

NATIONAL DIRECTORATE FOR THE ENVIRONMENT

**FIFTH NATIONAL REPORT
ON THE STATUS OF BIODIVERSITY
IN CABO VERDE**

August 2015

Technical sheet

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GEF/UNEP

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Rainer Breitling ; Amelia Coleing; Tiago Peixoto ; Helen Nagle ; E. Geoffrey Hancock; Robert N. Kelsh ; Tamas Szekely. 2012. An overview of the spider fauna of Maio (Cape Verde Islands), with some additional recent records (Arachnida, Araneae).....	91
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ANNEX I. MAIN SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACTS OF THE FISHING AGREEMENT BETWEEN CABO VERDE AND THE EUROPEAN UNION. . 92

EXECUTIVE SUMMARY

The National Report on the State of Biodiversity, in conjunction with the National Biodiversity Strategy and Action Plan (NBSAP), is the main implementation instrument for the Convention on Biological Diversity (CBD) at national level, in accordance with the provisions of its Article 6. These instruments emphasize a strategic and objective approach, which aims to inspire a broad action from all stakeholders.

The IV Report was prepared in 2009. With this V Report, the country intends to establish a certain alignment with the overall orientation contained in the 2011-2020 CBD Strategic Plan. Thus, on the basis of these guidelines, the report is basically structured to include a general introduction, a methodological approach to the works and two main chapters - Chapter I, which analyzes the situation, trends and threats to biodiversity and provides information on the current status of biodiversity, and the conservation and protection measures adopted by National Authorities; and Chapter II, which analyzes the current situation of the NBSAP, provides the current status of its implementation and highlights the achievements and constraints encountered in its implementation as an environmental management tool.

It was not possible to include in the main body of the report some information as suggested in the Guidelines on preparing the V Report given their nature, level of details and technical-scientific expressions. Nevertheless, given their importance and relevance, they have been incorporated in annex to allow better understanding of the subject matter.

This report was prepared in four successive stages: (1) collection and desk review of biodiversity-related information, mainly those produced between 2009 and 2014; (2) interactive technical meetings with the coordination team; (3) national meeting for restitution of outcomes, collection of inputs and final technical validation of the report's guidelines, and (4) drafting of the final version of the document.

CURRENT BIODIVERSITY STATUS AND TRENDS

Biodiversity, Environmental Services and Human Well-being

Cabo Verde is an island, oceanic and tropical system. Therefore, the territory is naturally fragmented and isolated from permanent continental influences, and possesses a relatively rich biodiversity, typical of tropical regions, normally characterized by very diverse populations but relatively weak in abundance.

Cabo Verde's population is growing at an average annual rate of 1.5% which, combined with the natural, landscape, and cultural conditions (which, through tourism, connects the archipelago to the outside world), explains the importance of biodiversity conservation in the country, in all its aspects - genetic, specific, taxonomic, ecological and functional. Apart from the ecological importance, biodiversity is the support of all economic

activities, particularly (i) agriculture, forestry and livestock; (ii) fishing; (iii) seaside and beach tourism; (iv) water, recreational and leisure sports; and (v) ecotourism / nature tourism.

Major changes in biodiversity status and trends

Current Knowledge

Between 2009 and 2014, there have been significant advances in the knowledge on biodiversity. Many studies conducted by national and foreign experts of different sources, some of them within the framework of cooperation projects, described new *taxa* and ecosystems, contributing to a significant increase in knowledge of biodiversity in the archipelago. However, a significant portion of existing information is very diffuse in nature and of no proven scientific validity, as they result from non-systematic compilations, not always from official publications as they were not published in scientific journals. There is no national observatory on biodiversity for an objective reference of the situation and which would allow analyzing the trend according to national development.

Current Conservation status

In Cabo Verde, there are still no indexes or indicators that allow for regular and systematic monitoring of biodiversity, which makes it complicated to present a real current status. However, despite these shortcomings, the result of surveys targeting national partners reveal that biodiversity is best preserved where there are functional natural parks. On the islands of São Nicolau and Fogo, where there are functional natural parks, conservation actions for plant biodiversity are notorious, including the gradual replacement of invasive plants by indigenous ones, monitoring of native plants by the population and inventories conducted in order to improve knowledge.

Main Threats and Pressures

Pressures on biodiversity in Cabo Verde continue to increase and, as in other island regions, this is due to natural and anthropogenic factors. These are noteworthy, not because they are more pronounced, but because they are more easily controlled by man himself.

Pressures on terrestrial biodiversity continue to derive usually from human activities, directly and indirectly through fragmentation, destruction, and disruption of habitats and human predation. Studies focusing on the impact of anthropogenic factors on plant biodiversity, identify invasive species, fragmentation of ecosystems, free grazing and harvesting of pasture, as the main causes of pressure on biodiversity in Cabo Verde, in addition to poor organizational and legislative management, insufficient knowledge and environmental awareness, and poor assimilation of climate change.

As for marine biodiversity, fisheries, tourism, water sports, recreation and leisure, naval and port activities, and maritime transport are still considered the main factors of pressure.

The main changes in biodiversity status and trends result from economic activities and ongoing development projects, and are direct and indirect threats of biodiversity loss. They are mainly: (i) rural poverty, (ii) coastal erosion, (iii) illegal, unreported, unregulated fishing (IUU), (iv) marine pollution, (v) import of aggregates and other construction materials, (vi) climate change, (vii) weak environmental citizenship, and (viii) cumulative, multiplicative and amplifying effects of threats.

Response to pressures and threats on land biodiversity

Although biodiversity still remains under strong human pressure, mitigation measures have always been implemented under different conservation projects that were, and are being, implemented, especially in recent years.

The creation of the National Protected Areas Network (Decree-Law 3/2003) with 46 Protected Areas (PA) demonstrates the importance afforded to *in-situ* biodiversity conservation. In 2009 there were only 3 operational terrestrial PAs in Cabo Verde, totaling about 2.5% of the national territory. At the time, there were no operational marine PAs. Between 2009 and 2014, the number of operational PAs went from 3 to 26, of which 9 terrestrial and 17 marine and coastal PAs, exceeding 10% of national protected area. All these units have had their limits approved and the management plans have either been approved or are in the approval stage, and are being managed and coordinated by their respective teams. Management plans of the natural parks of Monte Verde, on the island of São Vicente, Moroços, Cova, Ribeira da Torre and Ribeira do Paul on the island of Santo Antão, the Natural Reserves of Ponta Sinó, Fragata and Serra Negra on Sal Island, the North Natural Park and Turtle Reserve in on the island of Boavista are at the approval stage (DGA, 2014).

Also of relevance are the various actions undertaken in the fields of agriculture, forestry, animal husbandry and tourism planning, which have been responding to pressures from tourism, poor agricultural and farming practices, as well as from the extraction of inert materials on the coast and in the dry river-beds.

Impacts of the changes in biodiversity for ecosystem services

For the purposes of this report, ecosystem services and environmental services are understood to be the range of benefits from biodiversity for human well-being in a sustainable manner, including processes, functions and raw materials. Thus, it can be assumed that in Cabo Verde, given its archipelagic, oceanic and tropical nature such services are essentially those deriving from the main natural resources of easy access and mobilization, such as water and its ecological and climate functions, soil and the resources from terrestrial fauna and flora, the sea, animal and plant resources, and even landscape and climate.

Thus, in the agro-livestock systems, the construction of dams and large dams, in addition to the primary function of increasing water availability for irrigated agriculture, has contributed to the emergence of wetlands used as feeding and resting grounds of migratory

and native birds. The already built dams, coupled with the selection of crop varieties and valuation of traditional varieties contribute to better food supply and therefore greater food security in Cabo Verde. Furthermore, these ecosystems have become an attraction to scientific and leisure tourism as well as ecotourism/nature tourism, one of the emerging activities of great economic potential. The functional natural parks on the islands of Sao Nicolau, Santiago and Fogo have contributed to a significant increase in visits to those islands.

However, it is known that the degradation of ecosystems have adverse effects on the various services they can provide. For example, invasive exotic species, considered one of the greatest threats to the archipelago's biodiversity, require that measures and actions be taken for their control and management. Such costs can sometimes be high, but the implementation of preventive measures with the existing technologies in the country can prevent the loss of millions of escudos in agriculture, forests and natural ecosystems as well as human health itself.

At the marine and coastal levels, we have sought a greater assimilation and mitigation of the main threats to biodiversity. Fishing as a professional activity provides income for its operators and a source of growth for the economy. However, the activity continues to accumulate sustainability difficulties in the face of stability needs of existing jobs and governments' claims and projections in terms of generating direct economic returns and balancing the balance of payments, via exports. Fishery, as a major national source of animal protein, and among the healthiest, continues to register income decrease, compared to a continuous increase in fishing effort, and an ever more pronounced incursion into previously non-commercially exploited targeted species, causing de-structuring in the marine food chain. In addition there is an almost commercial extinction of important species, as mentioned in this report.

The marine production that feeds the plant and animal life in the sea and, in the end scale, fishing, for reasons of climate and anthropogenic nature, has been declining, given the natural lags observed in the seasonal cycles of nutrients through the atmosphere (desert dusts and rain - "dust fog" or *pó di terra*), sea (Upwelling) or land (rain and leaching of soils by runoff). In the first case, when the causes are natural, the impacts become difficult to mitigate. However, when they are anthropogenic, as in the case of reduced water flow and nutrients entering annually into the sea in certain regions and islands, due to the construction of dams, such causes should be further studied and the impacts mitigated aiming at a balanced agricultural development, without affecting fishing and other downstream activities.

Tourism and water, recreation and leisure sports, as economic, social and cultural activities, tend to lose quality in the face of the phenomena of coastal erosion of beaches as a result of falls in cycles and sand transportation corridors, due to anthropic reasons, especially on the islands of Sal and Boavista. Ecotourism / nature tourism provided along with underwater observations and excursions, currently as an emerging and promising activity, may be disturbed right at this early stage because of the rarity of emblematic species and the disruption of marine ecosystems as a result of pressure from IUU fishing.

In addition, tourism for the observation of iconic coastal species as the turtle, although currently flourishing, could be reduced early on if the hunting pressures on the species and the destruction of their habitats in the reproductive stage of their life cycle are not properly and consistently assimilated and minimized.

The use of ecological biodiversity in its substrate strand for human occupation of shorelines and coastal regions has been jeopardized by frequent episodes of threats from the stabilization of constructions, by expected floods in lower regions of the islands, especially at peak seasons in the natural processes and cycles (ripples, tide cycle and sea level) under the influence of changes attributed to climate and human pressures.

Outlook on future changes for biodiversity

The second NBSAP is a great opportunity to plan actions that in the next 15 years could contribute to greater mitigation of still prevalent pressures and threats on biodiversity, in order to consolidate already verified gains. This awareness opens interesting perspectives in terms of positive changes in the status and trends of biodiversity. So in terms of decision-making, greater political and governmental awareness of the archipelago's capacities and natural limitations should lead to more appropriate formatting of the economic, social and cultural development, according to the limitations and capacity load conferred by nature. These limitations and capabilities must be carefully studied, diagnosed and their changes should be monitored in the short, medium and long term. In this context, regardless of the options and political development models elected, we should promote an integrated view of the archipelago capable of maximizing favorable natural conditions and mitigate unfavorable ones.

NATIONAL STRATEGY AND ACTION PLAN

Biodiversity targets in Cabo Verde

In responding to the provisions of the CBD Article 6, Cape Verde drafted its first NBSAP that from the year 2000 up to the preparation of the Inter-Sectoral Action Plan on Sustainable Biodiversity Management in 2003 guided biodiversity conservation actions, which served to assess the commitments made within this framework.

During the 2002 COP 6 in The Hague, the parties adopted for the first time the Strategic Plan designed to guide the implementation of the Convention, having established the "2010 Targets" - *"achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national levels as a contribution to poverty alleviation and to the benefit of all life on Earth."*

Overall, the implementation of the 2010 Targets was deficient. Although most Targets were not achieved, the implementation of the CBD noted significant advances, particularly legislative gains, *in situ* conservation, conservation of endangered species, and participation of local communities in conservation and implementation of biodiversity

enhancement pilot projects. Since the establishment of the National Protected Areas Network in 2003, many actions have been developed with notorious capital gains. Thus according to the Fourth Report on the State of Biodiversity, until 2009 there were only 3 operational terrestrial PAs in Cabo Verde, totaling about 2.5% of the national territory. There were no marine areas operational at the time. Between 2009 and 2014, the number of operational PAs increased from 3 to 26, of which 9 terrestrial and 17 marine and coastal PAs, exceeding 10% of national protected area. All these units have their limits and management plans approved or awaiting approval, and are managed by their respective teams.

From the objectives of the first NBSAP which contains seven priority areas (Agricultural, Livestock, Forestry, Fisheries Sustainability, *in situ* and *ex situ* Conservation, Dissemination and Information, Research and Training) the implementation was positively assessed, thus opening up good prospects for the implementation of the objectives of the second NBSAP.

Update of strategy and action plan

The Second NBSAP was drafted in the 2nd quarter of 2014 through a widely participatory process for the 2014-2030 period with the vision that *"By 2030, Cabo Verde will protect, restore and enhance its biodiversity, promote its sustainable use, enhance mechanisms of participation and taking ownership of benefits in a fair and equitable manner, contributing to the country's development."* The strategy is developed around the principles of effective conservation and biodiversity mainstreaming, involvement and participation of society in biodiversity conservation and sustainable use as well as in fair and equitable distribution of benefits for the country's development and population well-being.

To address the still prevailing pressures, the NBSAP set seven national priorities: (i) civil society involvement (population, public and private organizations, NGOs and associations) in biodiversity conservation; (ii) mainstreaming biodiversity into strategies, policies, plans and programs of action; (iii) reducing pressures and threats on biodiversity; (iv) conservation of priority habitats and sustainable management of natural resources; (v) recovery and increased resilience of ecosystems; (vi) increased knowledge, monitoring and evaluation of biodiversity, and (vii) mobilization of funds. A set of goals was defined for each priority, as summarized in the table below:

Main targets set in the Second NBSAP to achieve by 2030.

Timeframe	Target
2018	Pollution will be reduced, its sources identified and brought to levels that are non detrimental to the normal functioning of ecosystems;
	All approved strategies and conservation plans will integrate elements of climate change resilience and adaptation;
2020	Marine resources are managed sustainably;
2025	Ecological, economic and social biodiversity values will be integrated into national and local poverty reduction strategies and planning processes and are duly incorporated into national accounts;

	20% of terrestrial PAs and 5% of coastal areas that are ecologically representative and important will be preserved through a coherent PA system efficiently and equitably managed through SPAMPL.
2030	Civil society is aware of biodiversity importance and values and of the necessary measures for its sustainable use.

Actions taken to implement the CBD

Though biodiversity in Cabo Verde is still under strong human pressure, the country has made efforts to keep up with the global dynamic around biodiversity conservation, either by ratifying international conventions and treaties, or pursuing policies, plans, programs and projects with visible results. Thus, despite the human and financial resources constraints and a still deficient link between conservation and development, there was significant advance in biodiversity conservation initiatives, including improvement of legal and institutional aspects, such as the proposal to establish an autonomous PAs management body. The country has respected the international commitments in this area, with significant progress made in the recovery of threatened species and degraded areas, greater involvement of national institutions, more information and awareness of populations, more knowledge on environment and the importance of biodiversity in development and promotion of the well-being of Cabo-Verdeans.

Mainstreaming biodiversity in sectoral and cross-sectoral strategies

The VIII Legislature (2011-2016) Government Program defined as guidelines for environment and natural resources to create an agenda based on innovation in the search for an optimal integration of renewable energies in sustainable cities and creating a more respectful attitude toward nature and the environment in Cabo Verde. Efforts to establish and manage PAs, combat of desertification, protection of forests, improved wastewater treatment and introduction of clean energy have been integrated as part of the agenda. The GPRSP II was prepared based on this guidance and is being implemented by public services, both at central and municipal levels, with the involvement of the private sector through public-private partnerships. Integration of biodiversity has therefore represented a political and strategic development framework based on government programs and the MDGs by integrating various planning instruments, notably (i) Main Options of the Plan, (ii) Government Program, (iii) the GPRSP, (iv) Poverty Reduction Strategy, (v) National Action Program against Desertification, (vi) Strategy and National Action Plan on Climate Change, (vii) National Forestry Action Program, (viii) 2004-2014 Fishery Resources Management Plan, (ix) Water Resources Integrated Management and Action Plan, (x) Strategic Plan for Tourism Development, as well as other plans and principles contained in international agreements and treaties.

By way of example, it is stated that the 2010-2013 Strategic Plan for Tourism Development, in describing the potentials of the archipelago's major tourist islands, highlighted the main natural spaces that make up the PAs Network on the islands and emphasized the need for conservation and enhancement of wildlife, flora and landscape values as key tourism products.

Mainstreaming biodiversity in economic activity continues to be done by requiring proper treatment of issues related to the conservation of fauna, flora, and ecosystems in general, and in the EIA process of economic activities.

ABBREVIATIONS

Acronym/ Abbreviation	Description
EIA	Environmental Impact Assessment
MPA	Marine Protected Areas
PA	Protected Areas
BCV	Central Bank of Cabo Verde
BSE	Bovine Spongiform Encephalopathy
C	Carbon (chemical element)
COP6	Conference of the Parties
CBD	Convention on Biological Diversity
CVE	Cabo-verdean Escudos
GPRSP	Growth and Poverty Reduction Strategic Paper
DGA	Directorate General for the Environment
DGADR	Directorate General for Agriculture and Rural Development
DGASP	Directorate General of Agriculture, Forestry and Livestock
DGRM	Directorate General for Marine Resources
DNA	National Directorate for the Environment
EIS	Environmental Impact Study
NBSAP	National Biodiversity Strategy and Action Plan
WWTS	Wastewater Treatment Station
FAO	United Nations Food and Agriculture Organization
<i>Fe</i>	Iron (chemical element)
FEAPA	Federation of Artisanal Fishermen Associations
FIBA	International <i>Banc D'Arguin</i> Foundation
GEF	Global Environment Facility
GPA	<i>Green Project Awards</i>
INDP	National Institute for Fisheries Development
INE	National Statistics Institute
INIDA	National Institute for Agricultural Research and Development
IUU	Illegal, Undeclared, Unregulated
MAHOT	Ministry of Environment, Housing and Land Planning
MAAP	Ministry of Environment, Agriculture and Fisheries
MDR	Ministry of Rural Development
MESCI	Ministry of Higher Education, Science and Innovation
NBSAP	National Biodiversity Strategy and Action Plan
ODM	Millennium Development Goals
WHO	World Health Organization
NBO	National Biodiversity Observatory
NGO	Non-governmental Organization
PANA	National Action Plan for the Environment
SPAMP	Special Protected Areas Management Plans
FRMP	Fishery Resources Management Plan
GDP	Gross Domestic Product
RMCP	Regional Marine and Coastal Conservation Program

GAC	General Agricultural Census
NRSB	National Report on Biodiversity Status
ESPA	Executive Secretariat for the Environment
U.E.	European Union
IUCN	International Union for Conservation of Nature
EEZ	Exclusive Economic Zone

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INTRODUCTION

The Xth Conference of the Parties to the Convention on Biological Diversity (CBD) in Nagoya, approved the 2011-2020 Biodiversity Strategic Plan and the Aichi Targets for Biodiversity. These instruments aim to promote the effective implementation of the CBD through a strategic and objective approach, which aims to inspire a broad action from all. Thus, the Convention recommended the Parties to review their national strategies and action plans, taking into account the new targets and the Global Strategic Plan, and the presentation of the V National Report on the State of Biodiversity (NRSB).

The NBSAP and NRSB are the main implementation instruments of the Convention, at national level, as per its Article 6. On the basis of these guidelines, Cabo Verde obtained the funding needed to carry out the exercise, of which this report is a part.

The four previous reports were prepared in 1999, 2002, 2006 and 2009. The four previous reports were prepared in 1999, 2002, 2006 and 2009. The status and trends of biodiversity at the national level can be best assimilated if, in a broadest possible framework, there is an understanding that previous reports are complemented by the current one in all aspects which informed the objectives of development and use of such environmental management tools under the CBD. In this context, this report presents a certain alignment between the two instruments and between them and the overall orientation of the Convention's 2011-2020 Strategic Plan. Thus, this report is basically structured into this general introduction, followed by a methodological approach to the works leading to its preparation, and two main chapters:

Chapter I analyzes biodiversity status, trends and threats and provides information on the current situation at national level, the threats and the conservation and protection measures adopted by national authorities. It analyzes biodiversity from three different, but complementary perspectives of sustainable human development (i) as a raw material and source that feeds national development - Status Factors; (ii) as a target of the pressure from economic, social and cultural development - Pressure Factors, and (iii) as a target of conservation policies, plans, programs and projects - Response Factors, for sustainable development. In the final part, it provides a reflection on the impact of the changes in biodiversity for ecosystem services and the future prospects of such changes.

Chapter II, less extensive than Chapter I, analyzes the status of the NBSAP, providing the current status of its implementation as an environmental management tool, highlighting the achievements and constraints which Cabo Verde has encountered. It looks at the updates, briefly presenting the main targets drawn from the second NBSAP prepared in 2014 to cover the period up to 2030, and ends with a brief analysis of the measures for implementing the CBD and its mainstreaming into sectoral and intersectoral development strategies, as well as the outlook and progress towards the 2015 and 2020 (Aichi Targets) MDGs.

METHODOLOGY

The preparation of this report involved four stages and several successive steps: 1) collection, as exhaustive as possible, and analysis of biodiversity literature, mostly produced between 2009 and 2014; 2) interactive technical and coordination meetings with the DNA for necessary adjustments in terms of form and content; 3) regional socialization meetings of the draft version for technical validation, and 4) preparation of the final version.

Thus, the methodological framework included the following successive steps:

1. Meetings with the coordination team for clarification of objectives, targets, implementation plan and schedule;
2. Surveys and documentation consultation on the status of biodiversity in Cabo Verde;
3. Analysis and synthesis of information leading to the preparation of the draft;
4. Presentation of the preliminary document structure, internal discussions, adjustments and corrections;
5. Preparation and presentation of the first draft, public discussion during national meetings on the islands of São Vicente (Mindelo) and Santiago (Praia), bringing together participants of institutions from the northern and southern parts of the country;
6. Incorporation of inputs from public participation and production of the final document.

The information in this V NRSB stems from the bibliographic research in scientific journals, and especially from consulting technical reports and activities undertaken by various institutions between 2009 and 2014. The data, given their nature, were verified and analyzed to the extent possible. However, the team found that unfortunately, difficulties that had already been referred to in the NRSB II in 2002 still prevail, especially in the field of biodiversity knowledge. Given their relevance, we have transcribed them below:

“... Difficulties of various kinds were noted which given their nature - inherent to the very freedom of scientific research - are likely to persist, limiting full access to information on new scientific knowledge relating to biodiversity in Cabo Verde. Indeed, many research works have been developed by foreign researchers of various nationalities, both individually or representing institutions without any real possibility of coordination by national institutions. These findings explain the reason why, no matter how detailed their bibliographic research, the information is always incomplete. Thus the establishment of a National Biodiversity Observatory, with constant updating of knowledge, should be a concern for national entities responsible for environment-related areas.”

This concern raised in 2002 still persists in 2014. Indeed, in 2005, a database was created on terrestrial biodiversity, but unfortunately it is out of date because new data was never

supplied. As we will see further on in the report, on the topic of updating knowledge, there is a wealth of scientific publications resulting from works carried out in Cabo Verde by foreign scientists that are not known to national institutions.

To note that the Guide made available to lead the preparation of the report was of vital importance because, having been guided by several very specific and targeted questions, it allowed arriving at the structure of the document, as described, with sections containing the fundamentals required in the Guide, both regarding compulsory questions and those considered optional. Thus, in terms of content, this paper seeks to provide in the first chapter the answers to the five questions related to the status and trends of biodiversity, of which one optional.

CHAPTER I
CURRENT BIODIVERSITY STATUS AND TRENDS

CHAPTER I - CURRENT BIODIVERSITY STATUS AND TRENDS

1. BIODIVERSITY, ENVIRONMENTAL SERVICES AND HUMAN WELL-BEING

In all analyses and reflections on biodiversity status, in Cabo Verde we are facing an insular, oceanic and tropical ecosystem (Figure 1 AC). Indeed, these physical, geographical and ecological characteristics are among those that most affect the environment's carrying capacity. As an insular space, it means that the territory is highly fragmented and dispersed. This situation, on the one hand, potentiates great ecological diversity due to the heterogeneity of spaces and coastlines, on the other, it shows the availability of space as a limiting factor for a natural expression in quantity.

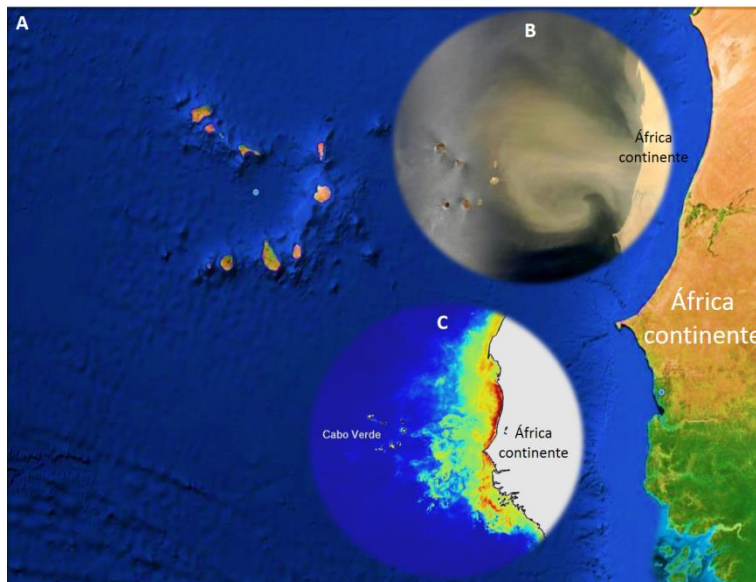


Figure 1. Natural biodiversity conditions in Cabo Verde:

A. Natural territory fragmentation due to insularity, oceanic nature and consequent distancing of direct influences of the continent.

B and C. Tropical location downstream of important atmospheric and oceanographic phenomena (Sahara Desert dust, Upwelling off the coasts of Mauritania).

