



# Republic of Seychelles

## Fourth National Report to the Convention on Biological Diversity

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## Acronyms and Abbreviations

## Seychelles Fourth National Report to the Convention on Biological Diversity

ASL	:	Above Sea Level
BD	:	Biodiversity
CBD	:	Convention on Biological Diversity
CITES	:	Convention on International Trade in Endangered Species
CPUE	:	Catch Per Unit Effort
C&SU	:	Conservation and Sustainable Use
DoE	:	Department of Environment
EC	:	European Commission
EEZ	:	Exclusive Economic Zone
EIA	:	Environmental Impact Assessment
EMPS	:	Environment Management Plan of Seychelles
ENSO	:	El Nino Southern Oscillation
EPA	:	Environment Protection Act
FAO	:	United Nations Food and Agriculture Organisation
FFEM	:	Fonds Français L'Environnement Mondiale
GEF	:	Global Environment Facility
GIF	:	Green Islands Foundation
IAS	:	Invasive Alien Species
IBA	:	Important Bird Areas
ICS	:	Island Conservation Society
IDC	:	Islands Development Company
IOTC	:	Indian Ocean Tuna Commission
IUCN	:	International Union for Conservation of Nature
IUU	:	Illegal, Unreported and Unregulated (Fishing)
MCSS	:	Marine Conservation Society, Seychelles.
MNP	:	Marine National Park
MPA	:	Marine Protected Area
MSP	:	Medium Size Project (GEF criteria)
MSY	:	Maximum Sustainable Yield
NBSAP	:	National Biodiversity Strategy and Action Plan
NGO	:	Non Governmental Organisation
NPNCA	:	National Parks and Nature Conservancy Act
NSPC	:	National Strategy for Plant Conservation
PA	:	Protected Area
PDF	:	Praslin Development Fund
PE&A	:	Public Education and Awareness
SAA	:	Seychelles Agricultural Agency
SBRC	:	Seychelles Birds Record Committee
SEYMEMP	:	Seychelles Marine Ecosystem Management Project
SFA	:	Seychelles Fishing Authority
SIF	:	Seychelles Island Foundation
SNPA	:	Seychelles National Parks Authority
SSDS	:	Seychelles Sustainable Development Strategy
SWERP	:	Seychelles White-Eye Recovery Programme
TCPA	:	Town and Country Planning Act
UNESCO	:	United Nations Educational, Scientific and Cultural Organisation
WCS	:	WildLife Clubs Seychelles
WWF	:	World Wildlife Fund

## Executive Summary

The Seychelles is a small island archipelago in the south western Indian Ocean with land masses of 455km, spread over 115 islands, a population of 87,000 and an exclusive economic zone of some 1.3 million km<sup>2</sup>. Seychelles was the second country to sign the CBD in June 1992.

This report was compiled by a broad iterative process of stakeholder consultation, based upon the main national environmental forum of the EMPS steering committee, including one initial presentation, the use of a web-based forum to present and comment upon drafts, two national workshops and review by selected experts.

Chapter 1 sets out a description of the status and trends in Seychelles biodiversity described in terms of three of the Conventions programmes of work that effectively cover the country's ecosystems, namely: Forest, Inland Waters and Marine and Coastal biodiversity. Five case studies are utilized in chapter 1 to highlight certain issues, research initiatives and related management interventions.

Terrestrial habitats can be divided between the two types of island, granitic and coralline. The granitic islands are of great antiquity, remnants of the supercontinent of Gondwanaland and harbour biodiversity of great interest and high endemism. The coralline islands though much younger in geological terms support significant seabird colonies, turtle rookeries, the majority of the archipelago's coral reef systems. Also included is Aldabra the largest raised atoll on the planet, a world heritage site and a site of great biodiversity interest.

The forests of Seychelles have undergone great anthropogenic alteration. The report divides forest habitats into six categories, lists key species and describes their importance for ecosystem integrity and service provision. The mid-altitude forest of the main granitic islands supports the greatest diversity of endemic species but is nearly entirely secondary. Invasive Alien Species (IAS) poses the primary threat and is difficult to address due to the terrain and the limitations of current management techniques. Seychelles exhibits a unique palm forest vegetation type composed of six endemic species from six monotypic genera. This is typically found in dryer areas such as hillside ridges. The famous Coco-de-Mer palm, endemic to the islands of Praslin and Curieuse, forms the emergent canopy in palm forests of those islands. Considerable progress has been made in the management of certain forest types in particular palm forest and most notably the rehabilitation of lowland forest ecosystems on small islands.

