirichthys novacula</i>	
44	LOBOTIDAE	<i>Lobotes surinamensis</i>	
45	LUTJANIDAE	<i>Apsilus fuscus</i>	Peixe novo
46	LUTJANIDAE	<i>Lutjanus fulgens</i>	
47	MONACANTHIDAE	<i>Cantherines sp.</i>	Asno buçeta
48	MONACANTHIDAE	<i>Aluterus sp.</i>	Asno de fundo
49	MUGILIDAE	<i>Mugil curema</i>	
50	MULLIDAE	<i>Pseudupaeneus prayensis</i>	

51	MURAENIDAE	<i>Lycodontis afer</i>	Moreia
52	OPHICHTHIDAE	<i>Pseudomyrophis</i>	ou Moreia
53	POLYNEMIDAE	<i>Galeoides decadactylus</i>	Barbudo
54	POMACANTHIDAE	<i>Abudefduf marginatus</i>	
55	POMACANTHIDAE	<i>Holocanthus africanus</i>	
56	PRIACANTHIDAE	<i>Heteropriacanthus</i>	Peixe sol
57	SCARIDAE	<i>Sparisoma rubripinne</i>	Bulhão congo
58	SCIAENIDAE	<i>Pseudotolithus</i>	
59	SCOMBRIDAE	<i>Thunnus obesus</i>	Atum flogo
60	SCOMBRIDAE	<i>Katsuwonus pelamis</i>	Atum judeo
61	SCOMBRIDAE	<i>Thunnus albacares</i>	Atum oledê
62	SCOMBRIDAE	<i>Auxis thazard</i>	Fulu Fulu
63	SCOMBRIDAE	<i>Euthynnus alletteratus</i>	Fulu Fulu
64	SCOMBRIDAE	<i>Acanthocybium solandri</i>	Peixe fumo
65	SCOMBRIDAE	<i>Scomberomorus tritor</i>	Peixe-serra
66	SCORPAENIDAE	<i>Pontinus kuhlii</i>	Canga
67	SCORPAENIDAE	<i>Scorpaena laevis</i>	Come molê
68	SERRANIDAE	<i>Epinephelus aeneus</i>	Bacalhau
69	SERRANIDAE	<i>Epinephelus</i> Sp.	Badejo
70	SERRANIDAE	<i>Epinephelus goreensis</i>	Badejo branco
72	SERRANIDAE	<i>Cephalopholis taeniops</i>	Bôbô quema
73	SERRANIDAE	<i>Anthias anthias</i>	Capitão
74	SERRANIDAE		Cherne
75	SERRANIDAE	<i>Cephalopholis nigri</i> (?)	Cota uê /Cota oyo
76	SERRANIDAE	<i>Epinephelus adscensionis</i>	Garoupa
77	SERRANIDAE	<i>Paranthias furcifer</i>	Mulato/ Bala Bala
78	SPARIDAE	<i>Lethrinus atlanticus</i>	Bica
79	SPARIDAE	<i>Bops boops</i>	Bonga
80	SPARIDAE		Cachucho (vermelho)
81	SPARIDAE	<i>Pagellus belottii</i>	Malagueta
82	SPARIDAE	<i>Dentex congoensis</i>	Mamaminha
83	SPARIDAE	<i>Pagrus caeruleostictus</i>	Pargo
84	SPARIDAE	<i>Dentex congoensis</i>	
85	SPARIDAE	<i>Dentex macrophthalmus</i>	
86	SPHYRAENIDAE	<i>Sphyaena barracuda</i>	Barracuda
87	SPHYRAENIDAE	<i>Sphyaena sphyarena</i>	Pescada
88	TETRAODONTIDAE	<i>Lagocephalus laevigatus</i>	Coelho
89	URANOSCOPIDAE	<i>Uranoscopus polli</i>	Lenha (rainha)

Source: Data adapted from ENPAB-Coastal and marine.

Tab. 18: Inventory of major crustaceans of S. Tomé e Príncipe

Class	Order	Scientific name	Locally known as		
Decapods	?	<i>Penaeus</i> sp.	shrimp		
Decapods	?	<i>Metapenaeus</i> sp.	shrimp		
Decapods	?	<i>Parapenaeus</i> sp.	shrimp		
Decapods	?	<i>Palinurus</i> sp.	Lobster		
Decapods	?	<i>Callinectes</i> sp.	Lobster		
Decapods	?	<i>Geryon maritae-santola?</i>	Crab		
Decapods	?	<i>Paramola cuvieri-aranha</i>	Crab		
Decapods	?	<i>Scyllarides herklatail</i>	Scale		
Decapods	?	<i>Nephrops</i> sp.	Langoustine		
?	?	<i>Macrobrachium zariquieyi</i>	shrimp	ES	EP
?	?	<i>Macrobrachium raridens</i>	shrimp		
?	?	<i>Atya intermedia</i>	?		

?	?	<i>Atya scabra</i>	?
?	?	<i>Sicydium bustamantei</i>	Sweet-water shrimp
?	?	<i>Cardisoma amatum</i>	crab
?	?	<i>Cambarus?</i>	?

Source: Adapted from ENPAB-Coastal and marine 2002.