These natural conditions, specific to the archipelago, make it a very particular ecosystem in the North Atlantic.

In addition to these limitations is the fact that these are islands with very low insular shelf, making it difficult for biotic and abiotic development of marine populations in great abundance. On the other hand, the oceanic nature keeps the ecosystem isolated from direct influences of continents, and therefore without direct and continuous benefit of coastal physical phenomena such as biochemical enrichment of surface waters and the consequent difficulty of sustaining natural marine productivity. As a tropical ecosystem, it has the advantage of a considerable diversity of marine, coastal and terrestrial populations that however, as mentioned, are less abundant and vulnerable to severe exploitation.

In Cabo Verde, when confronting the pace and levels of national development, given an average annual population growth rate of 1.5%, with the natural reality described in the preceding paragraphs, combined with the relationship that such natural, landscape and cultural conditions allow the archipelago to stay connected with the outside world through tourism, it justifies the importance of biodiversity conservation in Cabo Verde in all its aspects - genetic, specific, taxonomic, ecological and functional.

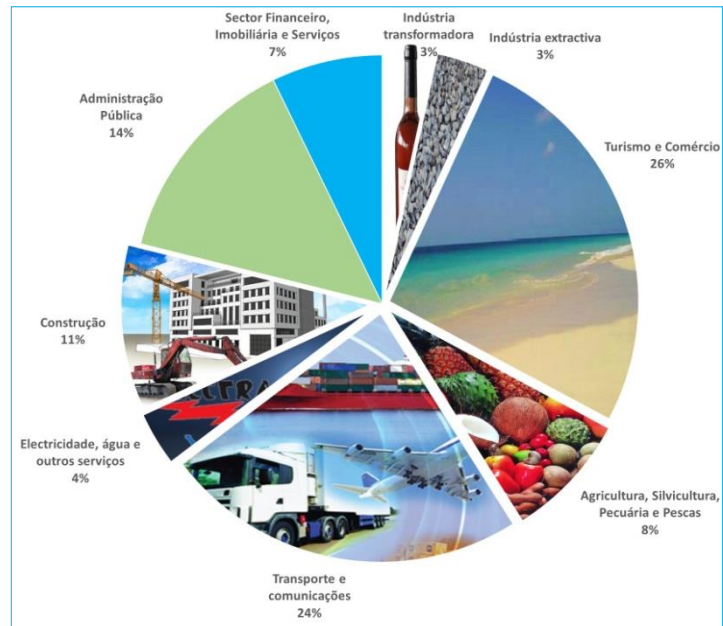


Figure 2. Sectoral composition of GDP in Cabo Verde, 2013.

Indeed, in addition to their ecological importance, judging by the sectoral composition of GDP as per BCV data in 2013 (Figure 2), biodiversity is the support of all economic activity, particularly (i) Agriculture, Forestry and Livestock; (ii) Fisheries; (iii) Beach tourism; (iv) Water, recreation and leisure sports, and (v) Nature Tourism, and (vi) of traditional and cultural values.

1.1 Agriculture, Forestry and Livestock

Agriculture, livestock and forestry accounted for 7% of GDP, in 2010, equivalent to 9,705,000 CVE (BCV, 2013). These sectors, along with fishing employ 10.2% of the population. Between 2010 and 2013, there was a significant increase in investments in the farming sector translated in increased production of roots and tubers, fruits and vegetables. During this period, agricultural research from basic genetic material tested and selected 38 species and 125 varieties of vegetables, roots and tubers, which have reflected not only in increased production and productivity, but also on the diversification of annual agricultural production. Estimated production of roots and tubers in 2013 totaled 27,163 kg and 16, 663, 000 kg in irrigated crops and 10 500 000 kg in rain-fed crops, which is equivalent to an increase of about 7% for the year 2012. In the same year, fruit production exceeded 16 000 000kg, equivalent to an increase of around 5% compared to 2012; this increase also extended to cash crops and vegetables. Coffee production in recent years has registered significant increases. Provisional data on the islands of Fogo and Santo Antão point to a production that will exceed 100 000 kg in 2014 (MDR, 2014).

In the forestry sector, 2013 national inventory data indicate a firewood plant coverage of 89 552 ha, representing 23% of the national territory. Still in 2013, 133 500 plants of 35 forest species were planted, including some of great socio-environmental, medicinal and

nutritional interest such as *Jatropha curcas*, *Moringa oleifera* and *Aloe vera*. The last two, covering a new area of 225ha, contributed to extend forested area from 1,489ha to 1,714ha, in the last four years. In economic terms, it is estimated that the wood production potential in the Monte Gordo Park forest perimeter may reach 19,780,000 CVE, an assessment that can be extended to other forest perimeters of the other islands (MDR, 2014).

In animal biodiversity, highlight goes to the production of beef, goat meat, sheep and swine, which together totaled 4 412 million kg, and poultry production, particularly chicken, which reached 929,000 kg, in the same year. Increased beef production has contributed to decrease in imports in the last four years, going from 1,664,000 kg to 1,423,000 kg in 2013, e.g. a 14.5% reduction, very significant in terms of security food and contribution to balance the balance of payments.

1.2 Fisheries

Fishing as an economic activity is supported by a considerable specific biodiversity (more than 100 commercial species - Annex I), taxonomic (several taxonomic groups - fish, shellfish and molluscs), ecological (the most diverse ecosystems from the coastal region through the submarine peaks to the open sea), genetic (endemic species of fish and shellfish - bream and pink lobster) and functional (predator-prey relationship in the marine food chain). Fishing ensures an average annual catch of 10 million kg, mainly comprising coastal pelagics (Mackarel - *Decapterus macarellus* and *D. punctatus*; Chicharro - *Selar Chrumenophthalmus* and Dobrada - *Spicara melanurus*) oceanic (Albacorae - *Thunnus albacares*, Patudo - *Thunnus obesus*, Gaiado - *Katsuwonus pelamis*, Merma - *Euthinus Aliteratus* and Judeu - *Auxis thazard*) and sharks (over 10 species).

In terms of food security in the country, fish provides the main source of animal protein. The importance of fish in the diet has gained more relevance in the last decade, internationally marked by various epidemics that affected the main traditional sources of animal protein - avian flu, swine fever and BSE. In this context, according to the WHO (WHO 2014), the international community is confronted with an increasing trend of cardiovascular diseases where a diet based on seafood products has been recommended and widely adopted by most developed countries. On the other hand, increase in *per capita* consumption of fish products, which increased from 19 kg in 1998 to 23 kg in 2003 and 26.5 kg in 2011 – these are, nevertheless data that require some caution - has been indicated as one of the major supporting factors of population growth in Cabo Verde.

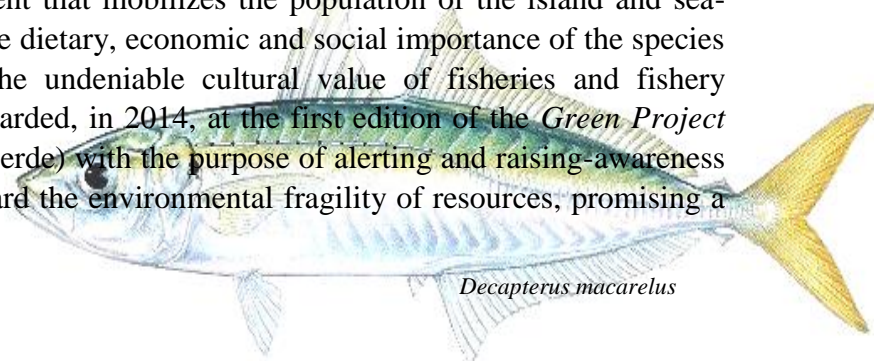
Economically speaking, artisanal and industrial landings, which guaranteed about 3.765 million kg in supply of raw material for the national canning industry in 2012, for domestic consumption and exports, continued to increase its relevance in 2013 and 2014 with 12 300 946 kg and 14 256 118 kg, respectively, according to provisional data provided by INDP. On the downstream of the activity itself, marketing is further complemented by the export of fresh and frozen products which, as a whole, represents about 80% of the country's exports and contributes, like agriculture and livestock, to

significantly balance the balance of payments. Thus it represents a 2-3% or 7-10% contribution of the GDP, according to whether considering, respectively, the primary activity (extractive) or the secondary (canning industry and trade).

Gross revenue from sport fishing and diving activities is annually estimated at around 14 million CVE (MAHOT, 2014). This is equally important for an assessment of landings from PMA of Santa Luzia and the Islets Branco and Raso, estimated at 291 million CVE, as gross revenue from artisanal fishing, which directly and indirectly benefits about 785 people (FEAPA, 2012).

The fisheries agreement between the European Union and Cabo Verde, covering a 3-year period (2012-2014), included a financial contribution of 47,900,000 CVE. This amount was increased to 55 million CVE for the next period of four years. However, this amount is clearly negligible, given that this is a process in which the country negotiates not only the exploitation of a certain fishery resource, but a significant portion of the functional marine biodiversity, not yet studied (Annex II).

At the cultural level, beyond that which the sea represents in the life of Cabo Verde as a link always ensuring the connection between the islands and between the archipelago with the world, it has been providing, by way of fishing, opportunities for happy moments and connection between music, food and public awareness given the need for best practices in sustainable exploitation of resources. Examples of this are the first three editions of the *Cavala Festival (Decapterus spp.)*, in Mindelo, São Vicente Island (2013, 2014 and 2015) as a gastronomic and cultural event that mobilizes the population of the island and sea-related authorities, highlighting the dietary, economic and social importance of the species as a fishing resource. This is the undeniable cultural value of fisheries and fishery resources, which was recently awarded, in 2014, at the first edition of the *Green Project Award Cabo Verde (GPA Cabo Verde)* with the purpose of alerting and raising-awareness among Cabo-verdian society toward the environmental fragility of resources, promising a sustainable future.



1.3 Seaside and beach tourism

Seaside and beach tourism and water sports, entail a set of economic, recreation and leisure activities facilitated by an important expression of ecological, marine and coastal biodiversity, characterized by extensive sandy beaches and clear seawater, mostly in the eastern islands (Sal, Boavista and Maio) as well as wave and tidal schemes already known to the international community fond of such activities. Such natural conditions have afforded the archipelago an important integration in international water sports circuits and has been one of the attractions for development of the tourism industry, currently, the most important national economic activity. According to BCV, in 2012, tourism revenue reached 33,752,000 CVE, representing 24% of GDP (BCV, 2012). In terms of employment, the sector employs 3.6% of the resident population. Given that the eastern islands (Sal and Boavista) have the largest national tourism expression in archipelago, this rate rises to 16.5% and 18.7% respectively (INE, 2010 Census).

According to MAHOT (2014), in the specific case of tourism, the lack of a satellite account in this area of activity, makes it impossible to assess the activity's real impact in the economy. On the other hand, one should consider the diffusion or leakage effect of revenues obtained from the expenditure incurred by tourists, which varies from one country to another. An UNEP estimate suggests that out of every \$100 spent by a tourist in a developing country, only five dollars stay in the country, as the remaining \$95 go back out to purchase goods and pay the costs of services provided to tourists. Also according to the same source, the greatest leakage effects of revenue occur in the all-inclusive tour packages (UNEP, 2003, cited by [MAHOT, 2014](#)).

1.4 Ecotourism - Nature Tourism

Resulting from the economic and social potential of marine biodiversity, marine and coastal eco-tourism development has been manifesting itself as an emerging economic activity, in full growth in Cabo Verde. It has been developing mainly through marine observations and tours targeting relative wealthy areas in terms of specific biodiversity, taxonomic, genetic and ecologic. Thus, underwater sightseeing tours to observe particular species of fish, crustaceans, reptiles and mammals, among others, often associated with coral ecosystems, with very specific ecological niches began gaining greater expression, as an emerging activity in recent years. In this same context there are also the emerging practice of marine mammal observations, especially the populations of Baleia-de-Bossa or Humpback whale (*Megaptera novaeangliae*). In the first months of the year, many individuals of this species pass between the South of Sal Island and North of Maio Island, with greater emphasis on Boavista Island, and most frequently in the Bay of Sal-Rei and Santa Monica. These are regions known as very important for mating and breeding habitats for this species in the archipelago ([Hazevoet et al. 2010](#)).

As a consolidated ecotourism practice expanding in several islands (Santo Antão, Sal, Boavista and Maio), sea turtle observation (*Caretta caretta*), usually in the breeding season, is naturally associated with very particular ecosystems, usually coastal zones and sandy beaches. These ecosystems, along with regions of shallow island shelves of limited extension, can be observed in all of Cabo Verde islands, with greater predominance in the eastern islands. On Boavista Island, gross revenues from ecotourism / nature tourism, will have reached 59 million CVE in 2012 (BIOS, 2012, cited by [MAHOT, 2014](#)).

The existence of many islets, usually near the islands, increases biological diversity and gives marine populations in Cabo Verde greater elasticity in spatial dynamics, adapting its abundance and density depending on how favorable the eco-physiological environment is. They are ecosystems with substantial marine biodiversity associated with spikes or seamounts, mostly used as important fishing banks (Northwest Bank in Santo Antão, the South Banks of de Island of Maio, Bank of João Valente between the Islands of Santiago and Maio, Bank of Nova Holanda to the Northwest of the Island of Sal, among others).

1.6 Traditional and cultural values

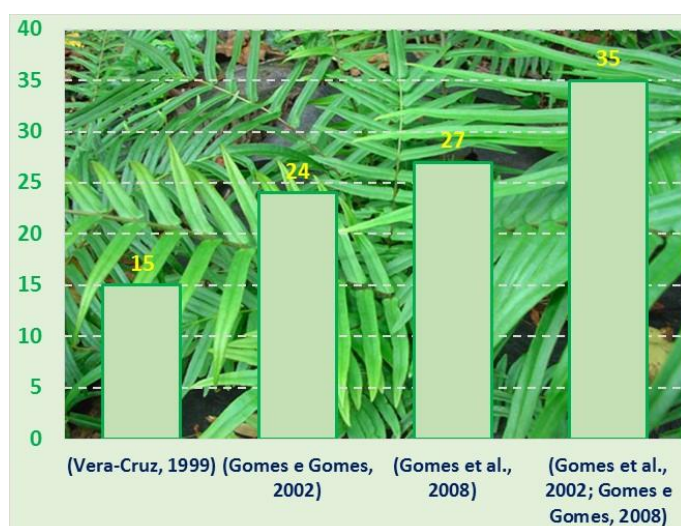
A bibliographic study, in 2006, identified 157 aromatic *taxa* with medicinal interest in Cabo Verde, being mostly non-native plants that were either introduced, sub-spontaneous, naturalized or cultivated. They are distributed among 68 families, namely *Lamiaceae*, *Asteraceae* and *Solanaceae*, with 21.6%. Cultivated plants represent 32% of endemic plants with 17% (Figure 4).

With regard to endemic species, about 35 *taxa* of endemic angiosperms of Cabo Verde are being used in traditional medicine (Vera-Cruz, 1999; Gomes *et al.*, 2008; Gomes, 2009), equivalent to 41% of Cabo Verde's endemic *taxa* list.

Many other plants of Cabo Verde's flora, especially endemic ones, are used in traditional medicine, without supporting studies on their active ingredients. It is the case of more than a hundred species found on the islands, with already recognized importance in traditional medicine in other regions, particularly in the Canaries, but which are still not utilized by the population in Cabo Verde (Gomes e Gomes, 2002). This confirms the urgent need to continue with field and laboratory researches to enhance valuation of the Cabo Verde medicinal flora.



Figure 4. Medicinal and aromatic plants of Cabo Verde. Distribution by categories, according to the number of *taxa* (Gomes *et al.* 2008)



The latest update of the medicinal or potentially medicinal plants inventory indicated 308 *taxa* belonging to 82 families, of which 5 belong to the Pteridophytes, 2 to Gymnosperms and 75 to Angiosperms (Gomes e Gomes, 2002; Gomes, 2009).

Figure 5. Major inventories of plants used in traditional medicine, at national level, between 1999 and 2008, according to different authors.

Plants can have diversified uses, from anti-inflammatory, anti-haemorrhoidal, emenagogue, diuretic, anti-malarial, anti-phlegm, anti-burns, anti-fungal, to laxatives, analgesics and anti-bacterial (Gomes, 2008).

2. MAIN CHANGES IN BIODIVERSITY STATUS AND TRENDS

Since 2009, there have been significant advances in knowledge on biodiversity. Many studies carried out either by national institutions or foreign experts from different sources, some in the framework of cooperation projects, have described new *taxa* and ecosystems, which have significantly contributed to increased knowledge on biodiversity in the country. However, when analyzing and researching the subject, it is important to note that a significant proportion of existing information assumes diffused nature, and unproven scientific validity, as they are the work of non-systematic compilations resulting from publications not always official or validated in specialized scientific journals. Indeed, there isn't a national biodiversity monitoring center. If such a monitoring center existed and it was systematically being fed, today, it could constitute an objective source and reference on the status of biodiversity and its trends on the basis of national development rhythms. If, as was already recommended 12 years ago, in 2002, in the Second National Report on the State of Biodiversity in Cabo Verde “...strategies are adopted with a view to setting up a national biodiversity observatory, which would be updated at short intervals...” if this environmental management tool is indeed set up, it will allow the contents of future reports on the status of biodiversity take on common guidelines, be less subjective and more user-friendly as an environmental decision-making tool. Such advancement will also allow for a common thread in periodic biodiversity assessments, with periodic updates at the national level, which is still not the case.

2.1. General characterization of terrestrial Biodiversity

Until 2005, 3,251 species had been inventoried in Cabo Verde (Database on Cabo Verde Biodiversity - wild species) spread across 2,097 genera and 634 families (Figure 6). Since 2009, the list has undergone additions, mainly due to a more comprehensive inventory, further taxonomy studies and the introduction of species in the archipelago, particularly the fungi (Furtado, 2011), arthropods (Baldé *et al.*, 2011; INIDA, 2011; Santos, 2011), and reptiles (Vasconcelos *et al.*, 2009; Arnold *et al.*, 2008 e Gardère, 2015) groups. Thus, the list of terrestrial biodiversity included 587 of the country's endemic species, of which 231 (43%) exclusive to the island of Santiago. Twenty-one endemic genera were reported for Cape Verde, being one phanerogamic, one lichen and 19 arthropods (Arechavaleta *et al.*, 2005). In terms of fauna, insects include the largest number of species and hence, of endemic species. On a much larger scale, Cabo Verde includes 9% of the endemic species of Macaronesia.

Approximately 20% of terrestrial species are included on the Red List, classified as endangered or extinct (Leyens & Lobin, 1996). Animals include the largest number of endemic and endangered species in the country. The Arechavaleta, *et al.*, (2005) list has been updated with the addition of 258 species, of which 200 species of migratory birds (Fernandes, 2007; Hazevoet, 1995, 1996, 1997, 1998, 1999, 2010, 2012, 2014), 46 species of fungi in agriculture, three species of angiosperms, four new instances of whales and dolphins (Hazevoet *et al.*, 2010), two new species of dragonflies - Odonata (Martens *et al.*, 2013), six new species bivalve molluscs, and three new species and subspecies of

terrestrial reptiles. Thus the total number of species went from 3251 to 3512 species (Figure 6).

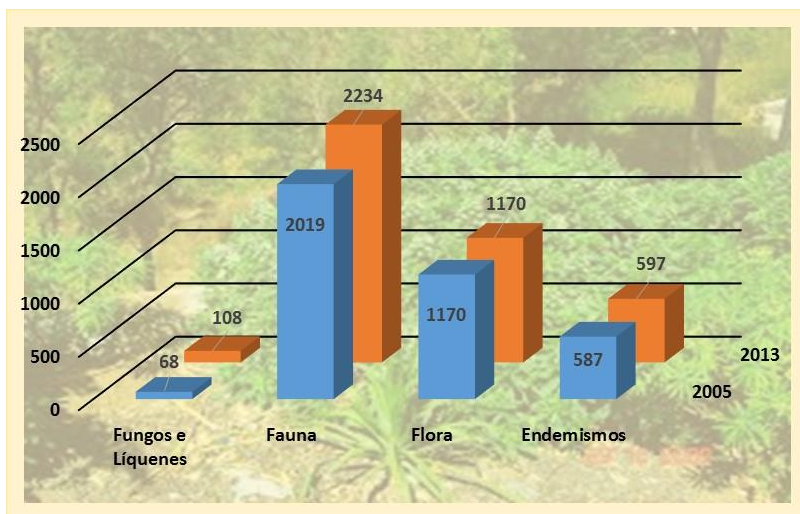


Figure 6. Evolution of the specific Terrestrial Biodiversity in Cabo Verde between 2005 and 2013, according to several authors. Flora includes lichens, mosses, ferns and spermatophytes. We underline the positive change in the number of fungi and lichens, and the number of animal species and endemics.

The endemic species list was increased with six *taxa* in terms of plant biodiversity, of which one fern, three species and two subspecies of spermatophytes, and six *taxa* related to animal biodiversity, particularly reptiles, of which three endemism at the species level and three subspecies (Marrero, 2008; Marrero *et al.*, 2012; Gonçalves, 2002; Vasconcelos *et al.*, 2010 e Gardère, 2015) that resulted from phyto-sociological inventories carried out by a team of botanists and taxonomists in recent years in all the islands. Note that this report did not consider four angiosperms which should, however, be included in the next endemic species inventory.

Until 2005, Cabo Verde had 62 species of fungi spread over eight classes, 16 orders, 26 families and 40 genera (Mies, 1993; Arechavaleta, *et al.*, 2005). To this number, we should add six new species of the *Curvularia* genus, reported on the island of Santiago by Lima and Furtado (2007), totaling 68 species for the country and 24 for Santiago.

This report does not consider 40 new species of fungi associated to banana trees on Santiago Island, already identified by Furtado *et al.* (2014), under the control of agricultural pests. Species distribution by island can be seen in Figure 7. Santiago is the island with the largest representation of fungi, followed by Santo Antão and São Vicente. The other islands are very poor in fungi, and don't have any of the endemic species identified in the country.

Lichens include 263 *taxa*, with 259 species and four subspecies, belonging to 90 genera and 40 families. Among lichens, a genre and eight species are described as endemic to Cabo Verde (Mies, 1993; Arechavaleta *et al.*, 2005). About 29% of lichens are considered extinct or threatened with extinction in the archipelago, including an endemic one (Lobin, 1996).

The mountainous islands are the richest, and the flat islands (Sal, Boavista and Maio) and the island of Santa Luzia the poorest, after the Branco and Raso islets (Figure 7).

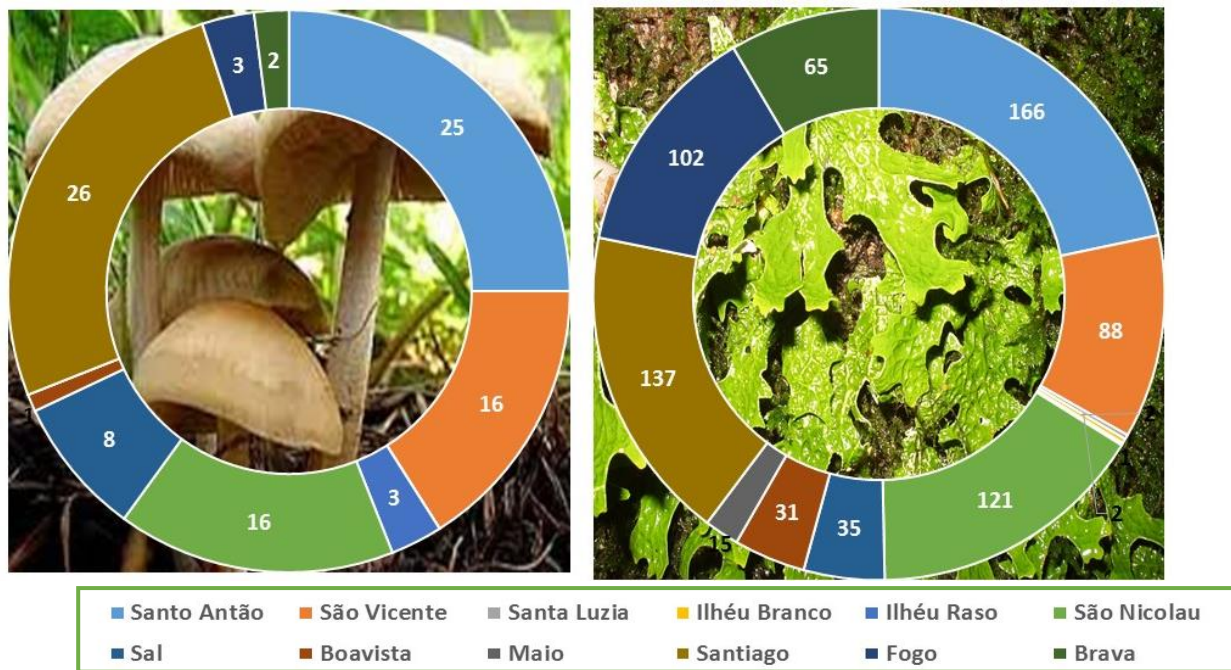


Figure 7. Geographic distribution of the number of Fungi (A) and lichens (B) taxa by island and islet

2.1.1 Plant biodiversity

Currently registered in the Cabo Verde flora are about 891 species, 515 genera, 151 families and 73 orders, divided into Bryophytes (17%), Pteridophytes (ferns) (4%) and Spermatophytes (79%) - Figure 8. About 10 % of identified species are endemic to the archipelago (Gomes *et al.* 1996, Brochmann *et al.* 1997; Santos, 1999, Arechavaleta *et al.*, 2005). Of these, 17.5% are on the Red List with some degree of threat (Lobin, 1996). Santo Antão, followed by Santiago and Fogo, are the islands with the highest number of plant species. Santo Antão, followed by São Nicolau and Fogo, are the islands with the highest number of endemism, while Santa Luzia and islets have the least.

Bryophytes and Pteridophytes. There are 153 Bryophytes described in Cabo Verde, including mosses and liverworts, of which six species are endemic (Leyens e Lobin, 1996; Arechavaleta, *et al.*, 2005), with 111 *taxa*, equivalent to 73%, is the island with the highest number of Bryophytes (Figure 8). The Pteridophytes include 32 species and two subspecies, totaling 34 *taxa*, including an endemic (*Dryopteris Gorgonean*) found on the islands of Santo Antão, São Vicente and São Nicolau (Arechavaleta, *et al.*, 2005). About 65.6% of Pteridophytes are classified as extinct or endangered, being five critically endangered (Lobin *et al.*, 1996). A species has been considered extinct and another has disappeared (Leyens e Lobin, 1996).