The inland (fresh) water ecosystems of Seychelles are of great interest isolated as they are by 1000 miles of ocean and 65 million years of evolution. The report divides this ecosystem classification into three habitat types and lists notable species etc... Highland wetlands have received considerable attention in recent years and are considered to be undergoing a positive trend. Rivers and streams in their upper reaches are also in good state and probably improved significantly over the last 50 years following the recovery of forest cover in catchment areas. The lower reaches of streams on the main inhabited islands however have undergone considerable modification and degradation and many exhibit signs of enrichment pollution. Lowland wetlands have faced particular pressure being reclaimed and canalized to extend the very limited areas of flat land in

the granitic islands. IAS has also become a significant problem since the early 1990's and this habitat type is probably the most degraded and threatened of any in Seychelles.

Marine and coastal biodiversity is central to the socioeconomic development of the country providing the main tourism attraction, the main source of food and the primary export resource of the country. The report describes and discusses the issues facing the three categories of fishery in the country – artisanal, semi-industrial and industrial. Various examples of fishery management are given and their relative success discussed. Great progress has been made in the national capacity to conceptualise, develop and monitor fishery management regimes. Effective enforcement in some cases however remains problematic in part due to the size of the area to be managed. The report divides marine and coastal biodiversity into nine habitat types, citing their socioeconomic importance and listing key species. Of key concern is the declining status of coral reef systems that were so severely impacted by the 1998 coral bleaching event. It is firmly believed, as evidenced by subsequent bleaching events, that the primary underlying factor in this decline is global climate change. It is recognized however that on the more heavily fished reefs other factors also contribute to the decline. Considerable research has been devoted to the health of Seychelles coral reefs and various recommendations made, it is important that more pilot projects are initiated to investigate the potential for assisted reef recovery. Information is lacking on sea grass and the deep sea bed habitats.

The Mahe Plateau is the centre of artisanal and various high-commodity value fisheries. Data shows that various resources are over-exploited and greater capacity is required to manage these resources. More research is required into the productivity of the plateau and the scope for widening fishing activities in a sustainable manner to reduce pressure on existing fisheries. Seychelles cooperates on an international level through the Indian Ocean Tuna Commission to manage pelagic stocks subject to the industrial fishery. This fishery is also lacking sufficient data for informed management (see **Table 3**) and further regional efforts are required.

In the terrestrial domain Protected Areas play an enormous part in Seychelles conservation and sustainable use of biodiversity - some 50% of the country's landmass falls within the protected area network and constitutes a huge national commitment by setting aside so much of the country's natural capital for future and enhanced conservation and sustainable use.

Chapter 2 discusses the Seychelles National Biodiversity Strategy and Action Plan (NBSAP) from its process of development in 1997, to its structure, content and subsequent implementation. The NBSAP was designed to address Seychelles' strategic commitments to the CBD in terms of implementation of the active articles of the Convention. The NBSAP's coverage of these commitments is analyzed and strategic implementation on a broad front noted. The NBSAP sets out various projects on a priority listing. Implementation of these projects is assessed and found to be fair. The NBSAP has been successful in the mobilization of biodiversity stakeholders, the identification of key priorities for action and the provision of a national framework for civil society involvement. The NBSAP served to galvanise stakeholder involvement and has seen the blossoming of a dynamic and effective biodiversity NGO sector. With the benefit of hindsight flaws in the administration of the NBSAP are noted, in particular the utilisation of the biodiversity thematic area in the EMPS 2000-2010 as the primary mechanism for the implementation of biodiversity issues in Seychelles. In retrospect this served to dilute the biodiversity issues and stakeholders in a broader national forum that itself had significant administrative flaws. It is recommended that the proposed NBSAP 2 be utilised as the primary mechanism for implementation of the CBD in

Seychelles, utilising a flexible format that allows for the periodic updating of the plan in line with CBD COP decisions. The Seychelles Sustainable Development Strategy 2011-2020 (SSDS) can be utilised to mainstream biodiversity.