Tab. 19: Inventory of major mollusk species of S. Tomé and Príncipe

Class	Order	Family	Scientific name	Local name
Gasteropoda		Buccinidae	<i>Buccinum sp.</i>	Búzio-do-mar
Pelecypoda		Veneridae	<i>Vénus spp.</i>	Ameijoa
Pelecypoda	Ostreides		<i>Ostrea spp.</i>	Ostra
Pelecypoda	Ostreides		<i>Crassostrea</i>	Ostra
Pelecypoda	Mytilides		<i>Lithodomus</i>	Canivete
Cefalópodes	?	Octopodes ?	<i>Octopus sp.</i>	Polvo
Cefalópodes	?	Decapodes?	<i>Sepia sp.</i>	Choco
Cefalópodes	?	Decapodes?	<i>Ommastrephes sp.</i>	Lula
Cefalópodes	?	Decapodes?	<i>Ommastrephes sp.</i>	Calamares
Gasteropoda	Archaeogastropoda	Neretidae	<i>Neretina afra</i>	Caramuso
Gasteropoda	Archaeogastropoda	Neretidae	<i>Neretina manoeli</i>	Molusco de Água doce
Gasteropoda	Archaeogastropoda	Skenediae	<i>Teinostoma fernandense</i>	Molusco marinho (P)
Gasteropoda	Archaeogastropoda	Skenediae	<i>Teinostoma funiculatum</i>	
Gasteropoda	Neogasteropoda	Buccinidae	<i>Paradoxa thomensis</i>	Molusco marinho
Gasteropoda	Neogasteropoda	Buccinidae	<i>Paradoxa confirmata</i>	Molusco marinho
?		?	<i>Tropidorissola</i>	
Gasteropoda	Neogasteropoda	Marginellidae	<i>Marginella melvilli</i>	Molusco marinho (ST)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Marginella liparozona</i>	Molusco marinho (ST)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Marginella charlmersi</i>	Molusco marinho (ST)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Marginella aemma</i>	Molusco marinho (P)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Volvarina insulana</i>	Molusco marinho (STP)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Granulina parilis</i>	Molusco marinho (STP)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Cysticus gutta</i>	Molusco marinho (STP)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Cysticus josephyinae</i>	Molusco marinho (P)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Gibberula modica</i>	Molusco marinho (STP)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Gibberula cucullata</i>	Molusco marinho (STP)
Gasteropoda	Neogasteropoda	Marginellidae	<i>Gibberula puntulun</i>	Molusco marinho (STP)
Gasteropoda	Neogasteropoda	Muricidae	<i>Muricopsis marianae</i>	Molusco marinho (ST)
Gasteropoda	Neogasteropoda	Muricidae	<i>Muricopsis marianae</i>	Molusco marinho (ST)
Gasteropoda	Neogasteropoda	Muricidae	<i>Muricopsis matilae</i>	Molusco marinho (ST)
Gasteropoda	Neogasteropoda	Muricidae	<i>Muricopsis principensis</i>	Molusco marinho (P)
Gasteropoda	Neogasteropoda	Turridae	<i>Scaevatula pellisserpentis</i>	Molusco marinho (STP)
Gasteropoda	Neogasteropoda	Turridae	<i>Scaevatula amancioi</i>	Molusco marinho (P)
Gasteropoda	Neogasteropoda	Turridae	<i>Cassispira sacerdotalis</i>	Molusco marinho (ST)
Gasteropoda	Neogasteropoda	Turridae	<i>Agathothoma finalis</i>	Molusco marinho (STP)
Gasteropoda	Stylommatophora	Thyrophorellidae	<i>Thyrophorella thomensis</i>	Molusco terrestre (ST)
Gasteropoda	Stylommatophora	Coelaxidae	<i>Pyrgina umbilicata</i>	Molusco terrestre (ST)
Gasteropoda	Stylommatophora	Coelaxidae	<i>Thomea newtoni</i>	Molusco terrestre (ST)
Gasteropoda	Stylommatophora	Achatinidae	<i>Archachatina bicarinata</i>	Molusco terrestre
?	?	?	<i>Bulinus forskalli</i>	?
?	?	?	<i>Schistosoma intercalatum</i>	?

Tab. 20: Inventory of main turtle species of S. Tomé and Príncipe

Main sea turtle species listed as protected in São Tomé e Príncipe				
Class	Order	Family	Scientific name	Local name
Reptilia	Testudines	Cheloniidae	<i>Cheloniias mydas</i>	Ambó or “white hand”
Reptilia	Testudines	Cheloniidae	<i>Carreta carreta</i>	Cabeça Grande ou Tartaruga Vermelha
Reptilia	Testudines	Cheloniidae	<i>Lepidochelys olivacea</i>	Tartaruga bastarda, Tatô
Reptilia	Testudines	Cheloniidae	<i>Dermochelys coriacea</i>	Tartaruga Ambulância

Source: adapted from ENPAB-Coastal and marine 2002.

Tab. 21: Inventory of main Cetacea species in S. Tomé and Príncipe

List of main cetacea in São Tomé and Príncipe			
Order	Family	Nome científico	Vernacular
Cetáceos	Mysticetes	<i>Balaenoptera musculus</i>	Blue whale
Cetáceos	Mysticetes	<i>Balaenoptera borealis</i>	Blue whale
Cetáceos	Mysticetes	<i>Balaenoptera acurostrata</i>	Blue whale
Cetáceos	Mysticetes	<i>Balaenoptera edeni</i>	Blue whale
Cetáceos	Mysticetes	<i>Balaenoptera plvshalus</i>	Blue whale
Cetáceos	Mysticetes	<i>Balaenoptera nodosa</i>	Humpback whale
Cetáceos	Odontocetes	<i>Delphinus delphis</i>	Dolphin

Source: adapted from ENPAB-Coastal and marine 2002 .