Santo Antao, Fogo and São Nicolau with 29, 28 and 24 *taxa* are the islands with greater diversity of ferns. Followed by Santiago and São Vicente with 16, and Brava with 13 *taxa*. Sal Island and the islets have no species identified in this group (Figure 8).

In 2010, a species of this group, *Actinopteris radiata* (Sw.) belonging to *actiniopteridaceae* family was described on the island of Santiago (Andrade, 2011; Gomes et al in prep), giving Santiago a total of 17 *taxa*. This species was described only on the islands of São Nicolau, Santo Antão e Fogo (Lobin e Ormonde, 1996; Lobin, et al,1998).

Spermatophytæ. By 2005, 743 spermatophytæ *taxa* had been described, with 706 species and 34 subspecies, 410 genera and 101 families, where 295 are native / probably native, including 82 endemics, 66 species and 16 subspecies. About 436 species and 12 subspecies were introduced (Brochmann et al., 1997; Arechavaleta, et al., 2005).

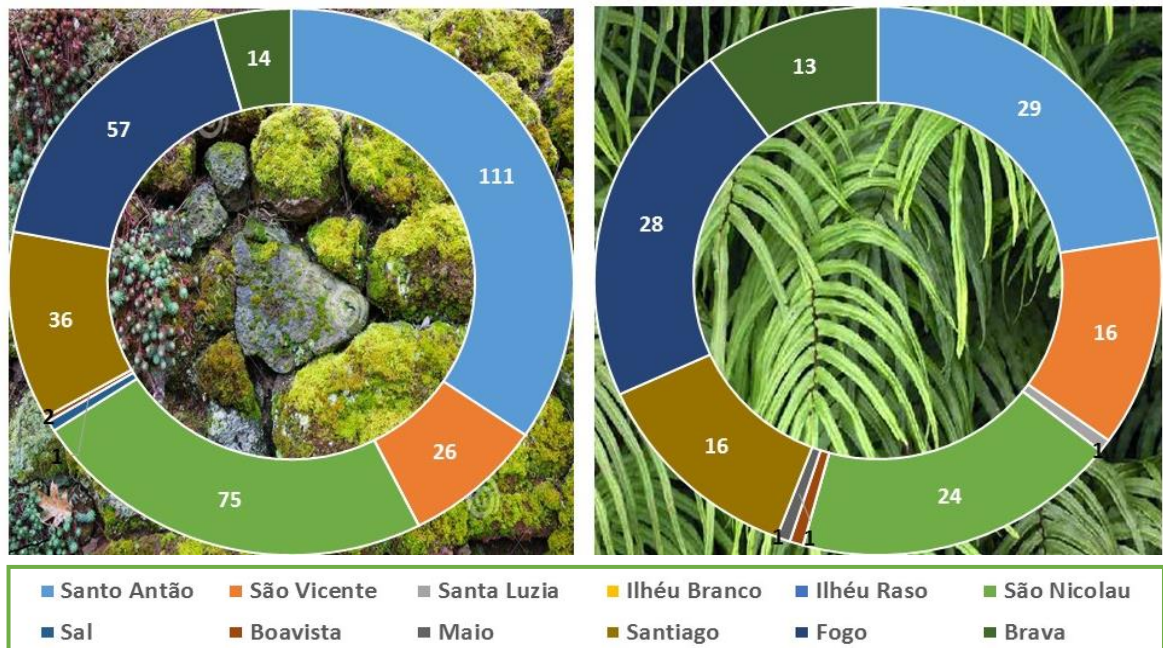


Figure 8. Geographical distribution of the number of Bryophytæ *taxa*, including mosses and liverworts (A) and Pteridophytæ (B) by island and islet.

Among the endemic species (Figure 9) 67 (82%) are woody shrubs, 15 (18%) are herbaceous. Only two species, *Sideroxylon marginata* and *Phoenix atlântica*, are tree-sized (Brochmann et al. 1997).

The endemic species list increased by three species, *Withania chevalieri* (Gonçalves, 2002), *Campanula feijoana* Gardère and *Campanula hortelensis* Gardère (*Contra-bruxa-azul*) and two subspecies - *Dracaena draco* (L.) L. ssp. *caboverdeana* Marrero Rodr. & R. Almeida, commonly known as dragon tree (Marrero et al. 2012), and the subspecies *Teline stenopetala* subsp. *santoantaoi* (Webb e Berthel, 2012) which contributed to increase the number of endemics from 82 to 87, with 486 *taxa*, is the island with the highest number, followed by Santiago and Fogo, with 474 and 377 rate, respectively (Figure 9). About 75 *taxa* are in the Red List as endangered (Gomes et al., 1996).

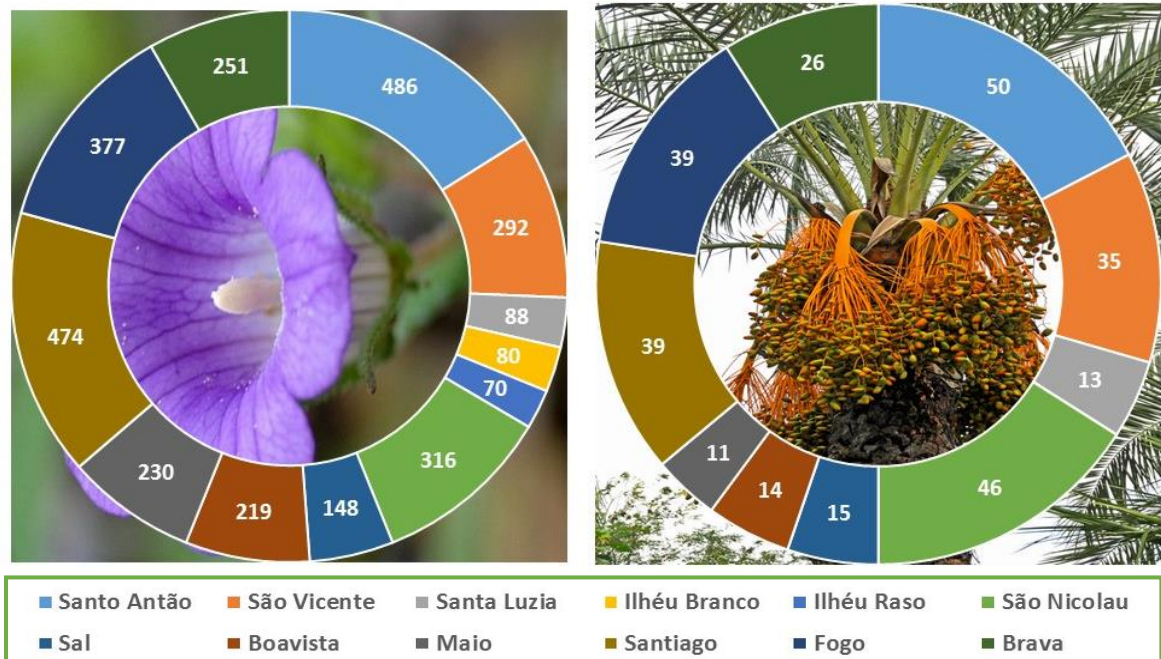


Figure 9. Geographical distribution of the number of endemic vascular plants *taxa* (A) and Angiosperms in general (B) by island and islets. Sources: Brochmann et al. 1997; Gonçalves, 2002 ; Marrero *et al.* 2012; Marrero, 2012; Arechavaleta, *et al.*, 2005; Gomes *et al. in prep.*, 2014.

This report does not consider six endemic *taxa* of Angiosperms, contained in an ongoing publication, two species of *Campanula*, and four *Acacia*, *Hyparhenia*, *polycarpaea* and *Indigofera*. Also not included are the results of other phyto-geographical studies in progress, particularly on the endemic species of Santiago *Frankenia ericifolia ssp. ericifolia*, which thus shall include 38 endemic *taxa*.

Between 2010 and 2011, INIDA recorded an increase in the populations of *Sideroxylon marginata* on the island of Fogo, having first noted a population of this species with 15 tree-sized specimens, about 250 m high, in an area of approximately 2 ha (Gomes *et al., in prep.*). In islands of Fogo and Boavista, an increase of this species was noted, as well as of *polycarpaea nivea* (Angiosperm), *Adiantum incisum* and *A. Philippian* (pteridophyte/fern), which, again, confirms the need to strengthen monitoring of plant biodiversity in all the islands, covering all bioclimatic zones.

Agro-ecological units and plant communities. The 743 known Angiosperm *taxa* are spread over 134 plant communities in 483 agro-ecological units, in 45 climatic zones (Diniz e Matos, 1986-1999). In 2014, as in 2002, it is still the most current and complete description of ecological and functional biodiversity in the terrestrial environment in Cabo Verde (Medina *et al.*, 2002).

Forest biodiversity. The National Forestry Inventory, published in 2013, reveals the existence in Cabo Verde of about 51 *taxa* in forest perimeters, 50 species and subspecies, covering an area of 89,552 ha, accounting for 23% of national territory.

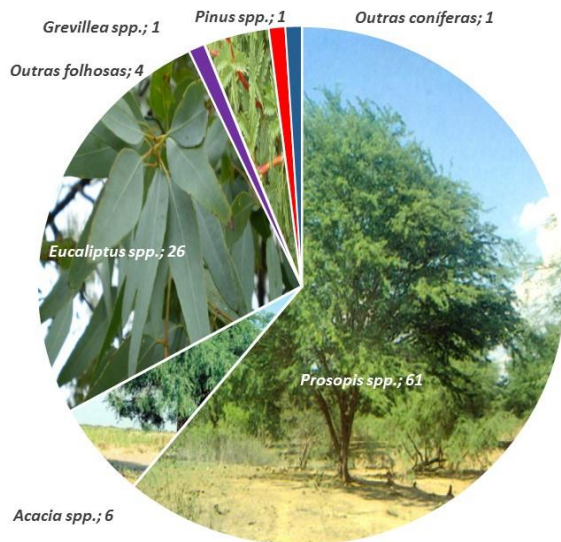


Figure 10. Species composition of forest perimeters, as per the 2013 Cabo Verde National Forest Inventory.

Of the 43 617 ha, 11% correspond to forest areas, 21,522 ha (5%) to shrub areas, 13,462 ha (3.4%) to agroforestry areas and 11,302 ha (2.8%) to open forests (Figure 10). Above-ground biomass (wood and leaves) in forest areas is of 801 000 tons. The carbon sequestered above ground is of 400 600 tons. Introduced species are prevailing in forest composition, and in a restricted area (548.5 ha) contains over five endemic species. Forests in wetlands are dominated by conifers and *Pinus* pine, while in low-lying areas *Prosopis* and *Acacia* prevail.

Forestry and agroforestry perimeters are present in the nine inhabited islands but islands of Santiago, Maio, Santo Antão and São Nicolau proportionally have the largest forest covered areas, while the islands of Fogo, Santiago and Maio have the largest agroforestry coverage (Figure 11).

Agricultural biodiversity. Agricultural biodiversity includes plant species used in rain-fed agriculture, such as maize (*Zea mays*) and beans (*Cajanus cajan*, *Lablab purpureus*, *Phaseolus vulgaris*, *P. Lunatus* and *Vigna sinensis*), whose seeds are conserved annually for production in the following year, as well as animal species used in livestock, particularly cattle, pigs, goats and poultry. Included is also a list which contains 125 varieties of 38 vegetable species, roots and tubers as well as species used as condiments, whose cultivation is recommended by INIDA, due to their good performance in the agro-climatic conditions of Cabo Verde (INIDA, 2012).

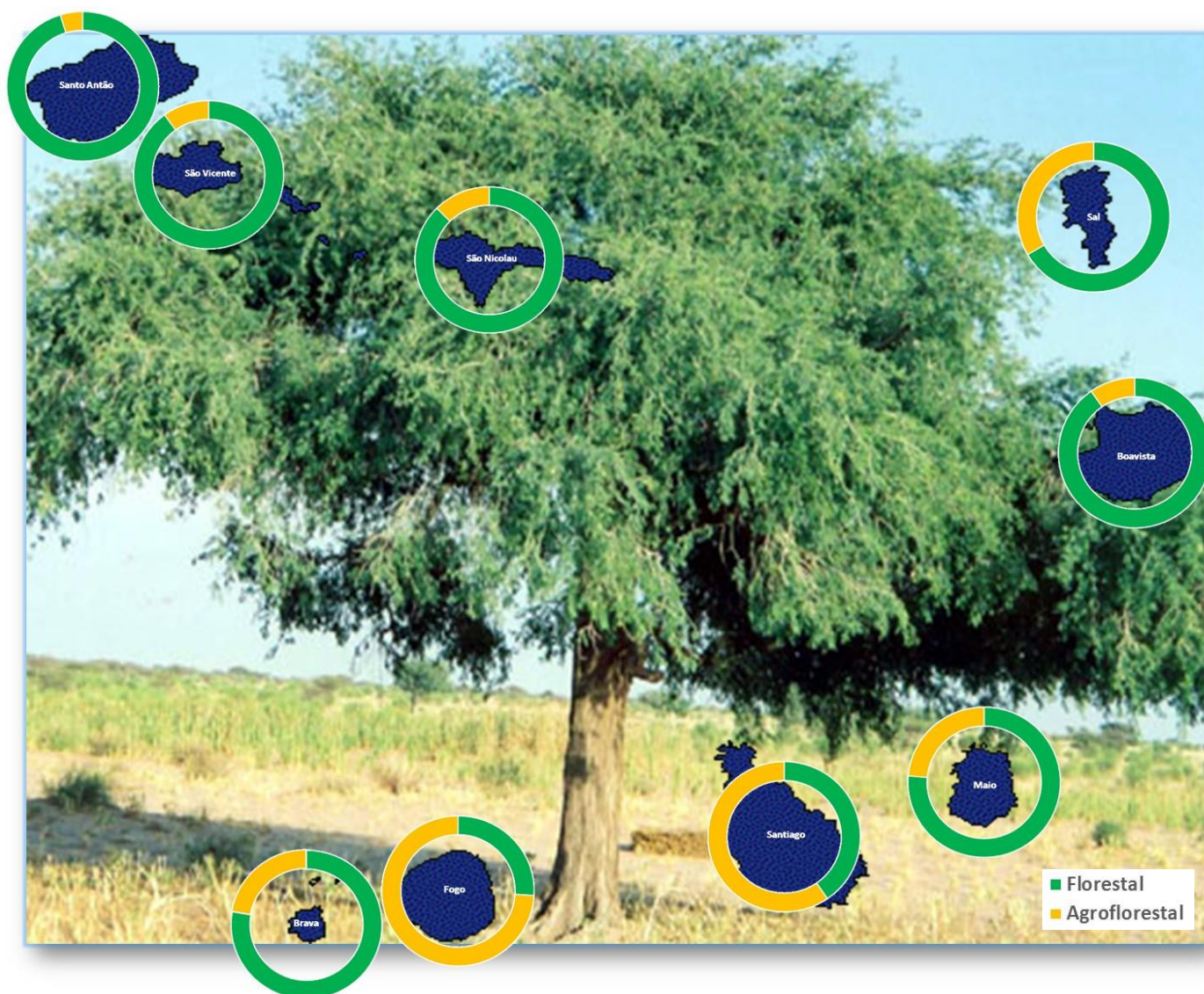


Figure 11. Agroforestry profile of the archipelago of Cabo Verde in terms of forestry and agroforestry areas, by island, according to the 2013 Cabo Verde National Forest Inventory.

2.1.2 Land animal Biodiversity

Over 2,000 species in terrestrial fauna have been identified in Cabo Verde, distributed in three phyla (Molluscs - 2% Arthropods - 95% and Chordates - 3%), 10 classes, 54 orders, 380 families and 1349 genera (Arechavaleta *et al.*, 2005; INIDA, 2010). Santiago Island is the most represented with 1 203 species (59%), followed by Santo Antão (39%) and São Vicente (27%). The island of Santa Luzia and Ilhéus Branco and Raso islets have fewer, with five species (Figure 12).



Figure 12. Fauna profile of the archipelago of Cabo Verde in terms of number of species and endemism, and conservation status of species in terms of endangered species, by island.

Arthropods. Arthropods include 1651 species in 5 classes, 40 orders, 330 families and 1270 genera. It is the filo with greater species diversity throughout the islands, and is also the one that includes highest number of endemics (450), about 83% of endemic species identified at national level. Insects are the class with highest species diversity encompassing over 50% of terrestrial biodiversity, followed by the Arachnids (Van Harten, 1993). Over 360 species are considered endangered. As shown in Figure 13, Santiago is the island with the highest arthropods species diversity (1096 species), followed by Santo Antão (703 species).

The largest additions of species were observed in this group, whether identified or introduced, especially those entering as pests affecting agriculture. Given their economic importance, we register the *Bractocera invadens* pests associated to fruit trees on the islands of Santiago, Fogo and Santo Antão (Baldé et al, 2007), the *Tuta absoluta*, with tomatoes on the islands of Sal and Santiago (DGASP, 2010).

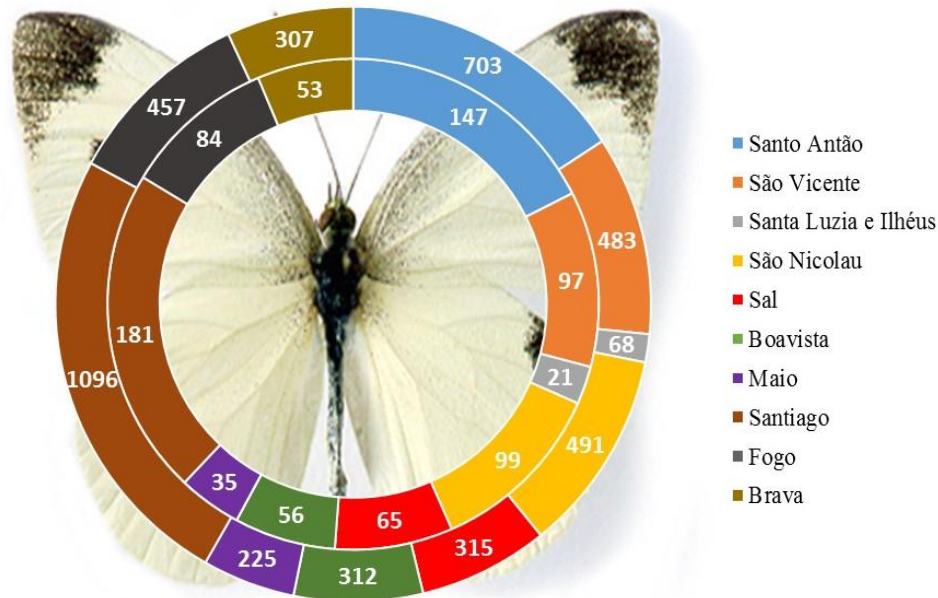


Figure 13. Distribution of arthropods (outer circle) and their endemic species (inner circle) by island in Cabo Verde.

Also, noteworthy are four new species in the *Califoridae* family in the city dump in Praia (Santos, 2012).

The recording of the spider species in Maio Island, belonging to the Dictynidae family (*Devade cf. Indistincta*) adapted to salinity and described for the first time in Cabo Verde (Breitling *et al.*, 2012), is also an enrichment for the phylum national biodiversity.

Chordates. There are 72 native species registered in this phylum, spread across four classes, 12 orders, 31 families and 48 genera. Birds and reptiles are the most nationally known and studied, containing a higher expression of specific diversity.

Birds

There are about 239 bird species registered in the archipelago, including 41 native species (Tosco *et al.*, 2005) and migratory birds visiting the country during winter season in the north (Hazevoet, 1995, 1996, 1997, 1999, 2010, 2012; Fernandes, 2007). Among the native species, 13 *taxa* are considered endemic, 5 species and 8 subspecies (Tosco, 2005). With 33 species, Santiago is the island with the largest number of native birds (Figure 14).

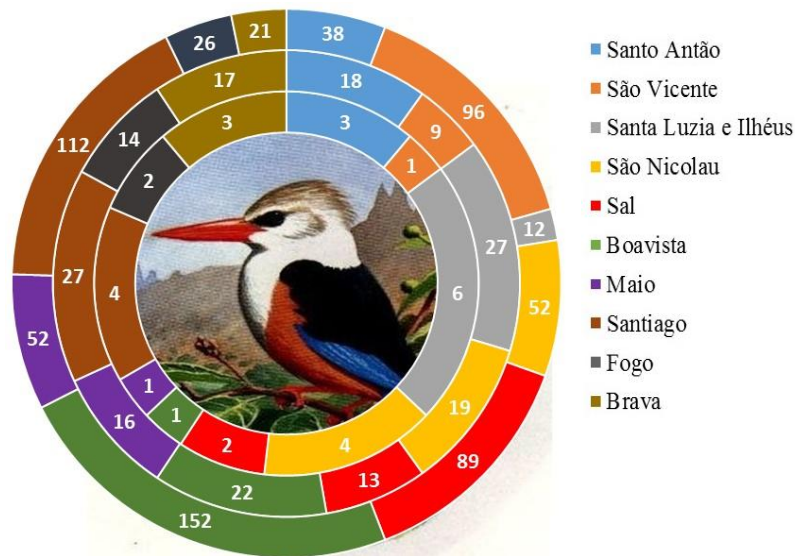


Figure 14. Distribution of the bird life species diversity in Cabo Verde, according to the number of migratory (outer circle), native (middle circle) and endemic species (inner circle) by island in Cabo Verde.

Over 50% of native species are on Cabo Verde's Red List of Birds, with some degree of threat (Lobin *et al.*, 1996). In recent years, several studies have enabled better knowledge of the conservation status of populations in Cabo Verde as for ex. Records of *Acrocephalus brevipennis* in Fogo Island (Hering e Fuchs, 2009; Hering e Hering 2005; Diniz, 2010), and the populations of *Phaethon aethereus* in the islands of Boavista, São Vicente and Sal (INIDA, 2006; 2008; Fernandes, 2008; Hazevoet, 2010). The identification of new *Garça-vermelha* (Red Heron) - *Ardea purpurea bournei* (INIDA, 2011; 2012), and *Halcyon leucocephala* breeding populations in Maio Island, as well as the *Alaemon alaudipes* (Cotovia) in Santiago (Hazevoet, 2012) and breeding of *Garça-real* (Grey Herons), *Ardea cinerea* (Palacios and Barone, 2001) represent an important knowledge update on the biodiversity of this class which now has 43 breeding species in the country.

In recent years, there have been many records of improvement in the conservation status of birds in Cabo Verde - significant reduction in shearwater catches, *Calonectris edwardsii*, in the islets; population increase of *Alauda razae* (Ilhéu Raso Larks) associated with improved rainfall between 2009 and 2012 (Brooke *et al.* 2012); this species was identified for the first time outside the Ilhéu Raso islet in São Nicolau (Hazevoet, 2012); identification of the *Galinha-da-água* (*Gallinula chloropus*) breeding in the Poilão Dam in Santiago and in Ribeira de Rabil in Boavista (Hazevoet, 2012), after breeding references made on the same island in Pedra Badejo Lagoon (Hazevoet, 1995), among others.

On the other hand, we continue to register the imminent disappearance of the *Fregata magnificens* in Boavista Island and, hence, in Cabo Verde (López *et al.*, 2007; 2012). In regard to migratory species, this island, with more than 152 species, has the largest number of records (Figure 14). However, in recent years, a greater number of new occurrences have been registered on the islands of Santiago (Poilão Dam) and São Vicente (WWTP in Ribeira da Vinha) than on the other islands, such as herons, ducks, and other birds that were once scarce in the archipelago (Hazevoet, 2012).

Among migratory species, until very recently, there were records of *Bubulcus ibis* nesting in the islands of Boavista (2004) and Maio (2009) – (Hazevoet, 2011) and Santiago (INIDA, 2012). In the latter, the population includes thousands of individuals sleeping in some parts of the City of Praia and Poilão Dam, which is already worrying the island's authorities because the species has occupied areas around the airport and hence, considered a threat to aviation security.

Reptiles

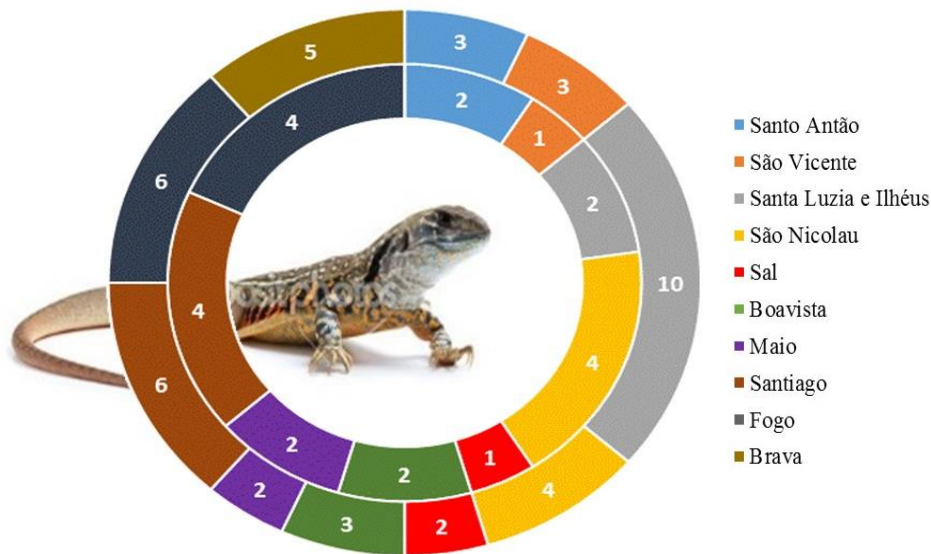


Figure 15. Distribution of species diversity of terrestrial reptiles (outer circle) and endemic to a single island (inner circle), by island in Cabo Verde, according to Vasconcelos (2010).