Chapter 3 discusses the national mainstreaming of biodiversity considerations. This has been very successful in terms of strategic national documents, sectoral documents and national legislation. Biodiversity was fully represented in the EMPS 2000-2010 as one of ten thematic areas. Various key sectoral plans notably for fisheries, agriculture and forestry are founded on the principles of the conservation and sustainable use of biodiversity. Biodiversity is also incorporated into the development cycle on an equal legal basis through the 1994 Environment Protection Act and its 1996 EIA regulations. Shortcomings in the mechanisms of mainstreaming have been identified and are being addressed in the SSDS and by the GEF biodiversity mainstreaming project.

The ecosystem approach as a means of mainstreaming biodiversity is also being harnessed. The complexity of ecosystems in the main granitic islands poses obstacles to informed management but considerable investment is ongoing, through the GEF Mainstreaming Biodiversity Project, to enhance capacities in this domain. On smaller islands however, Seychelles has made great progress in ecosystem restoration through the eradication of invasive species, rehabilitation of habitats and translocation of endangered endemic species. This progress also reflects the great advances made nationally in the mainstreaming of biodiversity in the tourism sector. **Case Study 6** in this chapter highlights the work on small island ecosystems.

Chapter 4 discusses the national progress towards the 2010 targets, implementation of the strategic plan and makes recommendations for future action to be included under the proposed second NBSAP.

National progress on the 2010 targets has been quite good in particular with regard to the overarching objective of decreasing the rate of biodiversity loss; the report concluding that Seychelles has achieved this target or better across the ecosystem types with the exception of the habitat categories of lowland wetlands and coral reefs.

The report closes by listing future priorities for implementation of the Convention as derived from the broader findings of this report and approved by stakeholders. These are set out in terms of the three ecosystem categories covered in this report plus protected areas, climate change and biodiversity, and implementation of the Cartagena and Nagoya protocols respectively. A core recommendation is that measures for monitoring and assessment of ecosystems be strengthened. IAS remains a key issue requiring ongoing attention particularly in mid-altitude forest. Urgent measures are required to conserve representative lowland wetlands and improve the general status of lowland inland water habitats. A better understanding of the Mahe Plateau and its productivity potential and use is required. Coral reef resilience and recovery mechanisms require further research and implementation of pilot projects; whilst by-catch issues in the semi-industrial and industrial fisheries are also highlighted.

These recommendations will provide the basis for elaboration of the second NBSAP and it is suggested that, if feasible, the NBSAP be structured as per the format of the Convention's newest programme of work namely that on Island Biodiversity.



## Introduction

The Republic of Seychelles lies in the southwest Indian Ocean, north east of Madagascar and consists of 115 islands. The central archipelago lies on the Mahé Plateau (between 3°30" and 5° South and 55° and 56° East) and serves as home to approximately 98-99% of the 87,000 human population (2010 mid-year population estimate 86, 525). These islands are unique being the only oceanic islands in the world of continental (granite) origin<sup>1</sup> and are of considerable ecological interest having been isolated from continental landmasses for some 65 million years. The terrestrial ecosystems display African and Indo-Malayan elements. The Amirantes and southern Atolls lie to the south and south west of the central archipelago and are coralline in origin – atolls and sand cays.

The Seychelles is recognized as a biodiversity hotspot by Conservation International and a centre of plant biodiversity by the International Union for the Conservation of Nature (IUCN) and the World Wildlife Fund (WWF). Endemism is high at 50-85% for different animal groups in general and approximately 45% for plants. The Seychelles are also of note, as like other islands of the Mascarene groups, it had no aboriginal human population.

The Seychelles has a very short human history having remained uninhabited until colonized in 1770 by European settlers and their African slaves. The islands therefore offered the settlers pristine ecosystems with a wealth of previously unexploited biodiversity. The islands, although being spread over a sea area of some 1.3 million square kilometres, are very small with a total surface area<sup>2</sup> of approximately 455 km<sup>2</sup> (the central archipelago approx 244km<sup>2</sup> and the outer islands 211km<sup>2</sup>). Man's activities therefore despite their short duration have had extensive impacts on terrestrial and coastal ecosystems through direct exploitation, change in land use and the introduction of Invasive Alien Species. Today only relict fragments of original vegetation structure remain and indigenous fauna abundance and diversity has been greatly reduced. The coastal environment has also undergone major anthropogenic change with early historical extirpation of some key species and ecological extinction of various others.

For the purposes of this report the status and trends of biodiversity are presented in terms of the Forest, Inland waters and Marine and Coastal thematic areas of the Convention on Biological Diversity (CBD) with the following justifications:

- The three thematic areas combined effectively cover the ecosystems of Seychelles.
- Agricultural biodiversity is of very limited relevance as only one or two endemic species have agricultural applications (e.g. Palmiste – *Deckenia nobilis*), and mainstream agricultural production is centred entirely on introduced species.
- The granitic Seychelles although typified by steep topography and mountainous, the elevations in question are insufficient to meet the CBD criteria for Mountain biodiversity.
- Whilst some of the outer islands may meet the criteria of dry and sub-humid lands they all can be covered by marine and coastal and/or forest biodiversity.

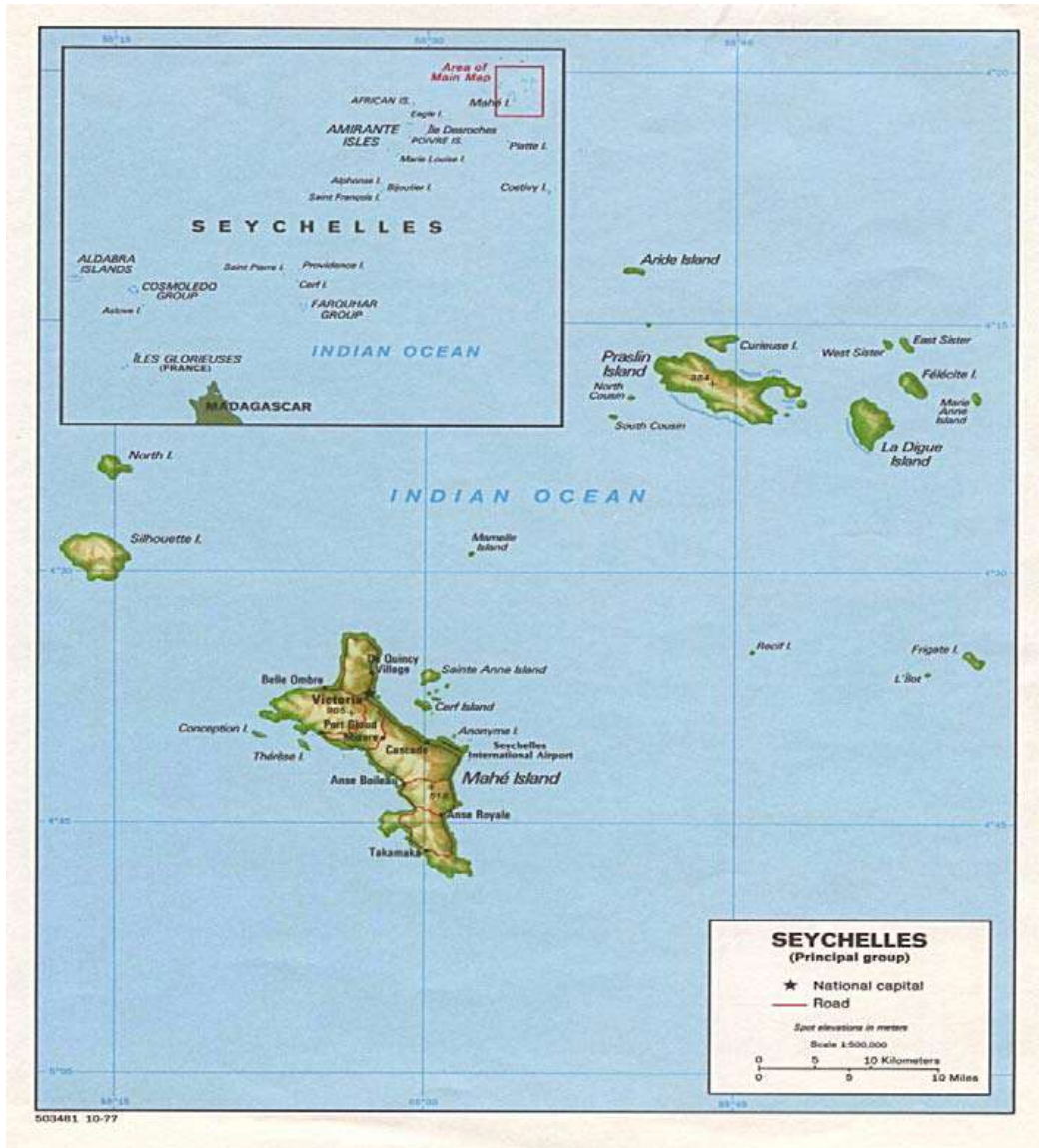
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<sup>1</sup> With the exception of two coral islands, Bird and Denis, which lie on the northern rim of the Mahe Plateau.