The class of reptiles underwent a major revision in recent years, leading to some taxonomic changes. Previously, 28 *taxa* were recognized, with 14 species, of which 12 natives and two introduced, 82% were considered endemic (Schleich, 1996). Based on phylogenetic and morphological studies, the number of native species increased to 22 and the number *taxa* to 31, belonging to three genera, *Hemidatylyus* (5), *Tarentola* (14), *Chioninia* (12) and three families. Ten subspecies (Schleich, 1996) were moved to the category of species, with three new species for the archipelago -*Hemidatylyus lopezjuradoi*, *Tarentola Bocage* and *Tarentola fogoensis* (Arnold, *et al.*, 2008, Mirales *et al.*, 2010; Vasconcelos, 2010; Vasconcelos *et al.*, 2012). Three new subspecies have been described *Chioninia vaillanti xanthotis*, *C. spinalis boavistensis* e *C. spinalis santiagoensis* (Mirales *et al.*, 2010, Vasconcelos, 2010).

Most of the land reptiles in Cabo Verde are concentrated in the higher areas of the islands of Santiago, Fogo and São Nicolau, while the first two have the highest taxonomic diversity. The islands of Santiago, Fogo and São Nicolau have the largest number of endemic species (Vasconcelos, 2010). The study recommends adjusting the boundaries of protected areas based on the distribution of threatened reptiles. Virtually, all species of native/ endemic reptiles in Cabo Verde are threatened (Lobin, *et al.* 1996, Vasconcelos *et*

al., 2010). Two taxa in the group are extinct: *Geochelone atlântica* and the giant lizard *Chioninia (Macroscincus) coctei*. The Red List of reptiles is updated, based on IUCN criteria (Vasconcelos et al., 2012).

In this group, we highlight three exotic species *Hemidactylus mabouia* *Hemidactylus angulatus* (Jesus et al., 2001, Vasconcelos, 2010), *Agama agama* (Vasconcelos et al., 2009). The latter has populations established and breeding on the islands of São Vicente and Santiago (INIDA, 2011), originating from African coast countries, specifically the Gulf of Guinea region, according to DNA studies (Vasconcelos, et al., 2014).

Molluscs



Figure 16. Distribution of terrestrial gastropod molluscs in Cabo Verde, by island

This phylum includes 39 species of gastropoda class, spread over two orders, 19 families and 31 genera. Eleven species are classified as endemic of the archipelago and about 54% are considered to be extinct or endangered (Lobin et al., 1996). Santo Antão, São Nicolau and Santiago are the most represented islands (Figure 16). Note that the taxonomic level, the diversity in this group of animals is not very significant, which makes them much more vulnerable to extinction - extinction of one species or one genus could mean the extinction of an entire family.

Mammals

Among land mammals there are 10 species considered wild, of which most were introduced.



Figure 17. Illustration of a *Rattus norvegicus*.

Three rat species (*Mus musculus*, *Rattus rattus*, *Rattus norvegicus*), one monkey species (*Cercopithecus aethiops* - green monkey) and six species of bats - *Thaphozous nudiventris*, *Pipistrellus savii*, *Pipistrellus kuhli*, *Plecotus austriacus*, *Miniopterus schreibersi* – (Pucetti & Zava, 1988) and *Eidolon helvum*.

The latter species of bat that has a migratory population in the West African region was first identified in 2010 in Boavista Island - Ervatão ([Jiménez e Hazevoet, 2010](#)). The spread of the hemorrhagic fever (Ebola) epidemic in 2014, in Africa, was associated to its consumption / handling.

Domestic fauna animals, introduced by man, were also recorded in this class, including goats, cows, horses, dogs, cats and rabbits (*Oryctolagus cuniculu*).

2.2 Marine and coastal biodiversity

Such gains are usually the result of research carried out in direct or indirect association with higher education institutions, research institutes, and national and international NGOs dedicated to environmental issues and nature conservation. For example, the studies by Freitas (2013, 2014) on fishes and by Fernandes *et al.* (2010) on a new especie of crustacean cirripedia – *percebes* (Figure 18), as well as many other publications in the Cabo Verdean magazine on Zoology, which has greatly contributed to the systematization of research and publication of knowledge in the field (www.scvz.org/).



Figure 18. New specie of Crustacean cirripedia - *Pollicipes caboverdensis*, described endemic to Cabo Verde in 2010 (in Fernandes *et al.* 2010)

In terms of marine biodiversity, mollusks (Figure 19) occupy a prominent place due to great genetic diversity and the number of endemic species in the Gastropoda class. The Second Report on the State of Biodiversity in Cabo Verde had already described in 2002 (Medina *et al.*, 2002) a great diversity of this class presenting about 168 species, 71 genera and 36 families, with the particularity of a family (Conidae) presenting over 22 species in one single genus (*Connus spp.*) of which 19 were considered endemic. Given the growing interest of malacologists in this group of marine animals, knowledge has increased considerably. A National Observatory on Marine Biodiversity is likely to systematize official and validated information in the field.

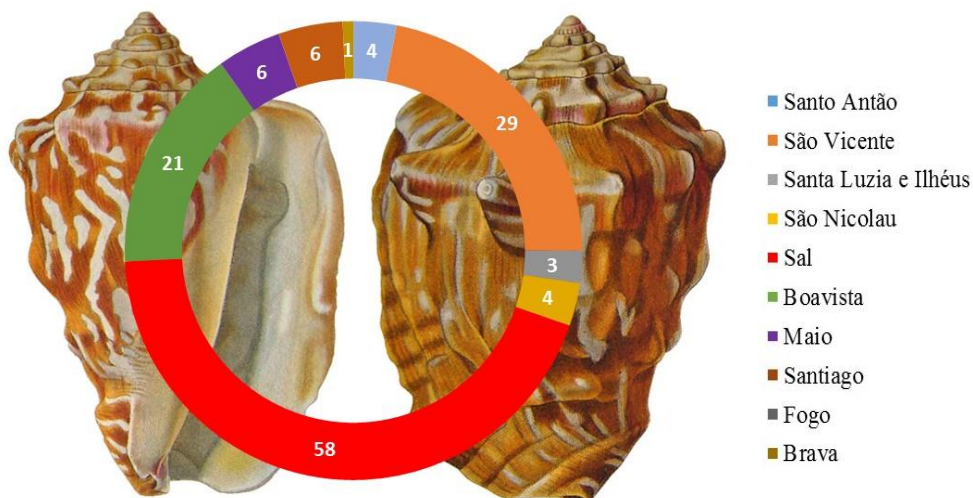


Figure 19. Distribution of the number of marine gastropod species in Cabo Verde, in 2002, by island.

Knowledge of the taxonomic marine biodiversity has been increasing and deepened through greater taxonomic clarification of certain *taxon* and *taxa* of large groups such as fish, shellfishes and marine mammals. Out of a list of 705 species of fish reported to the archipelago, 626 are confirmed and 34 of probable occurrence. About 45 species are considered to be taxonomic and inventorying errors (www.fishbase.org).

Also, it is now known that in an oceanic and tropical archipelago ecosystem like Cabo Verde, the long-term persistence of ecological isolation between islands will lead to a strong differentiation and speciation processes, resulting in high levels of specific marine, taxonomic, ecological, genetic and functional biodiversity (Medina *et al.*, 2007). Thus, it is shown that among populations of coastal demersal species, the most isolated islands tend to have an independent evolution in terms of ontogenetic variation in the phenotype, as demonstrated for the Island of Fogo (Medina *et al.*, 2008), e regarding the Garoupa (*Cephalopholis taeniops*) – Figure 20.

Figure 20. Sample of the Garoupa (*Cephalopholis taeniops*), a demersal species in Cabo Verde, divided into more than one population per island, judging by the dominance of the prevailing environmental conditions on genetic load, on the phenotype expression



Thus, since there is still limited scientific research on the structure of coastal marine populations in Cabo Verde, to prevent loss of genetic resources and biodiversity related to fishes and for conservation and management purposes as well, the populations of islands that are spatially distinct should be considered as discrete management units, which, in light of the FAO Code of Conduct for Responsible Fisheries, represents a preventive approach principle (FAO, 1995).

In terms of genetic marine biodiversity there is a positive trend in the evolution of knowledge, though much less significant than in other forms of biodiversity expression. Studies at this level are much more complex by reason of the insular, fragmented and dispersed nature of the national territory, requiring a lot of investment in terms of time, financial resources and adequate research equipment. These are usually mobilized only in a framework of partnership with international institutions, which oftentimes are institutes research and universities. For example, the studies on the phenotype variation between the islands on the Grouper's body shape (Medina, 2008).

Knowledge on the status of ecological and functional marine biodiversity have evolved greatly as a result of combined efforts of academic research (Medina, 2008; Benchimol, 2012; Freitas, 2012, Timas Almeida, 2013) and applied studies on nature conservation, typically oriented to give inform national policies on MPA delimitation, characterization and management. This is the result of previous studies to support policy decisions on the delimitation, location and initial characterization of a MPA, as well as of follow-up studies

and assessments of the successive status of environmental conservation within such an area.

There are many examples of growing trend in the knowledge of marine biodiversity. However, a significant part of its validation lacks scientific credibility, as they are recorded only in academic papers or technical reports, without scientific validation in specialized journals; exception made to the new knowledge that has been published in the Cabo Verde Journal of Zoology, which given the scientific peer review to which it is subject, is an important tool to validate these advances.

On the other hand, a significant portion of such advances, though scientifically validated, has been conducted in diffusive manner and therefore, is not resulting from precise research guidelines with the aim to deepen knowledge in the field – they stem from individual scientific curiosity within the academic community, both national and foreign, in countries which have cooperation ties with Cabo Verde.

In any of the circumstances mentioned, the absence of a National Biodiversity Observatory (NBO), does not allow conveniently leveraging the advances achieved, in diffuse and isolated manner, in national decisions on sustainable development.

3. BIODIVERSITY CONSERVATION STATUS

The lack of an available index or set of indicators for regular systematic monitoring of biodiversity in Cabo Verde, hinders the presentation of the real state of biodiversity in the country. This observation, shared by most researchers and technicians, is formalized in the Second Biodiversity Strategy and Action Plan (MAHOT, 2014). Nevertheless, despite these shortcomings, surveys conducted among national partners show that in islands where there are functioning PAs, biodiversity is better conserved. Noteworthy is the reintroduction of endemic species in the natural parks of Serra Malagueta - on Santiago Island), Monte Gordo - on the island of São Nicolau and Chã das Caldeiras on Fogo Island. Such initiatives have significantly contributed to restoration of once dilapidated plant coverage, either due to lack of knowledge on the importance of these resources, or lack of alternatives for survival, or simply out of curiosity.

As noted above, in 2011, 22 548 species of endemic plants belonging to six species that had very small populations were planted in Serra Malagueta Natural Park - the *Dracaena draco caboverdeana* ssp *caboverdeana* classified in the First Red List as extinct on the Island, *Echium hypertropicum* which currently exists in large quantities in Santiago, and should be reassessed for possible change of category, probably to Low Risk category (MAHOT, 2014). These actions were extended to the natural parks of Monte Gordo and Fogo. Another important measure has been the removal of invasive plants thus allowing space for development of endemic plants. Still in 2011, two areas were recovered - one totaling 9.78 ha in Serra Malagueta Park and the other 6.32 ha in Monte Gordo Park.

In other islands and places where PAs are still not functional, there are noteworthy actions being carried out by research institutions, notably INIDA and INDP, involving universities students, in conducting academic work which have contributed to some category change in the threat level of one specie or another. In this context, still current are the considerations regarding the *Globularia amygdalifolia* on Santiago Island (Gomes *et al.* 1999; Costa, 2005) which went from CR (Critically Endangered) to EN (Endangered) and *Sideroxylon marginata* (Marmolano) on which there has been some inventory effort both in real and potential habitats. Provisional data of this species, including individuals of new populations, indicate a significant increase in population on the islands of Santiago and Fogo, which contributes to improving the situation of the species – the only endemic species of the dicotiledoneas group. INIDA registered, between 2010 and 2011, an increase of populations of the species on Fogo Island, particularly of tree-sized individuals about 250m high, between the towns of Galinheiro and São Jorge, in an area of about one hectare (INIDA, 2012).

In the field of animal biodiversity, marine and land birds have suffered a rapid decline due, on the one hand, to hunting and theft of eggs and broods and, on the other, due to predation by introduced species such as cats and rats. In 2010, the island of Santa Luzia, mice, lizards and birds (*Passer iagnoensis*) constituted the bulk of the cat diet which highlights the impact of this species on the others (Medina *et al.*, 2012, cited in MAHOT, 2014). The predatory actions of this species on the nests of *Stercorarius Parasiticus* was also observed in Boavista Island (Lopez, 2005).

Cory's Shearwater (Cagarra) (*Calonectris edwardsii*), mainly located in the Ilhéu Raso islet, is one of the endemic seabirds which has been mostly preyed upon by man in Cabo Verde. Since 1940, thousands of off-springs are captured annually by fishermen in Santo Antão. This species was highly appreciated the island's people and sold in restaurants as a typical dish. In 2007, revenues from the sale of shearwaters were estimated at over twelve hundred thousand Escudos (PCMC, 2008), resulting from the capture of about 12 000 individuals.

Despite considerable improvements population of bird species like the Red Heron (*Ardea purpurea bournei*) and the Earth-Sparrow (*Passer iagonensis*), there are still occurrences of eggs and broods being taken for food and fun in the archipelago. The list of species in this class under significant human pressure is still extensive, e.g. the Egyptian Vulture (*Neophron percnopterus*) and the Black Kite (*Milvus migrans*).

Regarding terrestrial reptiles, Vasconcelos (2010) e Vasconcelos *et al.* (2012) point to the fragility of these species in relation to climate change. Prolonged drought and global temperature increases, in a context of restricted geographic distribution, are threats of extinction for these species.

As for marine reptiles - marine turtles, the work being done within the implementation of the National Plan for Sea Turtles Conservation is well known and considered an achievement for the conservation of the species. In 2013, about 14 553 nests were identified nationwide on beaches monitored during the spawning period. Boavista is still

the island in the archipelago with most occurrences, with 63% of the nesting population in the archipelago in 2013 (DGA, 2013).

3.1 Main pressures and threats

Pressures on biodiversity in Cabo Verde continue to be stressed, and like in other island regions is due to natural and anthropogenic factors. Anthropogenic pressures still merit special mention not only because they are more pronounced, but also because they are more easily controlled by man.

3.1.1 Pressures and threats on terrestrial biodiversity

Due to its insular nature, Cabo Verde has a fragile biodiversity, characterized by small, localized and highly specialized populations with low variability, making them vulnerable to any variation and therefore could easily be driven to extinction. Records of species that became extinct in island ecosystems should raise concerns in the country toward the conservation of its biodiversity. It is estimated that 75% of animal species and 90% of bird species have gone extinct on island ecosystems since the seventeenth century (CBD, 2008). Moreover, 23% of island species are presently considered to be endangered, while estimates for the rest of the world is set at 11%. In Cabo Verde about 20% of the species are on the Red List (Leyens e Lobin, 1996).

Several authors have analyzed the action of natural factors on biodiversity and point to factors associated with climate change as having contributed to the current state of populations of many species in Cabo Verde. There are several records where drought, high temperatures or heavy rainfall were associated with changes in populations of species in the archipelago. Hazevoet (1995) associates the breeding season of many bird species with the arrival of the rain season. Some species such as the *Garça Vermelha* (Red Heron) and Calhandra (Lark) in Ilhéu Raso islet are threatened with extinction due to prolonged droughts that cyclically affect the archipelago (Donald, 2003; Hazevoet, 1992; Ratcliffe, *et al.*, 1999).

Many plant species among liverworts, mosses, ferns, (*Hipodematium crenatum*, *Adiantum incisum*, *Adiantum filipense*) and angiosperms (*Umbilicus schmidtii* e *Campanula jacobaea*) have, for over 10 years, limited distributions in terms of climate and water availability (Diniz e Matos, 1999). Also, changes in mean temperature and relative humidity directly affect the physiology of the species - birth records of Raso islet Larks show more males than females when the species is subjected to prolonged periods of drought. Conversely, in years of good rainfall the number of individuals increases considerably (Donald *et al.*, 2003). Brooke *et al.*, (2012) associating the doubling of the species population in recent years with subsequent years of good rainfall. On the other hand, torrential rains affect bird populations, as is the case in the last two years, where several nests of Red Herons, Earth-Sparrows, and other birds were flooded with the consequent loss of youths (INIDA, 2011 and 2012).

The extinction rate of lizard species in the world estimated at 20% by the end of this century, if temperature increase predictions are confirmed. Variations in temperature and precipitation regimes change the critical resources and micro-habitat for reptiles (Whitfield *et al.*, 2007). Vasconcelos *et al.*, 2012 observed that high temperatures limit the habitat options and activity pattern of the *Tarentola substituta*, an endemic reptile species. In these animals, breeding period postponement trends have been associated with an increase in sea temperature - the breeding date of the *Caretta Caretta* on the Atlantic coast of Florida decreased on average by 10 days (from 1989 to 2003) and is significantly correlated with the increase of 0.8 °C of the sea water surface temperature (Weishampel *et al.*, 2004). Nest temperatures also affects the ratio of males and females of the species, thus favoring females rather than males (Godley *et al.*, 2002; Hays *et al.*, 2003; Glen e Mrosovsky 2004; Abella *et al.*, 2010).

The proliferation and introduction of invasive species of animals and plants, habitat fragmentation and destruction, and development of uncontrolled economic activities (free grazing and pasture harvesting), poor organizational and legislative management, poor environmental knowledge and awareness, and climate change, represent the main anthropogenic factors of pressure on biodiversity in Cabo Verde.

3.1.1.1 Exotic and invasive species.

Invasive species are the main cause of degradation and loss of plant biodiversity in Cabo Verde (Gomes, 1997; Duarte, 1998; Duarte and Moreira, 2002; Caujapé-Castells *et al.*, 2010; Romeira *et al.*, 2011; Gomes *et al.*, 2013). These pressures are likely to worsen in the islands with higher agricultural potential and the largest percentages of potentially invasive exotic species, namely, Santo Antão, São Nicolau, Santiago and Fogo. In Cabo Verde Biodiversity Database there is record of 448 introduced *taxa*, equivalent to 60% of the flora previously described in the archipelago, estimated at 738 *taxa*.

More than 10 species, including exotic and some native species, when facilitated by the degradation of their local ecosystems, have been manifesting the behavior of invasive species, with strong scalability. Aside from those already known, there is also the *Lantana camara* (Lantuna), *Furcraea foetida* (Carrapato) and *Opuntia ficus-indica* (Cacto), *Hyptis pectinata*, (Rosmaninho), *Leucaena leucocephala*, (Linhaço), *Dichrostachys cinerea* (Espinho-catchupa), *Nicotiana glauca* (Charuteira) *Calotropis procera* (Bombardeiro), *Acanthospermum hispidum* (Nhara-saquedo) and *Bidens pilosa*, (Seta-preta).

In Santo Antão, more precisely in Porto Novo County, a new introduced species was observed in agricultural parcels, with strong invasive and expansion capacity - *Schkuhria pinnata*, raising concerns among farmers. These need to be monitored by relevant authorities. The *Prosopis juliflora* (Acácia Americana) has merited major concerns in Boavista Island, where it occupies a large area of dunes, to the detriment of the *Phoenix atlântica* (Date palms). This has contributed particularly to degradation of the dunes landscape on the island, one of the main focuses of tourist attraction. Aside from Cabo

Verde, the species is considered biologically invasive in other countries like Brazil and South Africa.

Dichrostachys cinerea (Espinho-catchupa) was widely used in the past as firewood and has had invasive behavior in Santiago - in Ribeira Seca Watershed. The Linhaço (*Leucaena leucocephala*) has shown an invasive nature on some islands due to its non-use by cattle farmers, in due course.

The Carrapato (*Furcraea foetida*) e the Lantuna (*Lantana camara*) are a concern in mountain ecosystems (Island of Santo Antão - Cova/ Paúl/ Ribeira da Torre) where it occupies an estimated area of 162.5 ha, or 7.8% of the total area of 2 092 ha. They also occur on the islands of São Vicente (Monte Verde - covering an estimated area of 24.7 ha 7.9 % of total area), São Nicolau (Monte Gordo and Alto das Cabaças), Fogo (105 ha of the 800 ha occupied by the Monte Velha Forest) and in Brava (DGA, 2012). Nationwide, the Lantuna occupies a very large area in the wetlands (1 616 ha) if compared to the area occupied by endemic species (404 ha). These examples confirm that any exotic plant species has an invasive tendency when it finds favorable conditions. Thus, stronger management and environmental monitoring measures are recommended for key ecosystems under threat from introduced exotic species.

In animal biodiversity, the *Agama agama* lizard which likely entered Cabo Verde in imported lumber was identified in 2009, in Santo Antão and has spread to the islands of São Vicente and Santiago, occupying the latter with a population of more than 200 individuals (INIDA, 2011). This lizard is a danger to endemic species of lizards and insects, as these form the basis of their food.

The *Galinha-de-mato* (Wild chicken), is considered a major pest for rain-fed farming on the islands of São Nicolau, Maio, Santiago and Fogo, causing considerable losses in the sowing stage. It is however the prey of unregulated hunting in Cabo Verde.

3.1.1.2 Free grazing

The Top de Coroa vegetation has been destroyed by goats in free grazing (INIDA, 2014) creating conditions for the installation of extensive patches of monoculture unpalatable species of *Tortolho* (*Euphorbia tuckeyana*) and *Mostarda* (*Diplotaxis antoniensis*). Although these are endemic to Cabo Verde, the strong spread of these species in the natural space is still worrying and should be considered an indicator of the extreme environmental imbalance registered at the Natural Park, making this phytocenosis vulnerable to the eventual installation of plant and vegetable pests.

On Boavista Island, though without any major impacts on native vegetation, the goats wander across the island up to the coastal areas where there are typical vegetation formations of dune systems which are in general unpalatable for cattle. However, the low coverage level of palatable species demonstrates the existence of a large livestock pressure in these areas. This in a context where goats continued to grow at around 2.8%, going

from 160 885 heads in 2007 to 174 782 in 2010 (MDR, 2012). Pasture production in lowland areas, which have the largest goat population, have aggravatingly regressed due to low rainfall. The amount of pasture remains very much below the needs.

While conducting floristic inventories in Brava Island, marks were seen which indicated the overexploitation of vegetation by goats, bovine and asinine livestock. Unlike in other islands where free grazing is done mainly by goats, in Brava Island the asinine cattle is a constant pressure on natural vegetation.

3.1.1.3 Rain-fed agriculture

Rain-fed agriculture remains an economic activity which competes with native vegetation, notably in mountain ecosystems, such as Monte Verde (São Vicente), Santiago and Fogo.

3.1.1.4 Uncontrolled picking of plants

Indiscriminate cutting of shrubs for domestic consumption (firewood) and uncontrolled picking of plants (graze, medicinal, food and cultural purposes) including endemic ones, have contributed to the sharp decline of native plant populations, aggravated by water erosion in steeply sloping areas, degradation and soil degradation.

The cutting of firewood in national forests (430 t legally and 10 t illegally), is prevailing, just as in 2003, in various locations in the islands. In 2012, about 26% of the population still used firewood / coal as the main energy source for cooking (Censo 2010).

With the creation and implementation of the natural parks of Serra Malagueta, Monte Gordo and Chã das Caldeiras, logging and harveting of plant species, especially endemic ones, have been banned within the limits of parks. At the same time, large park areas have been restocked with endemic species like *Tortolho* (*Euphorbia tuckeyana*), *Lorna* (*Artemisia gorgonum*) and *Lantisco* (*Periploca laevigata*), and others, thus recovery of some native vegetation is visible.

3.1.1.5 Change and destruction of habitat

Agriculture intensification through the conversion of natural vegetation areas or semi-natural agricultural areas, extraction of aggregates and inappropriate tourism development in coastal areas are the main factors responsible for the change and destruction of habitats, one of the main causes of biodiversity loss in Cabo Verde.

The scarcity of arable land has given leeway to an intensive and often unregulated use of soil in Cabo Verde. Only 10% of land (44,359 ha) is considered arable (RGA 2004). When combined with poverty among the rural communities, it continues to induce heavy pressure by the rural population (growing at a rate of 2.4% per year!) on arable land. The land situation which is characterized by strong parceling of land has been a limiting factor in rain-fed production that has contributed to soil erosion, and consequently, to decrease in

production and rain-fed productivity which in 2004 occupied about 76% of arable land in the country. To offset decreases in income, natural or semi-natural vegetation areas have been converted into potentially agricultural areas. However, this strategy has contributed to the creation of voids, due to the abandonment of converted areas that have proved to be unproductive and are opportunistically occupied by invasive species. These are scenarios of change and destruction of habitat that still persist in the highlands, sub-humid and humid areas.

In coastal areas, the extraction of inert materials and the occupation of land for tourism infrastructure are still factors that have contributed most to change and destruction of habitats. On the other hand, the rampant extraction of inert materials on beaches and in the of river beds has led to an accelerated degradation of beaches and creeks around the country, with serious consequences for the environment and populations. These forms of pressure induce a direct loss of biodiversity because of the decreased size of beaches, with strong implications for the ecological niche of marine species of national and global importance (turtles) and even, the destruction of native vegetation patches, among others.

Furthermore, the development of harmful recreational activities (all-terrain vehicles - 4x4) has also contributed to the change and the degradation of dune ecosystems, modifying changes habitats and changing environmental functions. In Boavista, the destruction of dunes is notorious in Praia de Curral Velho Beach, where vegetation was completely destroyed. These practices in the sea turtles nesting beaches have not only adversely affected the reproduction of the species but has also destroyed the dune vegetation.

Viable alternatives to these pressures are necessary in order to ensure the supply of aggregates for the construction industry as well as alternative livelihood for the labor-force involved in the illegal extraction of inert materials. Among several possible approaches, there is the regulated mining industry, recycling of construction and demolition waste, new construction techniques and use of other types of materials.

3.1.1.6 Use of pesticides

The national plan for the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) reveals that presently Cabo Verde does not have any pesticides containing persistent chemicals in their composition (such as DDT¹ and Aldrine) , previously used for public health purposes. However, the use of obsolete and / or expired products (about 192 products in 2004) that haven't been used for over 50 years still persists. On the other hand, one should also take into account that many of these products are also toxic in their successive forms of degradation that remain in differentiated manner among the various ecosystems components. Existing measures in the POPs plan focus on the elimination of their use, enhanced surveillance, training and information for users.