<sup>2</sup> This area has been increased from 443 km<sup>2</sup> through various coastal reclamation projects.

- Island biodiversity whilst doubtless the most pertinent classification is the most recent thematic area to be developed and has not been incorporated into Seychelles national strategic documents or addressed by major projects to date and hence is not readily reported on. It should however provide a good basis for future reporting when it has been utilised nationally.

The Seychelles was the second country to sign the CBD in 1992 and became a Party that same year.



Map of Seychelles: the central islands with inset the broader archipelago

## Chapter 1: Overview of Biodiversity Status, Trends and Threats

### 1.1 Forest Biodiversity

The main granitic islands of the Seychelles were covered originally in virgin tropical forest. The main island of Mahé in particular had exceptional hardwood forests (e.g. *Mimusops sechellarum*, *Vateriopsis sechellarum*, *Intsia bijuga*) on the coastal plains and lower mountain slopes exhibiting very tall (30m), straight trees of huge girth. The intermediate and higher slopes were likewise heavily forested with valuable timber (e.g. *Northea hornei*, *Dillenia ferruginea*, *M. sechellarum*, *V. sechellarum*) though of lesser proportions. Valuable timber forests were found on the main islands of Mahé, Silhouette, Praslin and La Digue and to lesser extent on islands such as Saint Anne, Cerf, Felicite and Curieuse. Also of note were the Palmaceae (six species in six monotypic genera) with a wide range of habitat preferences and often forming palm-dominated communities in dryer and more exposed regions – most notably on the islands of Praslin and Curieuse where the famous Coco-de-mer (*Lodoicea maldivica*) (see **Case Study 1**) dominated such communities<sup>3</sup>. The smaller granitic islands had less substantial forest structure sometimes dominated by *Pisonia grandis* (e.g. Cousin and Cousine) or scrub species typical of small Indopacific tropical islands.

The forests were alive with birds, many of the species endemic to the granitic islands (e.g. *Falco araea*, *Copsychus sechellarum*, *Zosterops modestus*, *Terpsiphone corvina* etc...<sup>4</sup>) and the main herbivore was the giant tortoise (*Aldabrachelys gigantea*).

The coralline islands<sup>5</sup> can be divided into two groups: raised limestone islands (atolls) and sand cays accumulated on reef flats. The raised limestone islands are typified by varieties of scrub communities (e.g. Suriana scrub and Pemphis scrub) and scrub/woodland communities, composed of diverse species with a canopy of 3-5m, and various grassland types including Tortoise turf. The Sand Cays are characterised by *Scaevola* coastal scrub, *Tournefortia* scrub and scrub woodland with species such as *Cordia subcordata* and *Guettarda speciosa* being common (some sand cays, such as Denis Island, were dominated by *Pisonia grandis* woodland) interspersed with grassland areas. The main herbivore was again generally the giant tortoise and the islands usually have diverse and abundant terrestrial crab fauna. These islands also typically harbored significant sea bird colonies and some atolls had extensive mangroves (see section on Marine Coastal Biodiversity for further information).