¹Dichloro-diphenil-trichloro-ethane

3.1.2 Pressures and threats on marine and coastal biodiversity

Without detailing aspects of inventory on marine biodiversity as in previous reports, from the first in 1999 to the fourth in 2009, in this report we will analyze (i) the main changes in marine biodiversity status and trends induced by the implementation of projects and activities as economic stress factors; (ii) the environment load capacity and effective marine biodiversity conservation, as state factors, and (iii) the extent to which knowledge development translates into an equivalent evolution in the conservation and sustainable exploitation of marine biodiversity, as response factors by successfully implementing conservation, minimization, mitigation policies or compensation of development pressures.

3.1.2.1 Construction of infrastructure

Between the successive reports on the status of biodiversity in Cabo Verde, development projects were implemented, mainly on the coast, with direct and indirect impacts on marine biodiversity. They were basically the construction of marine infrastructures such as ports and marinas, or on the coast such as tourist resorts and marginal access roads and links between communities to ensure greater and more fluent movement of people and goods, infrastructures and centers of economic activity. Thus, with the exception of the islands of São Nicolau and Maio, ports were built in all other islands, while a marina built in the Bay of Porto Grande - São Vicente, where one had already existed. The islands of Sal, Boavista, Santiago and São Vicente recorded the most significant changes in terms of construction of hotel and tourism infrastructures. Marginal or access roads were built in all the islands, from Santo Antão to Brava. Already in 2007, Cabo Verde which has about 1 020 kilometers of coastline, had about 1 437 km of roads including asphalt, stone pavement and dirt roads.

In view of the archipelago's insular nature, it is not easy to idealize the separation between land, coastal and marine resources. That's why the marine and coastal environment is definitely the last vessel of man-made excesses. Hence, as a logical consequence, the majority of construction projects on land, depending on their size, nature and location, eventually extend their direct and indirect impact to coastal and marine areas, thus affecting biodiversity in all its forms of expression. It is the case of the construction of airports on all islands, except Brava and Santo Antão, as well as water retention dams on the islands of Santiago, Santo Antao and São Nicolau, in recent years. Nine water retention dams have been built, with a retention capacity of millions of tons of water, representing an equivalent *deficit* in the water courses that flow directly into the sea and consequent reduction of the natural fertilization of coastal waters without any mitigation programs.

On the one hand, they are infrastructure constructions which activities entailed reversible impacts, but often with irreversible impacts such as the loss and change in the structure of marine and coastal habitats. On the other hand, during their operational phase, they are sources of pressure that deserve to be monitored as part of the process of Environmental

Impact Assessments (EIA) that normally should have been conducted at project stage. This procedure, which will be addressed later on in the report, aims to prevent impacts of extreme changes on the ecological niches of fauna and flora at local, national and regional levels.

In terms of trends, other port construction projects have been prepared and are being launched in the coming years on the islands of São Nicolau and Maio, in addition to a deepwater port in São Vicente and various marinas, preferably located in São Vicente, Santiago, Sal and Boavista. These infrastructures are integral part of the continuous shipping and tourism development policy. There are also prospects for the construction of new water retention dams, within the agriculture and livestock development policy, integrated in promoting agro-business as an important axis of national development which will also impact on the status and trends of marine biodiversity.

There are also other pressure factors resulting from economic activities supported on the marine biodiversity such as fishing, beach tourism, water sports, recreation and leisure, naval and port activities, and shipping.

3.1.2.2 Fishing

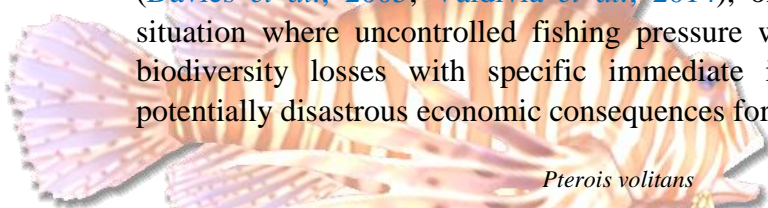
Fishing is a marine economic activity that at artisanal level is done using small on average 3-5 m long, open-hull out-board engine boats, mostly of wood, manned by an average of 3 fishermen and using mainly hand line for diverse fishing of demersals and tuna. When seine fishing or using gillnets, the number of fishermen increases to 6-10, the boat size is relatively larger and the target species are small pelagics. In the last five years, the annual average catch has varied between 4 and 5 million kg, without any record of significant increase. However, in the same period, the number of boats went from 1 036 in 2010, to 1 575 in 2014 (Central Database on Fishing Vessels - DGRM), e.g. a considerable increase of 50%, with consequent decrease in biological and economic returns.

In semi-industrial fishing, vessels are usually made of wood and / or fiberglass, with inboard engine manned on average by 8-12 fishermen and with autonomy to stay up to one week at sea. They use hand-lines, gillnets and seines as fishing gear for demersals, small pelagics and tuna. However, the latter uses larger vessels, fiberglass or iron, a larger crew, and has greater autonomy at sea. It is a deep-sea fishing, targeting tuna, sharks and pink lobsters – *Palinurus Charlestoni* (endemic to Cabo Verde). Average annual catches (INDP, 2013) have been at 5,000,000 kg and 6,000,000 kg, but there have been significant increases in 2013 and 2014, respectively 7,926,701 kg and 9,838,625 kg, according to provisional data by INDP. Associated with this increase is the 26% increase in semi-industrial vessels, from 80 to 101.

According to aforementioned indicators, we are up against scenarios of over-exploitation of resources where, despite some management measures expressed in 2004-2014 FRMP, effectiveness is still very limited, mainly due to IUU fishing practices, very hard to combat in a context of free access to resources. One can conclude that the two - free access to resources and IUU fishing, are, in terms of fisheries management, the main threats to

marine biodiversity, at both specific, taxonomic, genetic, and ecological and functional levels.

In an ecologically very heterogeneous coastal environment, in terms of habitats and spatial ecology of demersal stocks (fish and crustaceans and mollusks), local overexploitation can very seriously induce significant losses of genetic resources. Similarly, uncontrolled fishery focusing only on certain species will bring on imbalances at the level of the food chain and dominance relationships, making marine biodiversity much more unstable and vulnerable to external disturbances. For example, the threat posed by the invasion of the islands' ecosystems by highly opportunistic transatlantic exotic species, such as the lionfish (*Pterois volitans*). In fact, that which could presently pose a threat of great ecological imbalance, would not have been twenty years ago, in another context where the species would find important stocks of potential natural predators like *Chernes*, *Meros* and *Meratos* (*Epinephelus sp.*) or sharks, in these same ecosystems. In these cases, regardless the diffused results of scientific research still little consolidated (Davies *et al.*, 2005; Valdivia *et al.*, 2014), one can assume that the country is in a situation where uncontrolled fishing pressure will have already resulted in significant biodiversity losses with specific immediate impact on functional biodiversity and potentially disastrous economic consequences for Cabo Verde.



Pterois volitans

In a context of not properly regulated exploitation, the entire system enters a cycle of "snowball effect"- every form of pressure generates new forms of pressure, aggravated by a widespread poverty situation in remote island communities. New ways of using seemingly selective fishing gear have emerged in Cabo Verde. These are used in a cunning and opportunistically manner by fishermen, and become selective and devastating. It is the case of diving with autonomous means of artificial respiration using nets (gillnets and seine - in principle, passive gear), having as targets any and all species, with no regard to size and reproductive status. Even if it is a threat not documented in scientific literature, it is real and described by the fishermen themselves, especially on the island of São Vicente. Diving with autonomous means of artificial respiration is, in itself, a diversified fishing device that by using spears targets all species and taxonomic, demersal and pelagic groups, and is one of the most depletive gear, and still not being monitored by fisheries authorities.

Preceding paragraphs presented fisheries as a pressure factor in its different modalities - artisanal, semi-industrial and industrial. However, such an approach would be incomplete without a reference, however brief, to foreign fishing in Cabo Verde. This activity is carried out within the framework of fisheries agreements signed by the country with third parties, notably the European Union, China and Japan. According to the legal and administrative boundaries of such agreements, the fleets of those countries are authorized to fish tuna and sharks, and in principle, should catch a surplus of fishing potential, paying, in exchange, fishing rights to the State of Cabo Verde. Responding to the challenge of informing policy makers, in Annex II, is a brief foray on the impacts of the fisheries agreement that Cabo Verde has with the EU.

3.1.2.3 Beach tourism, water sports, recreation and leisure

As described and analyzed in Sections 1.3, 1.4 and 1.5, these activities entail economic potentials afforded by an important expression of marine and coastal ecological biodiversity, supported among others by extensive sandy beaches. If, on the one hand, these natural conditions have afforded the country an important integration in the international circuits of water sports, and constitute an attraction for the tourist industry, on the other, they are, in many cases, in conflict with the conservation needs of specific, taxonomic and genetic marine biodiversity. In these conflicts, emphasis is placed on the preservation needs of habitats that should be favorable to reproduction of the common sea turtle (*Caretta caretta*). The development of tourist establishments on beaches or surrounding areas has represented a pressure factor, mainly on the islands of Sal and Boavista. In many instances, the apparent economic advantages have taken on greater weight in decision-making. In others, the institutional weakness of national authorities responsible for marine and coastal environment, clearly represent a limitation when confronted with the monitoring requirements of environmentally adjusted decisions. Environmental Impact Assessment processes are rarely complete and end up with the approval / endorsement of the EIAs, without the consequent monitoring of licensing conditions and without any environmental audit at later stages of tourism projects on the coastline. These are instances of pressure factors that are not yet quantified and that require specific studies to allow better formatting of investment decisions, and subsequent monitoring.

3.1.2.4 Naval, port and shipping activities

These activities are considered pressure factors with impact on all forms of marine biodiversity expression. The real pressure in Cabo Verde comes from the resulting chemical pollution from washing, maintenance and repair of vessels on the high sea or in port areas of all the islands and shipbuilding areas, producing waste oils and hydrocarbons that are released in the environment, in the context of deficient environment and marine monitoring. In addition, there are real risks of spills due to grounding of ships carrying various loads, including fuel. This form of pressure is exerted directly on the habitat of species on water columns and depths, depending on the physical and chemical nature of the pollutant, affecting specific (species), taxonomic (*taxa*), genetic, ecological (habitats) and functional (the relative dominance relationships in the communities) biodiversity. These activities also result another form of pressure - the noise, which arises from the traffic intensity in certain sea lanes and the overlap between water and / or coastal tourism zones (movement of all-terrain vehicles on the islands of Sal and Boavista in areas of coastal dunes) with nesting and reproduction habitats. This form of pressure impacts mainly on marine mammals and sea turtles, disrupting their ecological niches in terms of communication, group behavior and reproduction.

3.1.2.5 Cultural practices

Certain dietary and medicinal cultural practices linked to the consumption of certain species such as the Common Turtle (*Caretta caretta*) and the Shearwater (*Calonectris edwardsii*) and *Gon-gon* (*Pterodroma feae*), cause direct negative impacts on the species, with the former being threatened with extinction worldwide. The *Gon-gon* is an endemic seabird threatened by human predation. Its conservation status in the country is uncertain due to lack of studies. There are three *taxa* in the North Atlantic, all of which endemic to the Macaronesia and with "Near Threatened" status, according to IUCN. In Cabo Verde, the bird can be found in just four islands - Santo Antão, São Nicolau, Santiago and Fogo, with higher occurrences in the latter island. The greatest threats to this species are local people and cats.

Despite the nationwide conservation efforts, involving authorities, educational and research institutions and civil society organizations, sea turtles are still under pressure, motivated by the cultural dimension, with authentic massacres of the species still taking place today, in all the islands. The archipelago congregates, on a global scale, the third largest nesting population of sea turtles. In addition to being captured by the population, turtles are also endangered due to predation of their nests by other species such as dogs and crabs. In 2010, 15 nests on the beach at Algodoeiro were preyed upon or disturbed by stray dogs. The following year, predation was higher. This led the conservation team to transfer part of the nests to a nursery. In 2012, in order to avoid predation, flat cages were installed, but were unsuccessful. More than half of the nests in Algodoeiro Beach had to be transferred to a nursery (Taxonera, 2012).

The shearwater is still hunted for human consumption, mainly in the northern region of the country, despite the awareness-raising and habitat protection efforts which have had very positive results in recent years.

3.1.2.6 Sand extraction at sea and in dry riverbeds

Sand extraction at sea, in coastal regions and riverbeds as a result of pronounced poverty in rural areas, is still a significant source of pressure on marine biodiversity. These pressures lead to the destruction and change of the structure of marine and coastal habitats, affecting their ecological component, with repercussions on the degree of favorable conditions in the environment (food, natural protection, growth and reproduction of the species) and important coastal ecological balances. They reduce the species' ecological niches in terms of salinity, temperature, water turbidity, oxygen and primary production leading losses of specific, taxonomic, genetics and functional biodiversity. Given that the situation stems from social pressure related to higher poverty levels, one would predict that it will continue for a few more years, despite the oversight mechanisms and practices that still have low level of effectiveness.

3.1.3 Main threats to marine and coastal biodiversity

The major changes observed in marine biodiversity status and trends in Cabo Verde as a result of economic activities and ongoing development projects, constitute either direct or indirect threats to biodiversity loss. Among the main causes are, notably (i) rural poverty, (ii) coastal erosion, (iii) IUU fishing, (iv) marine pollution, (v) the import of aggregates and other construction materials, (vi) climate change, (vii) low level of environmental citizenship, and (viii) the cumulative, multiplicative and amplifying effects of threats.

3.1.3.1 Rural poverty and poverty in remote areas

Poverty in Cape Verde is a phenomenon that derives, among others, from levels of employability, in part, as a result of national development policies under the responsibility of governments. Since it is a relatively young country, its youth population is an important feature that is supposed to catalyze its own development process in the medium / long term. However, the fact that it is a young country implies that development challenges are multi-sectoral and should aim to cripple the complex challenges at all levels. And the successive governments and the international community thus far have not been able to lower poverty to levels that ensure minimum levels of economic and social well-being for all. Thus, populations of rural and peripheral areas of urban centers see natural resources that can be rapidly mobilized as a quick and immediate way of obtaining minimum survival benefits. However, as described in 1 above, Cabo Verde is an island, oceanic and tropical ecosystem, with physical, geographical and ecological characteristics that influence the natural carrying capacity, compatible with such human pressure. An aggravating factor is the fact that the potentials of important natural resources such as the sea, the wind and the sun are, themselves, not easily exploitable in the short and medium-term policy framework. It is as result of these findings that a number of threats of marine biodiversity loss, already listed above, emerge. Given such scenarios, it is expected that Cabo Verde will continue under high human pressure and loss of specific, taxonomic, genetic, ecological and functional marine biodiversity in the coming years. A recent documentary film "*Sandgrains*" by José Fortes, edited by *Matchboxmedia collective* in 2012, illustrates well this cause or threat.

3.1.3.2 Coastal erosion

Coastal erosion, which in itself represents a loss of ecological biodiversity associated to loss of habitats of species such as sea turtles and certain seabirds, is at the same time the result of pressure factors such as rural poverty, as already described, and a threat in terms of climate change resilience of coasts due to the expected rise in the average sea level. This is the result of sand extraction in coastal areas and at sea - where the latter had once take on industrial proportions, with government permission. The banning of this activity in the last decade is, however, a very significant advancement in terms of maturity in environmental policy in Cabo Verde. Coastal erosion also arises as the direct and indirect result of projects of inadequate coastal occupation related to tourism infrastructures (islands of Sal and Boavista) that, apart from destroying and changing the habitat structure, block natural channels and alter coastal sediment transport cycles, which are important in coastal sediment dynamics and the balance of sandy beaches. These threats,

which often find economic reasons, could be safeguarded in an effective and efficient EIA context that unfortunately still does not exist. It is therefore to be expected that these threats will continue to be felt in the coming years in terms of ecological, specific and functional biodiversity.

3.1.3.3 Illegal, Undeclared, Unregulated Fishing

IUU fishing, a scourge affecting the entire planet, is in Cape Verde an even more aggravating threat factor due to the natural conditions of great biological diversity, which also feature biotic and abiotic conditions unfavorable to the development of large abundances in stocks. IUU fishing, particularly using explosives (islands of Fogo and Santo Antão), non-selective devices (gillnets and beach nets) and spear fishing by diving with auxiliary means of artificial respiration, that is little supervised, is a threat of specific (extreme pressure on certain demersal fish and coastal lobster species), taxonomic (fragility of certain taxonomic groups (fishes of the *Epinephelidae* family – *Chernes*, *Meros* and *Meratos*) genetic and functional (changing specific dominance relationships within one or more communities) biodiversity loss. This threat takes on worrying dimensions in a national context of weak capacity of fisheries resources management. Indeed, the ecological structure of its populations is still unknown, and may suffer irreversible loss of genetic diversity. National weakness in the area of fisheries management also results in some strategic inconsistency of certain policies for resources exploitation; for example, fishing sharks in the framework of fisheries agreements that in principle are tuna-oriented. This threat is real and has consequences for the entire marine food chain, with inevitable loss of functional marine biodiversity.

3.1.3.4 Marine Pollution

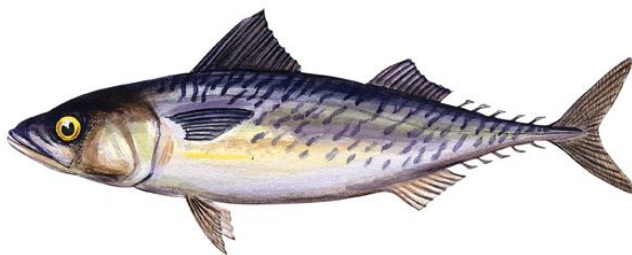
Marine pollution is now a threat factor, essentially linked to maritime traffic of goods and fuel between the islands, with the occurrence of accidents and stranding of vessels. In recent years, there have been several strandings and some accidents between cargo ships (Bay of Porto Grande on the island of São Vicente, Port of Praia on the island of Santiago and Port of Sal-Rei on the island of Boavista), as well as other coastal strandings where oil spill is a real threat, due to the cargo itself or the fuel and lubricants from the ship's machinery. These threats can potentially affect the biotic (primary production) and abiotic (turbidity, light and temperature) conditions affecting habitats and ecological niches of species. Consequently, specific and ecological biodiversity will be threatened. Among the threats mentioned, this is the one that can best be controlled in the coming years since, usually, shipping companies, in consultation with maritime and environmental authorities, have risk management contingency plans.

3.1.3.5 Importation of sand and other construction materials

Import of sand, as well as other natural materials such as wood, to meet domestic construction needs is a threatening factor to specific, genetic and functional marine biodiversity because of the introduction of exotic species. These species, the result of a certain ecological plasticity, can adapt to new habitats and ecological niches and become opportunistic and competitive with the local fauna and flora. These threats are expected to continue, and even become accentuated in the coming years, such is the current and planned reliance that is subject to the infrastructure dynamics on the islands. This threat can be significantly reduced in a context of greater effectiveness and efficiency of EIA processes.

3.1.3.6 Climate change

Climate change is a threat to marine biodiversity around the world, though this perception is egocentric in a way, where man is positioned as the center and the focus of the welfare benefits the planet can provide. Outside this perception, one should understand that every, and any, climate change is always natural, and the planet is to be able to find new ways of balance, with or without the presence of man. In the country, one can admit that climate change already represents a threat to ecological biodiversity with the destruction of or changes to coastal habitat structure, as well as changes in terms of ecological niches of marine fauna and flora species. This change in ecological niches may result in changes in average temperature patterns of sea water, oceanic productivity, food chain and food availability, often as a result of hydrodynamic patterns of changes in currents and physical structures (Upwelling or sags of ocean and coastal waters). Thus it affects all marine biodiversity, from specific, taxonomic, genetic and ecological to the functional levels and may lead to the proliferation of exotic and invasive species.



The distribution, abundance and migration of various fish species is related to ocean temperatures (Robinson *et al.*, 2005).

Figure 21. Sample of a *Cavala pintada* (Atlantic chub mackerel) (*Scomber colias*) previously described to the fish fauna of Madeira, and currently being significantly observed in commercial landings on the island of São Vicente - Cabo Verde.

The increase of pelagic species typical of North temperate seas since 1995 seems to be related to sea temperature increases in the area (Beare *et al.*, 2004).

The increasing number of migrant species in England was significantly correlated with temperature increases in the North Atlantic over the past 40 years (Stebbing *et al.*, 2002). An increase of species in the northern seas, consequently implies a decrease of these same species in warmer areas. While completing this report, commercially important landings of

the *Cavala pintada* (Atlantic chub mackerel) (*Scomber colias* – Figure 21), a pelagic species previously described for the Madeira region, (Wirtz *et al.*, 2008) were recorded in Cabo Verde.

In Cabo Verde, it is important to mention three oceanic-atmospheric phenomena that have been undergoing considerable changes and are perceptible in a time scale of less than a generation: annual rainfall cycles, annual cycles of dust from the Sahara Desert and upwelling cycles from the West African Coast - Mauritania.

The changes observed in the annual rainfall cycle in Cabo Verde are a significant threat to marine biodiversity, because it is directly related to the coastal water enrichment levels with land-based sources of nutrients (nitrites, silicates, phosphates) that reach the sea through leaching of soil during rainwater run-offs. Changes to this process in Cabo Verde have added importance as the islands of archipelago have very reduced insular platforms. Thus, despite a fairly deep euphotic zone due to high insolation, nutrient availability is the main limiting factor of marine production in Cabo Verde. These nutrients of coastal origin are very important in terms of primary productivity and consequently throughout the whole food chain.

On the other hand, significant changes have been observed in the annual cycles of dust coming from the Sahara Desert. Peak values that were previously (in the 90s) recorded in the months of December and January are now recorded between March and April. Given the importance of the dust in stimulating and catalyzing photosynthesis enzyme, due to its richness in iron (*Fe*), this almost seasonal change affects oceanic natural cycles, which have yet to be studied.

Upwelling variations on the coast of Mauritania coast have an impact in Cabo Verde, particularly on the island platforms of Eastern islands as they represent ideal conditions of oceanic productivity. Annual changes in this phenomenon, linked to the changes in ocean temperatures and current patterns, affect productivity conditions and, consequently, marine biodiversity as a whole. These factors may be threatening or potentiate threats, according to its manifestation or non-manifestation. Although outside the archipelago's immediate ecosystem, they can however be mitigated through MPA creation policies in the eastern region. The seas of Cabo Verde have been a field for research international on iron (*Fe*) metabolism as a central chemical element in oceanic productivity, in the search for a better understanding and assimilation of the cycle and metabolism of Carbon (*C*). These studies are very important to scientifically clarify/explain water acidification processes, e.g. they contribute in a decisive manner to a better understanding of the ecological biodiversity of the biogeographical region where the archipelago is situated (SOLAS Project - *Surface Ocean - Lower Atmosphere Study*).

3.1.3.8 Environmental citizenship

The man and women in Cabo Verde (nationals, foreign residents and tourists) are the direct beneficiaries of the living conditions and well-being provided by marine biodiversity, as a supporting environment and as raw material for human development. However, in practice, development challenges persist and are still seen in Cabo Verde as

possible and achievable at any cost, without any real concern for sustainability and without a consistent perception of the limits imposed by nature. Nationals still have a weak perception of what is, or should be, a balanced and lasting relationship between man and the environment. Foreign residents still don't have a sense of belonging towards the environment of a country that is not his/her. Tourists, who in their countries of origin are usually formatted by the principles of a healthy relationship with the environment, find in Cabo Verde all possibilities for evasion, escape and adventure without any sustainability prospect, and without assimilating the concept that in the long run, environment knows no boundaries. That is why we still observe all forms of pressure described to marine biodiversity. Tourists themselves are still the target of the profitability of projects that are not at all environment-friendly, such as certain tourism infrastructures, practices, and activities that are concentrated on eastern islands, mainly Sal and Boavista. The level and expression of public participation in Cabo Verde is still very limited and boils down to just a few manifestations of displeasure or discontent toward certain investment projects, not well founded and of little consistency without, and without capacity to influence decisions.

3.1.3.9 Cumulative, multiplicative and amplifying effects of threats

The referred threats to marine biodiversity are often times wrapped in a large socio-economic, cultural and political complexity, with the interaction of numerous stress factors, due to the existing cause-effect relationship between them. This situation often leads to negative feedback effects with accumulative, multiplying and amplifying impacts of one threat to another over time. This complexity, which can be studied and diagnosed using the various social sciences and humanities, should compel a profound thinking process at decision-making levels so that biodiversity can be effectively used as a source of material and support to sustainable human development. For example, IUU fishing, because of the pressure it imposes on the most sensitive and over-exploited resources, represents a threat to the sustainability of traditional fishing activity which, in turn, is permanently at risk of unsustainability and, consequently, is an element of poverty. These two forms of threat accumulate and multiply the effects of climate change on sensitive resources, making them more vulnerable to the effects of marine pollution or of introduced or invasive exotic species. In a context of rural poverty and peripheral regions, the challenges of creating an environmental citizenship awareness become much more complex, and all management decisions, however they are labeled as sustainable, have huge difficulties in succeeding. This context of the cumulative, multiplying and amplifying effects of threats is quite favorable to increased degradation and loss of marine biodiversity in all its forms of expression.

3.2 Main responses to pressures and threats on terrestrial biodiversity

From the analyzes presented in paragraph 3.1, it appears that the country constitutes a space ecologically very vulnerable to pressures arising from economic and social development which, in a context of sustainability, should be formatted according to the prevailing environmental conditions and natural cycles in balance - all of this at the expense of short-term economic gains. However, the environmental pressure situation

described in section 3.1 may eventually be seen as inevitable in an economic and social developing country that has no easily mobilized natural resources.

3.2.1 Conservation measures

Although biodiversity still remains under strong anthropogenic pressure in Cabo Verde, over the years, mitigation measures have been implemented under different conservation programs and projects.

In 2011, 22 548 specimens of six species of endemic angiosperms of Cabo Verde were planted in Serra Malagueta Natural Park - Santiago Island, namely *Euphorbia tuckeyana*, Lorna (*Artemisia gorgonum*), Lantisco (*Periploca laevigata*), and *Echium hypertropicum*, strongly contributing to the restitution of native vegetation in this natural space. In the same year, a total area of about 10 ha of invasive plants (DGA, 2012) was put under control and removed in this natural park (DGA, 2012). In the natural parks of Chã das Caldeiras, Fogo and Monte Gordo, in São Nicolau, thousands of samples of shrub endemic species were set in degraded areas, among which, the Dragoeiro (Dragon Tree). These actions have had a positive impact on strengthening the visibility of these areas and in creating an attractive landscaped framework for ecotourism. This is an activity capable of ensuring the economic sustainability of protected natural areas (Gomes *et al.*, 2013).