#### 1.1.1 Granitic Islands

For the early settlers, hardwood timber was a vital commodity for construction, ship building/repair and for export. Attention was initially focused on the accessible lowland forests but these were rapidly depleted and the process continued through time up the hillsides. The cleared lowlands were rapidly converted to agriculture, mainly food production and cotton for export. The pressures on forests changed with evolving international commodity markets. The 1850s saw a significant transition to coconut plantation on the coastal plains and up to 800ft above sea level in

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<sup>3</sup> Good accounts of Seychelles flora can be found in: **Baker 1877, Friedmann 1986 & Robertson 1989.**

<sup>4</sup> For a full account of Seychelles avifauna see **Skerrett et al 2001.**

<sup>5</sup> Detailed descriptions of coralline island vegetation can be found in: **Stoddart & Fosberg (1984)**(summarized in **Shah 1997**) and **Sachet et al 1983.**

places. At the beginning of the 20<sup>th</sup> Century the growing commodity market for cinnamon oil saw the widespread conversion of cinnamon-invaded secondary forest to rotational cinnamon coppice. The process of oil distillation required abundant fuel and deforestation of the higher reaches of the hills ensued to feed these furnaces leaving only small remnants of primary forest on the steepest terrain.

This intensive exploitation meant the mountainsides of Mahé from the 1920s through the 1960s had a largely denuded appearance. This raised concerns regarding maintenance of basic ecosystem services, future provision of timber for economic purposes and also the future of many endemic species. Substantive reforestation programmes were initiated in the 1950s focusing on enabling future timber production with the planting of the native Takamaka tree (*Calophyllum inophyllum*) and exotics such as *Sandoricum indicum*, *Swietenia macrophylla* and *Tabebuia pallida*. Such planting regimes were established as policy in 1961 and remained at the forefront of forestry policy until the mid-1990s when focus shifted to biodiversity conservation. Forest canopy cover therefore regenerated through the second half of the 20<sup>th</sup> century such that today forest coverage is estimated to be about 90%. The late 1960s and early 1970s saw the birth of extensive environmental programmes with development of Biodiversity policy, legislation and management mechanisms most notably the National Parks and Nature Conservancy Act (NPNCA). The use of this Act over the following decades has produced an extensive Protected Areas Network (PAN) that today constitutes more than 50% of the country's terrestrial surface area including large tracts of the hills of Mahé and Praslin, and nearly all (approx 93%) of Silhouette island. These designations have seen the effective protection of ecosystem services, e.g. soil and water cycles, and the notable recovery in recent decades of certain endemic bird species e.g. the Blue Pigeon (*Alectroenas pulcherrima*) and the Seychelles Bulbul (*Hypsipetes crassirostris*). The establishment of biodiversity policy and extensive protected areas has also fostered conservation activities and management-targeted research that have greatly enhanced understanding of the needs and parameters of natural forest habitats.

The main threat to forest ecosystems today and the key challenge to their effective conservation and sustainable use is Invasive Alien Species (IAS). Only relict areas of primary forest remain and secondary forest are highly invaded. The primary hardwood forests are gone with valuable species such as *Mimusops*, *Vateriopsis* and *Intsia* driven to the brink of extinction. The giant tortoises were extirpated in the early 19<sup>th</sup> century, some bird species lost and many others restricted to small vestige ranges and populations.

Looking at forested hillsides on Mahé today: the canopy is dominated by species such as the introduced Albizzia (*Paraserianthes falcataria*), Cinnamon (*C. verum*) and *Alstonia macrophylla*; the most abundant birds (*Acridotheres tristis*, *Geopelia striata* and *Foudia madagascariensis*) are invasive and most of the top predators (i.e. *Rattus spp*, *Felis catus*, *Canis domesticus*, *Tenrec ecaudatus* and *Tyto alba*) are alien to the islands. Seychelles has however made considerable and notable progress in the rehabilitation of forest ecosystems on smaller granitic islands. This work has pioneered methodologies in this regard and enabled major breakthroughs in endemic species conservation through (re)introduction programmes (see **Case Studies 2** and **6** for further information). Further major investment is currently ongoing on the national scale through the GEF Full sized project "Mainstreaming Prevention and Control Measures for IAS" which has, amongst other things, already developed a National IAS Strategy and related legal and administrative framework to address IAS issues in an integrated manner in line with best current practice.