Until 2009, there were only three operational terrestrial PAs in Cabo Verde, totaling about 2.5% of the national territory. There was no marine area operational at the date. By 2014, the number of operational PAs went from three to 26, of which 9 terrestrial and 17 marine and coastal, exceeding 10% of national protected area. All these units already have their limits approved and management plans, either approved or in the approval stage, and are being implemented by the respective management teams (DGA, 2014). The management plans of the natural parks of Monte Verde em S. Vicente, Moroços, Cova, Ribeira da Torre, and Ribeira do Paúl in Santo Antão, the Natural Reserves of Ponta Sinó, Fragata and Serra Negra in Sal, the Norte Natural Park and Turtle Reserve in Boavista (DGA, 2014) are at the approval stage.

Also, noteworthy is the in nursery production of over three hundred samples of tree-size Marmolano, an "endangered" species and the only dicotyledonea endemic to Cabo Verde that, until then, had not been able to spread or propagate either *in situ* or *ex situ*, in nurseries or laboratory.

Operating national parks have played an important role in the training and awareness-raising of visitors and civil society. Out of a total of 17 071 people who visited Monte Gordo Natural Park between 2007 and 2011, 3 500 were students, 1 219 nationals and 749 foreign visitors (PNSM 2007).

To address the problem of over-grazing there are ongoing activities within the project "*Improving breeds, feed production and processing of food products*". The project consists of pasture production to improve cattle feed, construction and improvement of livestock

infrastructure, diversification and improvement of livestock breeds through artificial insemination for cattle and goats. In pasture production, activities have consisted in the collection and conservation of pasture and fixing forage plants. Thus, in 2012, 44,576 plants were fixed and two protein banks installed. In 2012, forage production of grasses and legumes in the areas of open forest and shrub formations was estimated nationally at around 122 353 t of dry matter (DGADR, 2013). These activities and other private sector initiatives, particularly through the "*Ilha Verde /Green Island*" project which consists in the massive production of maize (15 000 t in 2013) abroad to manufacture of feed, have helped address the issue of extensive grazing and over-grazing.

3.2.2 Response actions

3.2.2.1 Rain-fed agriculture and over-exploitation of coastal wells

To cope with the pressure exerted by rain-fed agriculture and the overexploitation of wells in the coastal areas, the government has been carrying out programs for mobilization and provisioning of water and watershed planning, with the purpose of increasing production and agriculture productivity which includes the conversion of rain-fed farming into new irrigated areas. Thus, irrigated land area has significantly increased - the target set in the Government Program for the period 2011-2016 (3 070 ha) in terms of total irrigated area has been exceeded (in approximately 3 783 ha). With regard to the drip irrigation system, with less impact on soil erosion, the target set (1 820 ha) was achieved in 2013 (70% - 1 300 ha). Thus, the irrigated area increased from 16.4% in 2004 to 32.4% in 2013. It is also expected that the dams already built and those under construction, will enable mobilizing a significant volume of water, which will allow converting more than 1 000 ha of areas still occupied by rain-fed farming. All these have a positive effect on household income, particularly in reducing the pressure on land and in direct competition between man and native biodiversity (animals and plants).

The completion of the first national forest inventory in 2013 contributed to significantly improve knowledge on forest biodiversity in terms of total coverage, biomass and carbon sequestration. This quantitative and qualitative information are inputs for the Forest Areas Management Plan and Participatory Management that will introduce improvements in the management of forest perimeters and protected areas, including monitoring functional biodiversity (associations between forest tree species and species of native vegetation shrub).

3.2.2.2 Tourism

Since 2009/2010, the islands of Boavista and Maio now have tourism development plans for the ZDTI (Integrated Tourism Development Zones) which include mitigation measures to correct situations that constitute environmental imbalances: (i) estimate the carrying capacity of ZDTIs near PAs; (ii) introduce corrections in order to adapt constructions to the sedimentary dynamics of sand; (iii) systematically monitor tourist resorts to prevent constructions in protected areas; (iv) enhance protected areas seeking greater economic

and financial profitability through initiatives such as the creation of attractive landscapes for economic tourism.

3.3 Main responses to pressures and threats on marine biodiversity

After analyzing the changes in marine biodiversity status and trends, such as the result of infrastructure constructions, development of projects and various economic activities as pressure factors, it is now of interest to analyze the responsiveness resulting from the natural ability to withstand such pressures.

In terms of fisheries exploitation, the potential of resources (in abundance) is relatively small to support uncontrolled fishing pressures that cause losses of specific, taxonomy, genetics and functional biodiversity. However, in terms of pressures resulting from organic and marine pollution episodes, exception made to closed bays and bays located opposite dominant currents, the fact that Cabo Verde is an oceanic archipelago could represent, in the open sea, an advantage. This because, due to the action of dominant currents, water circulation time within the islands is reduced, favoring the dispersion and flow of particles. It is estimated that the flow of matter between the islands instantly induces a yearly loss of 40% of the archipelago's biological matter to nearby regions downstream of dominant currents (Medina, 2008).

On the other hand, the size of the islands and the availability of space is clearly reduced when compared to the rate at which these spaces are occupied, for example with the construction of infrastructures (ports in all the islands, marinas, marginal and penetration roads on all islands, airports and airfields, dams, urban and tourism constructions, landfills etc.) supported by biodiversity in terms of space, raw material and residual impacts. Thus, the changes induced in marine and coastal biodiversity are much faster and more pronounced, anticipating aggravating trends.

Pressures on the marine animal diversity of endangered species has been mitigated by several actions undertaken by public institutions and NGOs. Regarding the shearwater, actions have been concentrated in Ilhéu Raso islet, which is home to about 75% of the species population. Cabo Verde has benefited from the support of national institutions and international NGOs such as WWF, RMCP, the International Foundation of Banc d'Arguin (FIBA) and the Portuguese Society for the Study of Birds (SPEA). The national NGO Biosphere I led a shearwater protection campaign on Ilhéu Raso islet, with the support from the military, which allowed avoiding the killings of youths. The year 2013 marked six consecutive years of protecting this species and it is thought that the population of shearwater is finally recovering, estimated at 2013 7000 breeding pairs, with expected improvements in the following years.

With the implementation of the National Park of Fogo, several public awareness activities have been conducted, leading to improvement in the populations' behavior against the *Gon-gon*. On the other hand, there is the bird's ecotourism potential that can be developed and exploited to the benefit of conservation and the communities. A project funded by the

Small Grants Program (UNDP *Small Grants Fund*) and the Directorate General for the Environment, in collaboration with the Canary Center for Wild Fauna Recovery, has allowed castration of 78% of domestic cats in Chã das Caldeiras in order to reduce the number of individuals and therefore the threat to *Gon-gon*.

Regarding the use of pesticides in agriculture, one should note the existing measures in the POPs Plan on eliminating their use in Cabo Verde, enhancing surveillance, training and information to users. Also worthy of mention is a project implemented by the MDR in 2012 with FAO funding, aimed at determining the pesticide level on agricultural and livestock products in the country, with results that point to a significant reduction of pesticide residues in plant and animal products and of heavy metals to levels below recommended exposure limits. These results are owed to measures implemented over many years, with emphasis on awareness and training activities targeting farmers on the rational use of pesticides (MDR, 2013).

From this approach on the responsiveness of marine, coastal and land biodiversity as state factor, it is of interest to analyze, albeit briefly, the success of policies on conservation, minimization, mitigation or compensation of environmental impacts resulting from development pressures, as a response factor. The country has a national environmental authority with a mandate to propose and implement environmental policies within national development strategies. It is the reference institution for general environmental conservation policies. One should highlight the following responses: (i) creation and operations of PAs; (ii) the EIA process; (iii) specific species conservation programs; (iv) adoption and implementation of agreements, protocols and conventions and (v) promotion of participation.

3.3.1 Protected Areas

Preliminary studies, location, geo-fencing, definition and nature, ecological, economic, social and cultural characterization as well as PAs management are measures aimed to conserve marine and coastal biodiversity in a given space, allowing their regeneration in controlled use conditions. There are 46 units of Protected Areas established in Cabo Verde. Embarking on such a path is commendable and will help to promote not only increased environmental response capacity as well as increased resilience to pressures that potentially disrupt ecosystems. However, in terms of what is to be expected from PAs as response measures to development pressures in Cabo Verde, the country is far from the desired. The process from preliminary studies to the effective establishment of a PA is very time consuming (several years!) and when it reaches the level of formal legal definition, passage to the operational phase and effective environmental management also takes several years. This situation stems from the still little national awareness among ruling political structures on the strategic importance of these measures, and the still insufficient national technical capacity to drive and take on such challenges.

3.3.2 EIA

The existence of a national EIA system as a prior evaluation filter of the pressures that a particular development project potentially induces on marine and coastal biodiversity is a strong pillar in biodiversity conservation because it is supposed to conduct an evaluation and bring about effective operational decisions. Thus, in terms of EIA, promoters of a development project should conduct a comprehensive environmental impact assessment of the project at the site, location and region of implementation. They should not only choose more reasonably environment friendly scenarios in the short, medium and long term, but also integrate project mitigation, minimization or compensating measures for the negative impacts and potentiate the positive environmental impacts. To this end, as part of the EIA, they should provide an Environmental Monitoring Plan, which must take due account of a construction or development phase, an operational or functioning operational phase and, if necessary, a decommissioning phase. In the EIA evaluation phase, the national environmental authority is supposed to verify all aspects mentioned above, before submitting the EIA to a public consultation, prior to the final decision to approve or not.

The EIA can then be considered as a well-established system in Cabo Verde, in legislative and administrative terms. However, in technical and operational terms, it is still very weak, and doesn't even serve as the desired buffer to cushion the pressures described in this report, pressures exerted by development projects and by economic activities on biodiversity. Indeed, the EIA also presents an aspect of strong administrative value, since it is part of a project that is submitted to a formal approval. Thus, many EIA are not presented as a technical and rigorous exercise, and the capacity of the environmental authority is still insufficient to assess such rigor. In conjunction, it is noted that most of the investment projects subjected to an EIA, the process ends with the approval of the EIA, with no subsequent environmental monitoring or environmental auditing operations at any stage. This is yet more aggravating since public consultation is still very weak due to a very low level of environmental citizenship.

3.3.3 Specific species conservation programs

National environmental authority, national research and development institutions and many NGOs have continued with specific programs to protect certain species such as the Common Turtle (*Careta caretta*), the Shearwater (Cagarra) (*Calonnetris edwardsi*), marine mammals and sharks (Hammerhead shark – *Sphyrna spp.*), White Shark (*Carcharodon carcharias*) and the Whale Shark (*Rhincodon typus*). These are measures aimed at alleviating the cultural pressure on marine biodiversity at all levels.

The protection of sea turtles and shearwater, among others, is ensured not only by protecting the species against hunting, but also by protecting their habitats and ecological niches. There are programs to increase the levels of specific, genetic and ecological biodiversity. Given the major achievements in the conservation of these species (herein exemplified by the Common turtle - Figure 19) and the level of environmental awareness and population involvement, these are programs that should continue to receive the full attention of national authorities and the international community. Indeed, as can be seen in the integrated analysis on Figures 20 and 21, while the capture of sea turtles on beaches and in the sea still poses a threat to the conservation of the species, the situation has

substantially improved in recent years, with strong contribution from the inspection operations and awareness campaigns developed by NGOs, community associations, local authorities and DNA.

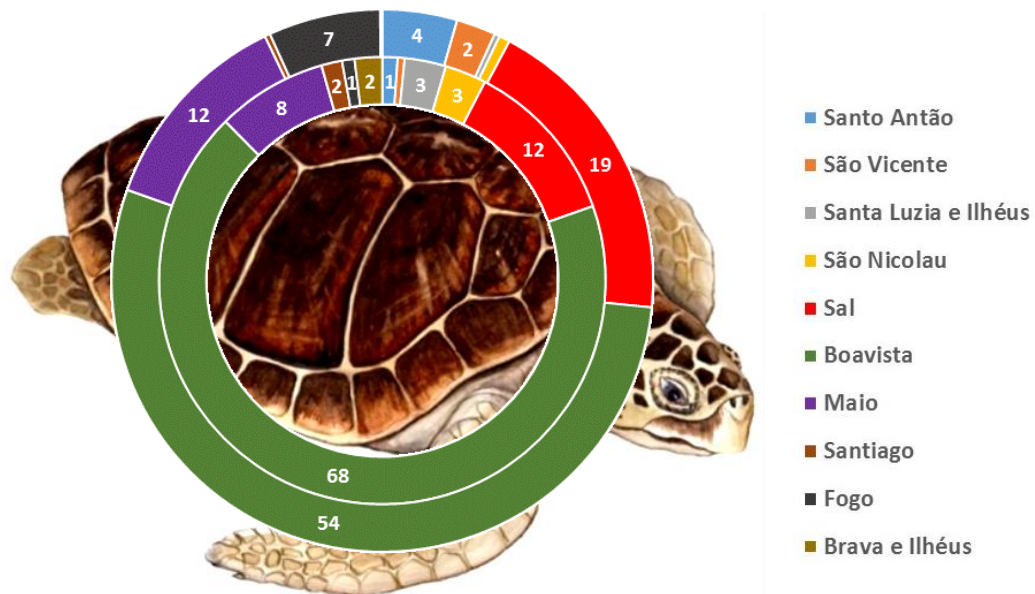


Figure 22. Relevance of the different islands (%) on the results of Common Turtle conservation programs (*Caretta caretta*) in Cabo Verde. The inner circle is the pressure of turtle capture and the outer circle represents the conservation efforts through nest inventorying and monitoring

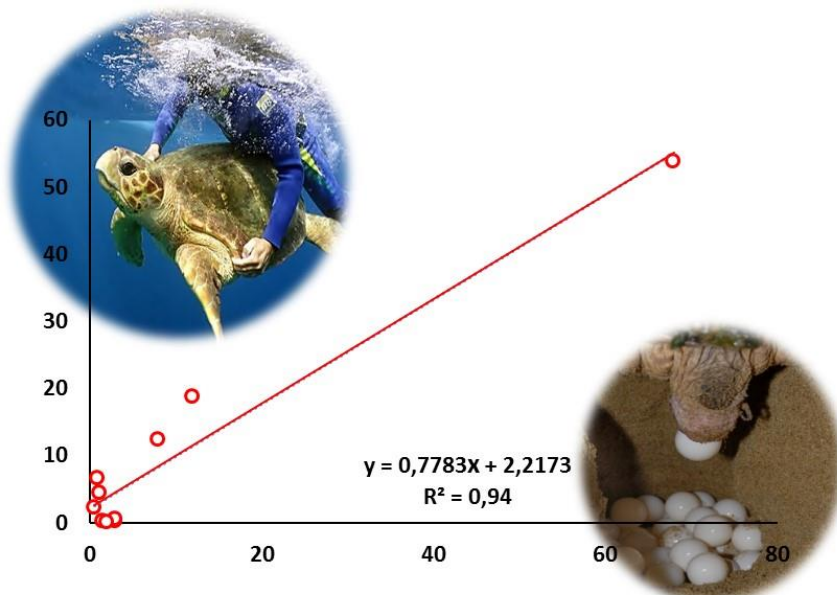


Figure 23. Relationship between the relevance of the islands in terms of human predation of the Common Turtle catches (*Caretta caretta*) and the predominance of conservation programs through monitoring of their nests between 2008 and 2013. To note, a very significant correlation that explains 94% of the illustrated trend.

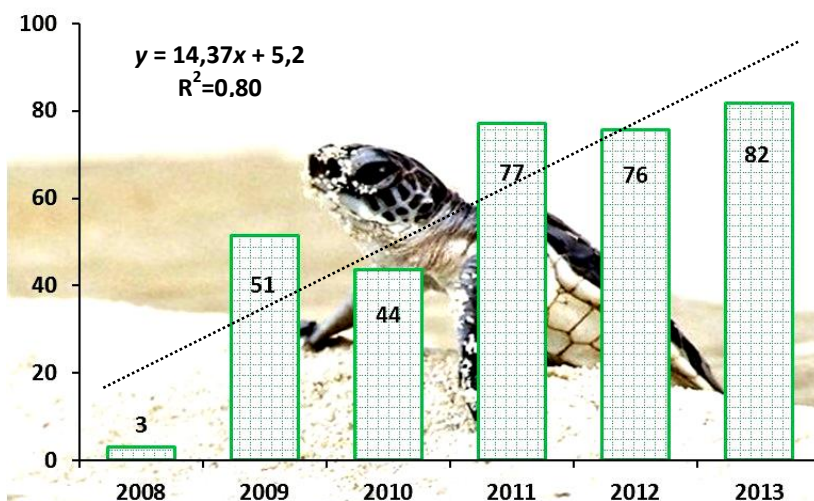


Figure 24. Evolution of the proportion of the number of nests to the number of turtles (*Caretta caretta*) captured per year in Cabo Verde archipelago, between 2008 and 2013. It shows a growing trend illustrated by a dominance of conservation in relation to predation in the last six years.

Responsiveness to the pressures is being strengthened in terms of legislation and conservation of vulnerable species groups, with some conservation plans already approved (Corals and Marine Mammals) and others in conclusion (seabirds and sharks), in a logic of involving, as much as possible, all potential national and international partnerships.

3.3.4 Adoption and implementation of agreements, protocols and conventions

At the institutional and legal level, the country continues to introduce and / or give effect to legislation and institutional practices to improve the role of environmental conservation in national economic and social development policies. This periodic report on the state of biodiversity and the review and updating of the National Biodiversity Strategy and Action Plan are examples of the implementation, in part, of the CBD, signed and ratified by Cabo Verde. Other processes that are in course of adoption and domesticated in the national law (FAO Agreement on Port State Measures - FAO, 2001) are advances that could be materialized and consolidated in response measures to the pressure of IUU fishing, and thereby, improve the responsiveness of marine biodiversity. However, at the current national development phase, they are legal and administrative instruments that are not yet effectively impregnated in the structures and decision-making. Consequently, given the very weak practical expression, they do not offer the answer required by the environmental pressure induced on biodiversity by the pace of economic and social development.

Other responses that will contribute to shaping national environmental policies are in the active phase of development by a significant number of NGOs whose objectives are centered on the conservation of specific and ecological biodiversity, aimed at promoting environmental citizenship through public awareness and participation. Unfortunately, due to financing difficulties and lack of skilled human resources, often the actions are not continued in time and are implemented in a random unsystematic manner, with weak cohesion of common conservation objectives. In this situation we have the civil society associations, in all the islands, usually of professional agents (fishermen and divers) with still very tenuous environmental concerns, focused on the stability of jobs resulting from the state of biodiversity, as a whole.

3.3.5 Public Participation Index

An informed, well-educated and informed public participation should be considered a balanced response element to development pressures on biodiversity. However, it is still very embryonic and timid, if considered at national level. This is quite evident in the levels and quality of public participation in the EIA processes. However, because the issue of sustainable economic development safeguarding environmental balance knows no boundaries, the incidence of an international environmental awareness is beginning to be felt in a very positive way in Cabo Verde. This is most evident when the pressures are felt on highly migratory transatlantic species, as in the case of sea turtles, sharks and marine mammals.

4. CHANGES IN BIODIVERSITY AND ECOSYSTEM SERVICES

Ecosystem services and environmental services are understood to be the full range of benefits that humankind gets from biodiversity, in a sustainable way, for their well-being, including processes, functions and raw materials. Thus, it can be assumed that in Cabo Verde, given its insular, oceanic and tropical nature, such services are essentially those deriving from the main natural resources, of relatively easy mobilization and access, such as water and its ecological and climatic functions, soil and terrestrial fauna and flora resources, the sea and marine animal and plant resources, as well as the landscape and climate. This issue had already been addressed in the Second National Report on the State of Biodiversity in Cabo Verde, in 2002 (Medina *et al.*, 2002), which points out in Chapter IV, the issue of sustainable use of biodiversity and emphasizes agriculture, forestry, herding, fishing, aggregate extraction activities and the use of biodiversity in medicine and pharmaceutical science. Chapter V also features the points of reference in terms of access and sharing mechanisms of the cultural, social, economic and political benefits in a perspective of economic viability, social equity and environmental sustainability. This exercise was carried out at about the same as the launching of the United Nations major global challenge *Millennium Ecosystem Assessment*. Although with no explicit reference in spatial and temporal terms to the findings of this multidimensional approach, which would be known only three years later, in 2005, the report pointed to findings and recommendations that fit perfectly in the international approach at the time and, which in the case of Cabo Verde, remained valid in 2014, during the preparation of this Fifth National Report on the State of Biodiversity.

Although not having the desired impact, the responses to pressures on biodiversity, especially in its terrestrial component, are having some reflex on the various ecosystem services. Thus, in addition to the primary function of increasing water availability for irrigated agriculture, in agro-livestock systems, the construction of Poilão Dam, among others, and of big dikes has contributed to the emergence of wetlands, used as feeding grounds and home to migratory and native birds. These ecosystems have been an attraction for scientific and leisure tourism. As can be noted, associated to these infrastructures is ecotourism / nature tourism, one of the emerging economic activities in the country.

As stated above, the dams already built, coupled with a selection of crop varieties and appreciation of traditional varieties, should help improve food supply, a fundamental condition to ensure food security in Cabo Verde.

On the other hand, the fully operational natural parks in the country (Islands of São Nicolau Santiago and Fogo) have contributed to a very significant increase in visits to those islands. Between 2007 and 2011, they received about 18,000 visitors, including foreigners (PNSM, 2007 e DGA, 2012).

It is known, however, that the degradation of ecosystems have adverse effects on the various services they can provide to local populations in these natural spaces. A specific case referred to in various literature and by various authors are the adverse impacts of

invasive alien species, considered to be among the greatest threats to the Cabo Verde Biodiversity. Urgent effective measures and actions need to be developed to control and management the effects, although in this case, the costs may be high. Implementing preventive measures, using existing technology in the country can prevent major economic losses in agriculture, forestry, fisheries, natural ecosystems and human health itself. It is therefore important to conduct a risk assessment, define and prioritize areas of intervention and the most appropriate approaches. A first invasive species management strategy has been developed for three terrestrial PAs, which should be capitalized on, evaluated and the recommendations therein should be adopted to apply in other priority areas (MAHOT, 2014).

Despite some national effort at marine and coastal levels for greater assimilation and mitigation of the main threats to biodiversity and the consequent impacts of biodiversity decline and on marine ecosystems, it appears now that fishing as a professional activity, an income potential for operators and source of growth for the national economy, continues to accumulate sustainability difficulties. On the one hand, in light of the national need for stability in existing jobs, and on the other, given the governments' claims and projections for economic development (generation of direct economic income and balancing the balance of payments via exports). Fish, as a major, and among the healthiest, national source of dietary protein continues to register a steady increase in the efforts for its acquisition, thus reducing the income of fishermen, and promoting an increasingly strong invasion into target species not commercially exploited in the past. This situation is compounded by the near commercial extinction of important species, once common on the market such as *Cherne*, *Mero*, *Merato* (*Epinephelus sp.*), *Badejo* (*Mycteroperca rubra*), *Bicuda* (*Sphyraena guachancho*), *Corvina* (*Bodianus scrofa*), and many others currently rare or non-existent in the market.

The oceanic productivity that feeds the plant and animal life in the sea and fishing, in the end-scale, has been declining for reasons of climate and anthropogenic nature, given the natural lags observed in the seasonal cycles of nutrients by air (rain and desert dust - "Christmas Dust" or *pó di terra*), sea (*Upwelling*) or land (rain and leaching of soils by runoff). In the first case, if the causes are natural, the impacts become difficult to mitigate. However, when they are anthropogenic, as in the case of decrease in water flows and nutrients entering the sea annually and seasonally in certain regions and islands, due to the construction of dams, such causes must be well studied and the impacts properly mitigated so as to achieve balanced agricultural development, without compromising fishing and other downstream activities.

Tourism and water, recreation and leisure sports, as economic, social and cultural activities, tend to lose quality in light of coastal beach erosion phenomena, resulting from declines in the cycles and corridors of sand transportation, due to anthropogenic reasons already described in this report, especially on the islands of Sal and Boavista.

Ecotourism / nature tourism made available through underwater observations and excursions, currently an emerging and promising activity, may be disturbed right at this early stage because of the rarity of emblematic species and disruption of marine ecosystems as a result of pressure from IUU fishing. In addition, tourism for the observation of iconic coastal species as the turtle, although currently flourishing, could be

reduced early on if the hunting pressures on the species and the destruction of their habitats at the reproductive stage of their life cycle are not properly and consistently assimilated and minimized.

The use of ecological biodiversity as a substrate and support strand for human occupation of shorelines and coastal regions has been jeopardized by frequent episodes of threats from the stabilization of constructions, by expected floods in lower regions of the islands of Santo Antão (Ponta do Sol) and Santiago (Ribeira da Barca), especially at peak seasons in the natural processes and cycles (ripples, tide cycles and sea level) under the influence of changes attributed to climate and human pressures. Other regions such as Sal-Rei, on Boavista Island, Porto Inglês in Maio and Santa Maria on Sal Island, have a considerable degree of vulnerability.

5. OUTLOOK ON BIODIVERSITY CHANGES

The preparation of II BNSAP, in 2014, is undoubtedly an important opportunity for planning activities for the next 15 years, which may contribute to the mitigation of prevailing pressures and threats on biodiversity, and consolidate achievements. This awareness opens interesting perspectives in terms of positive changes in biodiversity status and trends.

In terms of decision-making, a greater political and governance awareness of the capabilities and natural limitations of the archipelago should lead to a more appropriate formatting of economic, social and cultural development, according to such limits and load capacity conferred by nature. These limitations must be carefully studied, diagnosed and their changes monitored in the short, medium and long term.

Regardless of the choices and models of policy development adopted, they should always promote an integrated vision of the archipelago capable of influencing favorable natural conditions and of mitigating unfavorable ones. For example, in the context described on the exploitation of the main marine resources, development initiatives should envisage encouraging primary productivity of terrestrial, marine and coastal ecosystems. These can be materialized, in particular through continuous water mobilization (terrestrial water capture and retention infrastructures), induction of insular platform effect through ecological structures that favor the natural fertilization of the sea, development of animal production at sea (aquaculture) and on land (livestock). Such guidelines are attempts to circumvent natural limitations and should however be conducted without irreversibly interfering with the natural cycles, as is the case today with current dam constructions which impact negatively on the natural conditions of sea fertilization, without planned mitigation measures.

These prospects will only be realistic if a higher level of professionalism, technical and scientific rigor is introduced in all study, evaluation and decision-making processes on projects with complex impacts on the environment. This is the same as envisaging stronger institutional, technical and scientific requirements for EIA system of policies, plans, programs and projects.

At the marine and coastal levels, policies and development initiatives, including strategic development partnerships, should benefit, at both national and international levels, from the important recent advances in knowledge (ecological and genetic structure of resources, flow of matter between the islands, knowledge of the dynamics of shoreline and coastal resources, status of renewable resources exploitation, etc.), either validated or ongoing, on all aspects of biodiversity - specific, taxonomic, genetic, ecological and functional. Cabo Verde has posed itself as a natural laboratory open to the international scientific community in major international programs to study and understand climate change. It will therefore be essential to envisage a national ownership of the strategic leadership of these opportunities, in order to capitalize more resources and advancements toward national development.

CHAPTER II

NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

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1. BIODIVERSITY TARGETS IN CABO VERDE

In response to Article 6 of the CBD, Cabo Verde drafted its first BSAP, the instrument that guided the preparation of the 1999 Inter-sectoral Action Plan on sustainable biodiversity management, the national conservation actions and which served to assess the commitments made by the country.

During COP 6, held in 2002 in The Hague, the parties adopted the first time, the Strategic Plan designed to guide the implementation of the Convention and established the “2010 Targets” on Biodiversity Conservation for 2002-2010. The plan aimed at significantly reducing biodiversity loss by 2010. The goal was to *“to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth.”*








The themes and specific objectives of NBSAP (Table 1) were identified in 1999, during regional and national meetings held in the various municipalities of the country. That year, the assessment of the implementation of defined goals, included in the Fourth National Report on the State of Biodiversity, demonstrated that, like other countries, Cabo Verde also did not reach the major target agreed on. Thus, gathered in Nagoya in 2010, during the 10th Conference of Parties to the Convention, the parties approved the new Strategic Plan and new Targets for 2020. With the adoption of the Nagoya Protocol, Cabo Verde, as a contracting party, assumed the duty to draw up a new strategy and update the status of implementation of the 2010 Targets.






The current status of implementation of national goals in relation to the goals set by the CBD in 2010 is the findings from an analysis of Table 2. Overall, implementation was poor. However, despite the fact that most of the goals have not been achieved, the implementation of the CBD registered significant progress over the years, in particular on legislation, *in situ* conservation, instruments and activities for conservation of endangered species, participation of local communities in conservation, pilot projects for valuation of biodiversity, scientific research, among others.

Table 1. Themes and objectives of the First Biological Diversity Strategy and Action Plan identified in national and regional meetings in 1999.

Theme	Specific objectives
Theme 1: Agricultural Sustainability	Identify and develop more efficient and sustainable production systems.
	Intensify the diversification of alternative agricultural production, favoring biodiversity, better management of soil, water, fertilizers, pesticides and seeds.
	Encourage agriculture-forestry-livestock integration.
Theme 2: Livestock Sustainability	Step up and improve animal production and productivity. Promote environment-friendly operating systems.
	Encourage agriculture-forestry-livestock integration.
Theme 3: Forest Sustainability	Improve management of forest perimeters and create conditions for conservation of their genetic resources.
	Encourage agriculture-forestry-livestock integration.
Theme 4: Sustainable Fisheries	Assess the exploitation status of stocks, particularly commercial species.
	Prepare a management plan for major fisheries.
	Strengthen Economic Exclusive Zone (EEZ) supervision.
Theme 5: <i>In situ</i> and <i>ex situ</i> Conservation	Conservation of representative samples of different terrestrial, coastal and marine ecosystems <i>in situ</i> , in protected areas.
	Preserve endangered species <i>ex situ</i> .
Theme 6: Vulgarization, Information, Training	Promote social learning and ownership of the global biodiversity concept in different sectors of society.
	Awareness, information and training of society as a whole, on the concepts of biodiversity and its conservation and preservation.
Theme 7: Research and Training	Promote and encourage research to improve knowledge on the different ecosystems in the country, including animal and plant species.
	Promote the specialization of Biodiversity researchers and trainers.
	Disseminate research findings.

Table 2. Implementation status o 2010 Targets in Cabo Verde (Adapted from the IV National Biodiversity Conservation Status Report).

Focal areas of 2010 Target	Assessment of country objectives	Implementation status
Focal area 1: Protect the components of biodiversity	The main areas of greater ecological value of national and global importance protected by law, representing more than 10% of the total area of the country.	
Focal area 2: Promote sustainable use	All species of the country's flora and fauna protected by law and awareness campaigns to reduce biodiversity loss in various areas nationwide.	
Focal area 3: Assess threats to Biodiversity	Most important habitats are being protected by law as well as by conservation and recovery initiatives, in order to control the introduction of exotic species, address threats from climate change, pollution and loss of Biodiversity	
Focal area 4: Maintain biodiversity goods and services for human sustainability	Biodiversity conservation initiatives were carried out, aimed at the population's well-being, food security and quality of life.	
Focal area 5: Protect traditional knowledge, innovations an practices	Socio-cultural diversity of local communities, traditional knowledge and practices promoted through the development of various environmental projects.	
Focal area 6: Ensure the fair and equal sharing of benefits arising out of the use of genetic resources	The country's genetic resources are not very much exploited and marketed; for this reason there have been no conflicts or adjustments.	
Focal area: Ensure availability of adequate resources	The country has benefited from funding, essentially from international cooperation.	

-  Insignificant progress or no progress;
-  Target not reached, but some progress made;
-  Target not reached, but with significant progress;
-  Significant progress;
-  Target fully met.

In terms of *in-situ* conservation, between 1990 and 2012, there was a 18.65% increase in the proportion of terrestrial and marine protected areas, which allowed to exceed the Millennium Goals target.

In terms of agricultural sustainability, highlight goes to actions aimed at converting rain-fed farming (biodiversity pressure factor and threat) to irrigated agriculture. This is supported by the water mobilization and provisioning program through the construction of dams, retention dikes and perforations. Currently, it is expected that in a normal rainfall situation, the eight dams built or in the final stages of construction will allow mobilization

of about 5.5 million m³ / year and an irrigation potential of over 587 ha of land still occupied with rain-fed agriculture.

It should be noted that the amount of water mobilized for agriculture went from 13 million m³/year in 2012 to 24.65 million m³ / year in 2013, with the completion of infrastructures. The Government's goal is to mobilize 57 million m³/year by 2016, which can be attainable with the completion of the dams under construction, as well as perforations and retention dikes. The water already mobilized and to be mobilized will allow irrigation of over 1,000 hectares of new areas, in land used for rain-fed farming (DGADR, 2014).

Also, erosion control works for the protection and recovery of degraded areas, in more than 400 ha, have contributed to the recovery of vegetation coverage through soil and water conservation techniques (construction of banquettes and boilers, Congo bean sowing, reforestation, planting fruit trees, among others, all within the watershed development planning in the most mountainous islands).

The volume of mobilized water and the recovery of degraded lands, along with the selection of varieties of vegetable, fruits plants, roots and tubers that have been vulgarized and made available to farmers (38 species and 125 varieties), have contributed to the increase farmers' income and decrease the pressure of rain-fed farming on biodiversity.

In terms of livestock, actions focused on the diversification of livestock and improvement of breeds through artificial insemination for cattle and goats, improvement of livestock infrastructure, epidemiological surveillance, pasture production as a commitment to improving cattle feed, and modernization of the family livestock. These actions which have been developed in a systematic way and with greater efficiency in recent years should help to reduce the pressure of free grazing on vegetation.

In terms of forest sustainability, the national inventory data, the first to be conducted and completed in 2013, indicate that woody vegetation cover reaches a total area of 89 552 ha (23% of national territory). The preparation of planning and participatory management plan for forest areas, which is ongoing, includes a significant increase in the areas planted with endemic plants of shrubs and trees bearing.

In the fisheries sector, the 2004-2014 RFMP was prepared and has been implemented since 2005, through three biannual executive plans. Resource conservation measures such as closed seasons for fishing of black mackerel, review and updating of the closed seasons for fishing of coastal and deep-sea lobsters, minimum catch sizes for several species, regulation of various fishing gear etc., are being implemented under these plans. Also, a national corps of fisheries inspectors and observers was established and implemented, and functions as an instrument of surveillance and to combat of IUU fishing.

In terms of dissemination, information, and training, the results are not easily measurable. However, there was an increase in the quantity and, above all, in the quality of NGOs working directly with Biodiversity conservation issues. Integrated Basic Education (EBI) schools are taking better ownership of concepts and a reaction capacity is stemming within

civil society regarding the implementation of infrastructure projects that supposedly have negative impacts on biodiversity – such as in the case of popular involvement in the project to extend the embankment and build a new access road in the northeast of Porto Grande in Mindelo, São Vicente Island, or the public reactions to the works of underwater burst in the port basin of Boavista Island, both in 2014. To note that the National Environmental Education Plan was prepared in 2013.

Between 2000 and 2013, there was an encouraging performance by the country in the production of knowledge on biodiversity. This was, in part, due to an increase in the quantity and quality of technical experts in these areas of knowledge. On the other hand, the creation of national scientific journals, a portal of knowledge in the Ministry of Higher Education, Science and Innovation, as well as web portals of other institutions have allowed for greater dissemination of information.

Thus, unlike the 2009 evaluation, it is considered that at present the degree of realization of the objectives of the seven thematic areas identified during the regional and national meetings is positive and bodes well for the implementation of the objectives of the second 2014- 2030 NBSAP.

2. UPDATING THE STRATEGY AND ACTION PLAN

The second NBSAP, 2014-2030 , was drafted in the 2nd quarter of 2014, through a highly participatory process involving all sectors of society, with the vision *"By 2030, Cabo Verde protects, restores and enhances its biodiversity, promoting sustainable use, enhances mechanisms of participation and appropriation of benefits in a fair and equitable manner, contributing to the country's development"*. The second NBSAP is developed around three fundamental principles: i) effective conservation and integration of biodiversity values; ii) the involvement and participation of the society in biodiversity conservation and sustainable use, and iii) the fair and equitable sharing of benefits that will ensure the country's development and well-being of the population.

To address the still prevailing pressures, the NBSAP set seven national priorities that require efforts by all stakeholders to safeguard Cabo Verde Biodiversity and hence the benefits it provides for current and future generations. The priorities are: (i) involvement of the whole society in biodiversity conservation (population, public and private organizations, NGOs and associations); (ii) integration of the importance of biodiversity in strategies, policies, plans and programs; (iii) reduction of pressures and threats on Biological Diversity; (iv) conservation of priority habitats and sustainable management of natural resources; (v) recovery and increasing the resilience of ecosystems; (vi) increased knowledge, monitoring and evaluation of biodiversity, and (vii) fund-raising.

For each priority, a set of targets were set in line with the strategic goals and the 2020 CBD Aichi Targets. In all, 15 national targets were set. Below are the most important ones.

Table 3. List of the main six most important targets from the 15 established under the second NBSAP, for the 2030 horizon.

Timeframe	Target
2018	Pollution will be reduced and its sources identified and controlled to levels not harmful to the normal functioning of ecosystems;
	All national conservation strategies and plans approved incorporate elements of climate change resilience and adaptation;
2020	Marine resources of economic interest are managed sustainably;
2025	Ecological, economic and social values of biodiversity will be integrated into national and local strategies and planning, as well as poverty reduction processes, and properly incorporated into national accounts;
	At least 20% of terrestrial PAs and 5% of coastal and marine areas, ecologically representative and important, will be preserved through a coherent PA system managed efficiently and equitably through the implementation of Special Protected Areas Management Plans (SPAMP).
2030	Society is aware of the importance and values of biodiversity and the necessary measures for its conservation and sustainable use;

3. CBD IMPLEMENTATION MEASURES

Though biodiversity in Cabo Verde still remains under strong anthropogenic pressure, the country has made efforts to keep up with the dynamic world around Biodiversity conservation, either through ratification of international conventions and treaties or through the materialization of plans and programs, with results of some visibility.

Table 4. List of the main programs and projects and the main achievements most visible in CBD implementation, between 2004 and 2013.

Projects/ Programs	Accomplishments
<i>Naturalia</i> Project	Marine biodiversity enhancement through ecotourism associated to observation of turtles, birds and corals.
Marine and coastal Conservation Project (DGA/WWF)	Preliminary studies on characterization and delimitation of the MPAs of Santa Luzia and islets of Ilhéus Branco and Raso.
Fogo Natural Park Management Project - DGASP-DGA.	Conservation and economic promotion of the park, given its ecological, geological and cultural importance, as well as operation of the Natural Park of Bordeira, Chã das Caldeiras and Pico Novo.
"Integrated and participatory management of ecosystems in PAs and	Conservation of Biodiversity of global importance, through the creation and

surroundings" Project, 2004-2009 (GEF/UNDP/CV GOV).	management of a PAs system which includes a representative sample of six critical ecosystems found only in Cabo Verde, as well as operationalization of the natural parks of Serra Malagueta and Monte Gordo.
Maio Wetland Conservation Project (Ramsar Convention – WWF execution).	Conservation and enhancement of the Salinas de Porto Inglês wetland.
PAs System Consolidation Project	Establishment of legal limits and 14 PAs management schemes in four islands, integrating a significant community component, with the participation of local government in planning and management. Particular emphasis was placed on issues of Marine Protected Areas (MPA) through an island management approach for each island under a single management group or complex.
Ramsar Convention, 2005	Conservation of Biosphere reserves and wetlands. Cabo Verde has designated three sites as wetlands of international importance: Curral Velho and Lagoa de Rabil – Island of Boavista; Lagoa de Pedra Badejo – Island of Santiago; Salinas de Porto Inglês – Island of Maio.

The 26 operationalized PAs units, with their limits and management plans approved, or in the approval stage, and equivalent to more than 10% of the country's surface, demonstrate the importance attached to *in-situ* biodiversity conservation. Thus, despite the weaknesses in human and financial resources and the coordination difficulties between conservation and socio-economic development, there are visible significant progresses in Biodiversity conservation initiatives, including legal and institutional aspects. Here, highlight goes to a current proposal for the creation of an autonomous PAs management body with view to ensure the dynamics of the network.

State and civil society organizations, and international research institutions and partners have been implementing an important series of conservation of endangered species initiatives. For example, Biosphere I, an NGO that is implementing a Cagarra conservation program in the islets of Ilhéus Raso and Branco, and the TAOLA Network, which has done a remarkable job of sea turtles conservation in the spawning grounds during the reproduction period.

We also highlight the fact that Cabo Verde is working for the recognition of Biosphere reserves, within UNESCO's Man and Biosphere program. The process initiated in 1999, in the framework of the cooperation with the Canary Islands, was later followed up in 2005 with UNESCO, to prepare the application for the first Biosphere reserve in Cabo Verde – Maio Island.

Resulting from the implementation of various projects and interventions in recent years is the preparation of a significant range of Biodiversity management, conservation and enhancement documents, including conservation and management / conservation plans for PAs and threatened species covering all islands, except Brava, among others. The country has therefore complied with its international commitments under the CBD, with significant progress made in the recovery of threatened species and degraded areas, participation of national institutions (at central and municipal levels), more information and greater public awareness on environmental issues, and greater knowledge on national Biodiversity status and importance.

4. MAINSTREAMING BIODIVERSITY IN SECTORAL AND INTER-SECTOR STRATEGIES

The Government Program for the VIII Legislature (2011-2016) defined as environmental and natural resources guidance, the creation of a cross-cut green agenda. The agenda would be based on innovation, looking for the optimal integration of renewable energies in sustainable cities and creating a more respectful attitude toward nature and the environment in Cabo Verde. Efforts for PAs establishment and management, combating desertification, protection of forests, improved wastewater treatment and the introduction of clean energy have been integrated as part of this agenda. The third Growth and Poverty Reduction Strategic Paper (PRSP III) was prepared based on this guidance and is being implemented by all public services - central and municipal governments, with private sector participation, through public-private partnerships. The PRSP III has been a framework for development policies and strategies, based on the Government Program and the Millennium Development Goals, properly integrated into various national plans and national development instruments, with emphasis on (i) the Main Options of the Plan, (ii) the Government's program, (iii) the PRSP, (iv) the Poverty Reduction Strategy, (v) the National Action Program to Combat Desertification, (vi) National Strategy and Action Plan on Climate Change, (vii) the National Forestry Action Program, (viii) the 2004 - 2014 Fishery Resources Management Plan, (ix) the Integrated Water Resources Management Action Plan, (x) the Strategic Plan for Tourism Development, as well as other plans and principles contained in international agreements and treaties.

When describing the potentials of major tourist islands of the archipelago, the 2010-2013 Strategic Plan for Tourism Development highlighted the main natural spaces that make up the PAs network in the islands and laid emphasis on the need for conservation and enhancement of wildlife, flora and landscapes values are key tourism products.

Biodiversity is continuously being mainstreamed in economic activities through the requirement of proper treatment of issues related to the conservation of fauna, flora and ecosystems in general, as well as in the EIS and EIA of economic activities.

LITERATURE AND REFERENCES

- Arechavaleta, M.; Zurita N., Marrero, M. C. Martins J. L. 2005. “Lista preliminar de species silvestres de Cabo Verde (Hongos, Plantas e Animales Terrestres)”. Consejería del Medio Ambiente e Ordenacion Territorial, Gobierno de Canarias. 155p.
- Baird AH, Bellwood DR, Connell JH, Cornell HV, Hughes TP, Karlson RH, Rosen BR. 2002. Coral reef biodiversity and conservation. *Science*. 2002 May 10; 296 (5570):1026-8.
- Baldé, A. Lopes, D.J.H., Cabrera, R. & Lima, A. 2011. Contribuição para o estudo de *Bactrocera invadens* em Cabo Verde. INIDA. S. Jorge dos Órgãos. Cabo Verde.
- BCV. 2012. Boletim de Estatísticas 20 anos. Banco de Cabo Verde. Praia, Ilha de Santiago. Cabo Verde, 58p.
- BCV. 2013. Relatório do Conselho de Administração: Relatório e Contas 2012. 170 p.
- Bannerman, D. A. & W.M. Bannerman. 1968. History of the birds of the Cape Verde Islands. 458 pp. Edinburgh.
- Benchimol C. 2012. Aménagement des espaces insulaires et Biodiversité: la gestion des Aires protégées littorales et marines au Cap Vert. Thèse de doctorat. GéoSUDS (UMR IDEES), Département de Géographie, Université de Rouen. 539 p. (2 tomes, T1: 405 p., T 2:134 p.)
- Benchimol C., CY. Rocha CY, R. Medina R, and M Lesourd M. 2009 b. La gestion des ressources marines et côtières au Cap Vert: Évolution du cadre législative et institutionnel. Présenté au I Congresso de Desenvolvimento Regional de Cabo Verde. APDR., 6 a 11 Julho 2009.
- Bernasconi, L. 2007. *Serra Malagueta - Relatório Florestal*. Integrated Participatory Ecosystem Management in and around Protected Areas, Phase 1, Governo de Cabo Verde/GEF/UNDP, Serra Malagueta, Cabo Verde
- BIOS. 2011. Relatório Ecoturismo Tartarugas. 12 p.
- Borges A. 2007. O estado da arte da educação Ambiental em Cabo Verde – I Congresso Internacional de Educação Ambiental dos Países Lusófonos e Galiza. Santiago de Compostela
- Boughtflower, A. 2006. Ornithological Report; Serra Malagueta, Monte Gordo. Integrated Participatory Ecosystem Management In and Around Protected Areas Phase 1, Government of Cape Verde/GEF/UNDP, Serra Malagueta, Cape Verde.

- Brochmann, C. O., H. Rustan., W. Lobin e N. Kilian. 1997. The endemic vascular plants of the Cape Verde Islands. W. Africa. Sommerfeltia. Botanical Garden and Museum. University of Oslo. 181 pp.
- Caujapé-Castells, J., Alan Tye, Daniel J. Crawford, Arnaldo Santos-Guerra, Ann Sakai, Katy Beaver, Wolfram Lobin, F.B. Vincent Florens, Mónica Moura, Roberto Jardim, Isildo Gomes, Christoph Kueffer. 2009. *Conservation of oceanic island floras: Present and future global challenges*. Perspect. Plant Ecol. Evol. Systematics. Revista Elsevier.
- Cesarini D. 2007. Formação das equipas técnicas e análise de diagnóstico ambiental no planeamento das Áreas Protegidas. Integrated Participatory Ecosystem Management In and Around Protected Areas. Phase I, Governo de Cabo Verde/GEF/UNDP, Praia, Cabo Verde, 130 p.
- Clarke, Tony. 2006 Birds of the Atlantic Islands- Christopher Helm London.
- DGA. 2006. Terceiro Relatório Nacional sobre o Estado da Biodiversidade em Cabo Verde. Direcção Geral do Ambiente. Equipa técnica: Manuel L. Carvalho e Sónia Araújo. Cidade da Praia, Ilha de Santiago, Cabo Verde, 162 p.
- DGA. 2008. Relatório de Progresso da Implementação do Pana II – Ano 2007. Direcção Geral do Ambiente, Praia, MAA.
- DGA. 2009. Relatório de Progresso da Implementação do Pana II – Ano 2008
- DGA. 2009. Quarto Relatório Nacional sobre o Estado da Biodiversidade em Cabo Verde. Direcção Geral do Ambiente. Equipa técnica: Sónia Araújo Lopes e Vera Figueiredo. Cidade da Praia, Ilha de Santiago, Cabo Verde, 65 pp.
- DGA. 2007. Relatório de Progresso da Implementação do Pana II – Ano 2006, Direcção Geral do Ambiente, Praia, MAA, Março 2007.
- DGA. 2013 e 2014. Resultados da campanha de Conservação de Tartarugas Marinhas em Cabo Verde em 2012. 12 p.
- DGA. 2012. Relatório de actividades do ano 2011. Praia. Cabo Verde.
- DGA. 2014. Relatório de actividades do ano 2013. Praia. Cabo Verde.
- DGA. 2009. Documento de Projecto de Consolidação do Sistema de Áreas Protegidas de Cabo Verde, Direcção Geral do Ambiente. Praia. Cabo Verde.
- DGADR. 2013. Relatório de Actividades de 2012. MDR. Praia. Cabo Verde. 60 p.
- DGADR. 2014. Relatório de Actividades de 2013. MDR. Praia. Cabo Verde. 60 p.

- DGASP. 2009. Plano Nacional para a Implementação da Convenção de Estocolmo sobre Poluentes Orgânicos Persistentes (POP's) em Cabo Verde, Praia, 117p.
- Duarte Silva, M.O. Sousa. 2014. Analyse économique des accords de pêche entre le Cabo Verde et l'Union Européenne. Thèse de doctorat, Université de Brest. France.
- FAO. 2001. Plan d'action international visant à prévenir, à contrecarrer et à éliminer la pêche illicite, non déclarée et non réglementée. Rome. FAO, 27p.
- FEAPA. 2012. Avaliação socioeconómica do Plano de Gestão das Pescas e do Plano de Gestão do Complexo de Áreas Protegidas de Santa Luzia e ilhéus Branco e Raso: Estudo preliminar sobre o impacto socioeconómico dos Planos nos pescadores artesanais do Complexo de Áreas Protegidas de Santa Luzia, Ilhéus Branco e Raso, 141 p.
- FERNANDES, J. N., CRUZ, TERESA & VAN SYOC R. 2010. *Pollicipes caboverdensis* sp. nov. (Crustacea: Cirripedia: Scalpelliformes), an intertidal barnacle from the Cape Verde Islands. *Zootaxa* 2557: 29–38.
- Freitas, R., O.J. Luiz, P.N. Silva, S.R. Floeter, G. Bernardi and C.E.L. Ferreira. 2014. The occurrence of *Sparisoma frondosum* (Teloestei: Labridae) in the Cape Verde Archipelago, with a summary of expatriated Brazilian endemic reef fishes. *Mar. Biodiv.*
- Freitas Rui. 2013. Biology of Reef Fish From Cape Verde Islands Community Structure & Biogeography of Reef Fish from Cape Verde. DECM- UNICV, Cape Verde – 22 April 2013.
- Furtado, Manuela, T. Vasconcelos e A. Lima. Fungos da folha de bananeira na ilha de Santiago, Cabo Verde. In Pinto, F. Cardoso. 2014. Cabo Verde – Agronomia e Recursos Naturais. Universidade de Lisboa. Portugal. 311 p.
- Gardère, Mathieu. 2015. Two new species of *Campanula* (Campanulaceae) from the island of Santo Antão, Cabo Verde archipelago. *Phytotaxa* 197 (2): 104–114.
- GEP-MAAP. 2004. Segundo Plano de Acção Nacional para o Ambiente PANA II. Praia. Cabo Verde.
- Giralt. M. e Pieter P. G. Van de Boom, 2008. New *Rinodina* Species from Cape Verde Islands with notes on some additional species. Research Article accepted June 27, 2008
- GISP, 2005. Programa Global de Espécies Invasoras. 80 p.
- Gomes Alda Roque, Teresa Vasconcelos, e M. Helena Guimarães de Almeida. 2008. Plantas na medicina tradicional de Cabo Verde. *Workshop* Plantas Mediciniais e Fitoterapêuticas nos Trópicos. IICT /CCCM, 29, 30 e 31 de Outubro de 2008. 9 pp.

- Gomes, I., S. Gomes S., N. Kilian, T. Leyens, W. Lobin, and M.T. Vera-Cruz. 1996. Lista Vermelha para as Angiospermas, in Leyens T., e W. Lobin. 1996. Primeira Lista Vermelha de Cabo Verde. Courier Forschungsinstitut Senckenberg – CFS, 193. Frankfurt. pp 43-62.
- Gomes, I. e S. Gomes. 2002. Plantas utilizadas na medicina tradicional em Cabo Verde. In Colóquio das Plantas Utilizadas na Medicina Tradicional em Cabo Verde. Mindelo. S. Vicente. Cabo Verde.
- Gomes, Samuel. 2009. Plantas endémicas medicinais de Cabo Verde. INIDA. S. Jorge dos Órgãos. Cabo Verde.
- Gomes, S. F. 2011. Avaliação do impacte de apanha de areia e extração de inertes na Ribeira da Barca, Ilha de Santiago, Cabo Verde, Instituto Superior de Agronomia da Universidade Técnica de Lisboa. pp.82.
- Gonçalves, A. Estevão. 2002. Flora de Cabo Verde. Plantas vasculares. 71. *Solanaceae*. In J. Paiva, E. Martins, M.A. Diniz, I. Moreira, I. Gomes & S. Gomes (eds.) Flora de Cabo Verde. Instituto de Investigação Científica Tropical e Instituto Nacional de Investigação e Desenvolvimento Agrário, Lisboa e Praia.
- González, J.A. e O. Tariche (eds). 2009. Um olhar sobre a biodiversidade marinha e bases para a sua gestão sustentável. Potenciais recursos pesqueiros de profundidade de Cabo Verde/Una mirada sobre la biodiversidad marina y bases para su gestión sostenible. Recursos pesqueros potenciales de profundidad de Cabo Verde. Presidencia del Gobierno de Canarias / Fundación Universitaria de Las Palmas. Las Palmas de Gran Canaria: 176 pp.
- González José A., Oksana tariche & José I. Santana. 2009. Propuesta para un Proyecto de Evaluación de Stocks de Camarón de Profundidad en águas de Cabo Verde (2010-2013)
- Harriette Taylor & Jacque Cozens. 2010. The effects of tourism, beachfront development and increased light pollution on nesting Loggerhead turtles *Caretta caretta* (Linnaeus, 1758) on Sal, Cape Verde Islands, *Zoologia Caboverdiana* 1 (2):100-111. 12 p.
- Hazevoet C.J. 1995. The birds of the Cape Verde islands: an annotated check-list. B.O.U. Check-list;13:192.
- Hazevoet C.J., 1996. Lista Vermelha para as aves que nidificam em Cabo Verde. Pp. 127-135 in T. Leyens & W. Lobin (eds.). 1996. Primeira Lista Vermelha de Cabo Verde. Courier Forschungsinstitut Senckenberg.
- Hazevoet, C.J., V. Monteiro, P. López, N. Varo, G. Torda, S. Berrow and B. Gravanita. 2010. Recent data on whales and dolphins (Mammalia: Cetacea) from the Cape Verde

- Islands, including records of four taxa new to the archipelago. *Zoologia Caboverdiana* 1 (2): 75-99.
- Hazevoet, C. e Wenzel, F.W., 2000. Whales and dolphins Mammalia, Cetacea of the Cape Verde islands, with special reference to the Humpback Whale *Megaptera novaeangliae* Borowski, 1781; Contributions to zoology; 63 3 197-211.
- INDP. 2003:2012. Boletins Estatísticos das pescas nº 12 a 21. Dados Sobre Pesca Artesanal, Pesca Industrial, Conservas e Exportações. Mindelo, São Vicente, Cabo Verde.
- INDP. 2005. Censo da Frota da Pesca Artesanal do Ano de 2005. Mindelo, São Vicente, Cabo Verde.
- INE. 2010. Censo 2010. Recenseamento geral da população e Habitação. Instituto Nacional de Estatística, Praia - Ilha de Santiago, Cabo Verde.
- INIDA. 2008. Plano de Conservação das Aves Marinhas de Cabo Verde. Projecto de conservação marinha e costeira.
- INIDA. 2011. Sobre o lagarto *Agama agama* que se acredita ter entrado em Cabo Verde através das madeiras importadas. Equipa Técnica: Aline Monteiro. S. Jorge dos Órgãos. Santiago. Cabo Verde.
- INIDA. 2014. Relatório de Actividades realizadas em 2013. S. Jorge dos Órgãos e Praia. Cabo Verde. 37 pp.
- Jann B., Allen J, Carro PM., Hanquet S, and Katona SK. 2003. Migration of a humpback whale *Megaptera novaeangliae* between the Cape Verde Islands and Iceland. *Journal of Cetacean Research and Management* 2003; 5:123-129.
- Jesus, J., D. Menezes, S. Gomes, P. Oliveira, M. Nogales, and A. Brehm. 2009. Phylogenetic relationships of gadfly petrels *Pterodroma* spp. from the Northeastern Atlantic Ocean: molecular evidence for specific status of Bugio and Cape Verde petrels and implications for conservation. *Bird Conservation International* 19: 199–214.
- Jurado L.F. 1998. Inventario preliminar de los recursos naturales litorales de la Republica de Leyens T.et Lobin V. 1996. Primeira Lista Vermelha de Cabo Verde. *Cour. Forsch. - Inst. Senckenberg*, 193. Frankfurt a. M., 24.9.1996. 140p.
- Leyens Teresa & Wolfram Lobin (eds). 1996. Primeira Lista Vermelha de Cabo Verde. *Cour. Forsch. – Senckenberg*. Frankfurt.
- Lima L. 2008. Áreas Protegidas e/ou Zonas de Desenvolvimento Turístico em Cabo Verde? O caso da Boa Vista. Tese de mestrado. Universidade de Aveiro. Aveiro. Portugal.

- Lima, A. e M. Furtado. 2007. Espécies do género *Curvularia* (Fungos anamórficos: Hyphomycetes) na Ilha de Santiago, Cabo Verde. *Portugaliae Acta Biol.* 22: 145-156. Lisboa. Portugal.
- Lopes, E. 2010. A problemática da apanha de inertes na ilha de Santiago (Cabo Verde), Universidade de Coimbra, Faculdade de Letras. 106 p.
- López-Jurado LF, C.I.C.D.E.C.A.P., 2000. Distribution of marine turtles in the archipelago of Cabo Verde.
- MAA. 2006. Relatório de Progresso da Implementação do Pana II – Ano 2005, Direcção Geral do Ambiente. Praia. Cabo Verde.
- MAA. 2008. Plano Nacional de Conservação das Tartarugas Marinhas em Cabo Verde, Direcção Geral do Ambiente e WWF: Projecto de conservação marinha e costeira. Praia.
- MAAP. 2002. Direcção Geral do Ambiente, Plano de Acção Nacional para o Ambiente, PANA Estratégico, Abril 2002. Equipa Técnica: Praia, Cabo Verde.
- MAAP. 2003. Plano Nacional para o Ambiente II- 2004-2014. Equipa Técnica: Petra Penninkov, Oumar Barry, Ivone Lopes, Isildo Gomes, M. S.R. Vieira e Margarida Varela. Ministério do Ambiente, Agricultura e Pescas.
- MAAP. 2004. Livro Branco sobre o Estado do Ambiente 2004, Direcção Geral do Ambiente. Equipa Técnica: Isildo Gomes e António Querido.
- MAAP. 2004. Plano Nacional de Gestão das Pescas. Praia. PANA II
- MAHOT/DGA. 2013. Livro Branco sobre o Estado do Ambiente em Cabo Verde. Equipa Técnica: Isildo Gomes, José Maria Semedo, Aline Monteiro e Marise Gominho. Direcção Geral do Ambiente. Praia. Cabo Verde.
- MAHOT. 2014. Estratégia Nacional e Plano de Acção para a Conservação da Biodiversidade 2015-2030. Equipa Técnica: M. Celeste Benchimol, Maria Teresa Vera-Cruz e Kátya Neves. Direcção Geral do Ambiente, Praia- República de Cabo Verde. 128 p.
- Marrero, Águido & Rafael R. Almeida Pérez. 2012. A news species of *Dracaena draco* (L.) L. subsp. *Caboverdeana* Marrero Rodr. & R. Almeida Dracaenaceae from Cape Verde islands. *In International journal of Geobotanical Research*, vol. nº 2. 2012. pp. 35-40
- Marrero Águido R. 2008. *Teline stenopetala* (Webb & Berthel.) Webb & Berthel. subsp. *santoantaoi* subsp. nov., para Santo Antão, islas de Cabo Verde. *Bot. Macaronésica* 27: 89 - 100 (2008).
- Mason E. Hale, Jr. 1983. *The Biology of Lichens*. Third Edition Edward Arnold Ltd

- Martens, Andreas, Nuno de Santos Loureiro, & Cornelis J. Hazevoet. 2013. Dragonflies (Insecta, Odonata) collected in the Cape Verde Islands, 1960-1989, including records of two taxa new to the archipelago. *Zoologia Caboverdiana* 4 (1): 1-7.
- Mauremootoo, J. 2012. *Invasive Plant Management Strategy*, 185 p.
- Medina A., Brêthes J-C., Sévigny J-M. & Zakardjian B. 2007. How geographic distance and depth drive ecological variability and isolation of demersal fish communities in an archipelago system (Cape Verde, Eastern Atlantic Ocean). *Marine Ecology*, 28, 404 – 417.
- Medina A. 2008. Structure et dynamique spatio-temporelle des populations démersales dans un système d'archipel océanique tropical. Le cas de l'Archipel du Cap-Vert (Océan Atlantique Est). Institut des Sciences de la Mer de Rimouski, Université du Québec à Rimouski (ISMER/ UQAR).Thèse de doctorat. 290 pp.
- Medina, A., Brêthes, J.-C. and Sévigny, J.-M. 2008. Habitat fragmentation and body-shape variation of African hind *Cephalopholis taeniops* (Valenciennes) in an archipelago system (Cape Verde, eastern Atlantic Ocean). *Journal of Fish Biology*, 73, 902–925;
- Medina M. F., P. Oliveira P., P. Geraldés P., J.Melo J.,N. Barros N. 2012. Diet of feral cats *Felis catus* L., 1758 on Santa Luzia, Cape Verde Islands, 7 p.
- Medina R. 2007. Estudo Sobre o Inventário e Análise da Legislação Nacional Existente Relacionada com a Protecção Marinha e Costeira. Projeto de conservation marine et côtière du Cap Vert, DGA/WWF
- MDR/INIDA. 2012. Lista de variedades hortícolas recomendadas em Cabo Verde. 29 p. Praia. Cabo Verde.
- MECC. 2010. Plano Estratégico para o Desenvolvimento do Turismo em Cabo Verde – 2010-2013. Praia. Cabo Verde.
- Merino S. 2003. Uma Estratégia de Criação de uma Rede Regional de Áreas Marinhas Protegidas. Communication présenté dans le cadre de l'Atelier de lancement du PRM. PRCM/INDP. Mindelo. Cabo Verde.
- Merino S. E and Berrow SD. 2004. Marine Eco-tourism in Cape Verde, its potential for sustainable development and conservation of marine biodiversity. In: Anon. Proceedings of the 5th Fauna and Flora of Atlantic Islands conference. Dublin.
- Millennium Ecosystem Assessment. 2009. Ecosistemas e Bem-Estar Humano: Avaliação para Portugal do Millennium Ecosystem Assessment. Sumário Executivo. 8 p.

- Monteiro A. 2005. Monitorização da Avifauna Ameaçada de Extinção. Estudo para a criação de um plano gestão e conservação para Cagarra *Calonectris edwardsii*, Oustalet, 1883 - Relatório de Viagem a Santo Antão. 8 pp. INIDA. PCMC-DGA/WWF
- Naturalia. 2009. Relatório Técnico Excursões Tartarugas. 5 p.
- Ortet R., E. L. Regalado, O. P. Thomas, J. A. Pino, M. D. Fernández. 2010. Composition and Antioxidant Properties of the Essential Oil from the Endemic Cape Verdean *Satureja forbesii*. GIFC 2010.
- PCMC. 2007. Estudo Socio-económico das Áreas Marinhas Protegidas da Baía de Murdeira e da Ilha de Santa Luzia e Ilhéus Branco e Raso. Projecto de Conservação Marinha e Costeira. DGA/WWF/Wetlands International. Elabore par INDP: Sousa O, Cruz I, Tariche O, Martins A. 97 pp.
- PCMC. 2008. Evaluación ambiental y socioeconómica de los recursos de la reserva natural marina de Baía da Murdeira. Resumo Executivo. Projecto Conservação Marinha e costeira. DGA/WWF/WI. Elaborado por uma equipa do ICCM, Cátedra UNESCO de Desenvolvimento sustentável em Canarias, INDP. Praia. 36 pp.
- PND, 2006. Plano Nacional de Desenvolvimento 2006-2011. Ministério das Finanças e desenvolvimento Regional. DG Plano. Praia. Cabo Verde.
- MAAP. 1999. Primeiro Relatório Nacional sobre a Biodiversidade em Cabo Verde. MAAP-DGA.
- M. E. & Wenzel, F. W. 1996 Cetaceans of the Cape Verde Archipelago. *Marine Mammal Science* 12, 434-443.
- Programa do Governo da VIII Legislatura 2011-2016. Praia. Cabo Verde.
- Reeves R.R., Clapham P.J., and S. Wetmore. 2002. Humpback whale *Megaptera novaeangliae* occurrence near the Cape Verde Islands, based on American 19th century whaling records. *Journal of Cetacean Research and Management*. Reiner, F., dos Santos,
- Reiner F. 1996. Catálogo dos peixes do Arquipélago de Cabo Verde. Lisboa: Instituto Português de Investigação Marítima. Lisboa. Portugal.
- Rolan E. 1985. Aportaciones al conocimiento de los Conus de Cabo Verde por las observaciones.
- Schleich, H. 1996. Lista Vermelha para os Répteis. In Leyens Teresa & Wolfram Lobin (eds). 1996. Primeira Lista Vermelha de Cabo Verde. Cour. Forsch. – Senckenberg. Frankfurt.

- Secretariado da Convenção sobre Diversidade Biológica. 2010. Panorama da Biodiversidade Global 3, Brasília, Ministério do Meio Ambiente, Secretaria de Biodiversidade e Florestas MMA. 94 p.
- SEPA. 2002. Segundo Relatório Nacional sobre o Estado da Biodiversidade em Cabo Verde. Secretaria Executivo para o Ambiente. Equipa técnica: Anibal Medina, Maria Helena S. Rita Vieira e Patrício Varela. Cidade da Praia, Ilha de Santiago, Cabo Verde, 140 p.
- SEPA. 1999. Estratégia Nacional e Plano de Acção sobre a Biodiversidade. Ministério da Agricultura, Alimentação e Ambiente. Equipa Técnica: Rui Silva, José G. Levy, Isildo Gomes, Edério Almada e José A. Lopes. Secretariado Executivo Para o Ambiente, Praia. República de Cabo Verde.
- SEPA. 1999. Primeiro Relatório sobre o Estado da Biodiversidade em Cabo Verde. Ministério da Agricultura, Alimentação e Ambiente. Equipa Técnica: Rui Silva, Isildo Gomes, Edério Almada e José A. Lopes. Secretariado Executivo Para o Ambiente, Praia. República de Cabo Verde. 58 p.
- Teixeira, Generosa, Eurico S. Martins & Filomena Nóbrega. 2008. Metodologias para o estudo de fármacos vegetais. In Workshop Plantas Medicinais e Práticas Fitoterapêuticas nos Trópicos. IICT / CCCM, 29,30 e 31 de Outubro de 2008. Lisboa. Portugal.
- Timas Almeida, C.R. 2013. Valoración ecológica del Área Marina Protegida de la Bahía de Murdeira, Isla de Sal, Cabo Verde. Tesis doctoral. Universidad de Las Palmas de Gran Canaria. Departamento de Biología. Ecología y Gestión de los Recursos Vivos Marinos. 232 pp.
- Vasconcelos, Raquel, J. C. Brito, S. Carranza & D. J. Harris. 2010. Review of distribution and conservation status of the terrestrial reptiles of Cape Verde Islands. *In* Fauna & Flora International. *Oryx*. 47 (1) 77-87.
- VASCONCELOS, R. 2010. Integrative Approach to the conservation of Reptiles of the Cape Verde Islands. Tese de Doutoramento apresentado ao Departamento de Biologia da Faculdade de Ciências da Universidade do Porto.
- Vasconcelos, Raquel, José Carlos Brito, Sílvia B. Carvalho, Salvador Carranza, D. James Harris. 2012. Identifying priority areas for island endemics using genetic versus specific diversity – The case of terrestrial reptiles of the Cape Verde Islands *Biological Conservation* 153 (2012) 276-286.
- Raquel Vasconcelos, Evandro Lopes & Bruno H. Martins. 2014. *Agama agama*: a charter tourist in the Cape Verde Islands? *African Journal Zoology*.

- Wirtz P., A. Brito, J.M. Falcón, R. Freitas, R. Fricke, V. Monteiro, Francisco Reiner & Oksana Tariche. 2013. The coastal fishes of the Cape Verde Islands –new records and an annotated check-list (Pisces) SPIXIANA 36 1 113-142 München, September 2013.
- WHO. 2014. World Health Organization, World health statistics 2014 – Part III. WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland, (116-128).
- WHO - WORLD HEALTH ORGANIZATION. 2010. Policy perspectives on medicines: medicina tradicional – necesidades crecientes y potencial. Geneva, 2002. 6 p.
- OMS - ORGANIZACIÓN MUNDIAL DE LA SALUD. 2002b. Pautas generales para las metodologías de investigación y evaluación de la medicina tradicional. Ginebra, 75 p.
- Rainer Breitling ; Amelia Coleing; Tiago Peixoto ; Helen Nagle ; E. Geoffrey Hancock; Robert N. Kelsh ; Tamas Szekely. 2012. An overview of the spider fauna of Maio (Cape Verde Islands), with some additional recent records (Arachnida, Araneae)
- Wirtz, P., R. Fricke e M.J. Biscoito. 2008. The coastal fishes of Madeira Island-new records and an annotated check-list. Zootaxa 1715:1-26.
- Valdivia A, Bruno JF, Cox CE, Hackerott S, Green SJ. 2014. Re-examining the relationship between invasive lionfish and native grouper in the Caribbean. *PeerJ* 2:e 348 <http://dx.doi.org/10.7717/peerj>. 348 pp.

ANNEX I. MAIN SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACTS OF THE FISHING AGREEMENT BETWEEN CABO VERDE AND THE EUROPEAN UNION.

In a context where Cabo Verde negotiates fishing rights with the EU so that that latter, as a foreign entity, may engage in the fishing of pelagic fish species considered highly migratory species (tuna and sharks) and considering it deals with the use of specific and functional biodiversity of Cabo Verde's marine ecosystem, one of the questions for decision makers is: What are the advantages and disadvantages for the parties? There are various scenarios of reflection, among which:

1. Advantages for Cabo Verde

Considering the portion of the fish population (5 species of tuna, 4 genera and 3 three families; more than 10 shark species, 9 genera and many other families) that an EU vessel catches in the Cabo Verde's EEZ, Cabo Verde will basically have social, economic benefits and the benefits of consolidating a strategic partnership in the country's national development process.

Table 1. List of the main species caught in the Cabo Verde EEZ by EU fleets, under the Fisheries Agreement.

Common Name	Scientific Name	Family	Conservation status UICN (**)
Silky sharks	<i>Carcharhinus falciformis</i>	Carcharhinidae	NT
Sandbar shark	<i>Carcharhinus plumbeus</i>	Carcharhinidae	VU
Dolphinfish	<i>Coryphaena hippurus</i>	Coryphaenidae	LC
Atlantic sailfish	<i>Istiophorus albicans</i>	Istiophoridae	NE
Shortfin Mako sharks	<i>Isurus oxyrinchus</i>	Lamnidae	VU
Longfin Mako	<i>Isurus paucus</i>	Lamnidae	VU
Skipjack tuna	<i>Katsuwonus pelamis</i>	Scombridae	LC
Escolar	<i>Lepidocybium flavobrunneum</i> ^(*)	Gempylidae	NE
Atlantic Blue Marlin	<i>Makaira nigricans</i>	Istiophoridae	VU
Blue shark	<i>Prionace glauca</i>	Carcharhinidae	NT
Hammerhead shark	<i>Sphyrna spp</i>	Sphyrnidae	CR
Barracudas	<i>Spyraena spp.</i>	Sphyraenidae	LC
Albacore	<i>Thunnus alalunga</i>	Scombridae	NT
Yellofin tuna	<i>Thunnus albacares</i>	Scombridae	NT
Bigeye tuna	<i>Thunnus obesus</i>	Scombridae	VU
Swordfish	<i>Xiphias gladius</i>	Xiphiidae	LC

1.1 **Social.** Cabo Verde can see a certain number of Cabo-verdean seamen being employed (negotiable) on board EU vessels, meaning job generation, which is always very important in the national development of any country;

1.2 **Economic.** Cabo Verde receives a monetary value for the price of the license which the ship-owner pays to conduct licensed fishing, plus a value established globally by the agreement, as a

whole, according to the maximum potential to be exploited (in the case of the Agreement with the EU, it is the so-called "compensation funds"). From the social advantage resulting from the possibility of job creation, Cabo Verde also gets economic gains from remittances sent by the seamen to their relatives. This means not only currency (always important in terms of foreign exchange reserves) but also income for the seamen's families and hence, money supply in the country, from all household expenditures (food, education, health, leisure etc.);

1.3 Consolidating a development partnership. Depending on the strategic level of the agreement on the political context of national development, the establishment of a fisheries agreement between Cabo Verde and the EU could represent an opportunity for partnerships to finance other areas of the fisheries sector or other completely different development sectors (This scenario is usually accepted in classic fisheries management, but, as a matter of promoting an informed citizenry, should be well expressed in widely socialized policy documents).

2. Advantages for E.U.

Considering the portion of the fish population (5 species of tuna, 4 genera and 3 three families; more than 10 shark species, 9 genera and many other families) that an EU vessel catches in Cabo Verde's EEZ, the EU will basically have the following advantages:

2.1 Social. Also, by employing seamen and officials from the country of origin, it creates jobs on board vessels, decongesting the labor market in the country of origin;

2.2 Economic. The EU gets raw material of excellence, both in terms of food and nutrition, in an international context marked by epidemics affecting the main sources of animal protein (BSE in cattle, bird flu and swine fever). Therefore, there is enormous potential in terms of added value, with all the positive implications for many of the country's economic sectors (industry, trade and tourism) and as well as in the health and well-being of the citizens of that country (a healthier population is a productive resource, without the healthcare costs that a less healthy population would represent for a given economy);

2.3 Ecological and environmental. Reduces fishing pressure on fish stocks in the country of origin, increasing the chances of recovery or restoration of sensitive marine populations over-exploited by fishing (this advantage becomes more relevant in present days, shaken by climate changes of still very unpredictable consequences).

3. Disadvantages for Cabo Verde

Considering the portion of the fish population (5 species of tuna, 4 genera and 3 three families; more than 10 shark species, 9 genera and many other families) that an EU vessel catches in Cabo Verde's EEZ, Cabo Verde is basically confronted with the following disadvantages:

3.1 Social. Cabo Verde may see the availability of important resources for artisanal fisheries and semi-industrial reduced (see ecological implications later on!) with consequences for the sustainability of viable jobs in the field, in addition to representing a risk of food security embrittlement;

3.2 Economic. The mentioned social implications can have economic benefits as they reduce the opportunities to be able to develop so as to increase the added value of fishing resources, at the artisanal and semi-industrial levels. In fact, it is the national strategic policy guidelines (Growth and Poverty Reduction Strategic Paper - PRSP III) that point preferably towards an investment in primary sectors where artisanal and semi-industrial fishing represent a major producer of raw materials.

3.3 Ecological and environmental. Given that fishing operations do not develop in an isolated space but rather in a portion of a functional whole that is the marine ecosystem, when negotiating fishing rights with foreign entities, Cabo Verde will be negotiating an important part of the functional biodiversity of the ecosystem (that is why, in terms of fisheries management worldwide, the understanding has been, since the last decade of the last century, to be more prudent to evolve from a fish stock management approach to an ecosystem approach in fisheries activity!). In this analysis, it is necessary to attend to the fact that every fraction of a top predator population in the marine food chain, which is captured beyond 12 miles, will represent an imbalance in the predator-prey relationships at the coastal level, with implications for resources available (prey) for artisanal fishing. In terms of spatial ecology, it is known that changing predator-prey relationships induce changes in the density and abundance aspects important in the spatial dynamics of coastal populations - for example, small pelagic fish, especially Cavala (mackerel) (*Decapterus spp.*) and the Chicharro (*Selar Chrumenophthlamus*). If such an imbalance in the spatial ecology of these species remains a long time (a generation), artisanal fisheries will be deprived of important features were never as available as before the ecological imbalance just mentioned. On the other hand, on the part of the artisan fishermen changes may occur in the fishing strategies that in order to maintain their viable their activity, increase the fishing capacity and the actual fishing effort, in addition to a change of target species. From the perspective of an ecosystem approach, all these situations contribute to increased pressure on coastal resources, involving both pelagic and demersals. Therefore, Cabo Verde, by selling fishing rights under these conditions, is selling a portion of the functional biodiversity of its ecosystems, with quantifiable implications for environmental protection and coastal fisheries stability - it is not just selling tuna and sharks fishing rights, but rather a part of the functional marine biodiversity which also involves small coastal pelagic and demersals.

4. Disadvantages for the E.U.

This hypothetical aspect was not examined at length deliberately because, normally, an entity that requests access to a particular resource, projects significantly and largely more advantages than the possible disadvantages.

In conclusion, a country made up of fragile ecosystems and populations such as Cabo Verde has no room for maneuver to jeopardize the consolidation efforts of a strategic partnership of its development, as the one that exists with the EU in issues direct and indirectly related to fishing. In these cases, one of the prerequisites is that such a strategy be explicitly stated in the policy instruments and socialized with different actors / direct and indirect beneficiaries. In addition, the establishment of such a requirement brings governance awareness to the strategy and opens doors to the consequent adoption of measures that enhance advantages and mitigate disadvantages, to ensure sustainability. From a point of view of purely strategic management of the sector (isolated, and not in a multisectoral context - which is not the case of Cabo Verde), one may even assume that in social, economic and environmental terms, for fisheries, there are numerous ways to

maximize the advantages of a purely national fishing (increase of added value, food safety, social security with stable jobs and coastal environmental balance) in detriment of foreign fishing.

A recent detailed economic analysis of fishing agreements between Cabo Verde and EU reviewed the sharing of benefits, only economic ones ([Duarte Silva, 2014](#)), and concluded that these are mostly on the EU side and recommends negotiation strategies that may lead to minimizing such an imbalance.