### 1.1.2 Coralline Islands

The coralline islands were also heavily impacted by historical exploitation to establish coconut plantations; guano was mined on some islands through to the mid 20<sup>th</sup> century with considerable impact. Latterly failed agricultural initiatives and the collapse of the coconut oil market in the 1980s resulted in livestock (e.g. pigs and goats) being left feral on highly disturbed islands along with diverse other introduced plant species. Seabird colonies have been lost or greatly reduced in abundance and diversity; giant tortoises have been extirpated from all their previous colonies except for Aldabra. Finally all such low lying islands are now threatened by sea level rise.

Much of value remains however, Aldabra the largest raised atoll in the world and biodiversity treasure trove was saved from major development in the late 1960s and designated a UNESCO World (biodiversity) Heritage Site in 1982. Aldabra was declared a Special Reserve, the highest protected status utilised under Seychelles law – *an area set aside in which characteristic wild life requires protection and in which all other interests and activities are subordinated to this end*, in 1981 and is managed to this end by the Seychelles Islands Foundation (SIF).

Various other islands hold biodiversity assemblages of great regional and global significance including 10 Important Bird Areas (IBAs). Many of the islands however face the challenge of IAS<sup>6</sup> whilst their isolation, accessibility and in some cases size pose considerable logistical and management challenges. These challenges are increasingly being addressed however through innovative multi-stakeholder partnerships. The parastatal company the Islands Development Company (IDC) which is responsible for the management of the vast majority of the outer islands has partnered with a national NGO, the Island Conservation Society (ICS) to undertake conservation management work on certain islands e.g. Alphonse and Desroches. On these islands hotel operations support the initiatives enabling research, conservation and rehabilitation work to the benefit of biodiversity and ecotourism development. The privately owned island of D'Arros, in the Amirantes, has likewise set up a foundation to manage its ecosystem and has already successfully undertaken rat eradication as the first step in ecosystem rehabilitation.

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<sup>6</sup> For further information on IAS issues in Seychelles see the National IAS Baseline Report (Nevill 2009a): <http://www.pcusey.sc/Invasive%20Alien%20Species%20-%20Biosecurity/Outcome%203%20-%20Knowledge%20Management%20and%20Learning/Final%20Reports>

**Table 1: Description and Status of Forest Biodiversity**

Main Habitats	Main Species	Importance for Ecosystem integrity/Human well-being
<p><b>Coastal and Lowland Forests (up to 200m asl).</b></p>	<p><b><u>Granitic Islands</u></b>                      Flora:  <ul style="list-style-type: none"> <li>Littoral: <i>Scaevola sericea</i>, <i>Cocos nucifera</i><sup>7</sup>, <i>Calophyllum inophyllum</i>, <i>Hernandia nymphaefolia</i>, <i>Hibiscus tiliaceus</i>, <i>Thespesia populnea</i>, <i>Cordia subcordata</i>, <i>Tournefortia argentea</i>, <i>Suriana maritima</i>, <i>Casuarina equisetifolia</i><sup>8</sup>, <i>Pisonia grandis</i> etc...</li> <li>Lowland: (Native) <i>Terminalia catappa</i>, <i>C. inophyllum</i>, <i>Heritiera littoralis</i>, <i>C. subcordata</i> etc... (Introduced) <i>Cinnamoum verum</i>, <i>Adenanthera pavonina</i>, <i>Tabebuia pallida</i>, <i>Cocos nucifera</i>, various fruiting and ornamental species.</li> </ul>                     Fauna :  <ul style="list-style-type: none"> <li>Endemic : <i>Pteropus seychellensis</i>, <i>Coleura seychellensis</i>, <i>Lycognathophis seychellensis</i>, <i>Trachycnemis sechellensis</i>, <i>Copsychus sechellarum</i>, <i>Terpsiphone corvina</i>, <i>Acrocephalus sechellensis</i>, <i>Foudia sechellarum</i>, <i>Alectroenas pulcherrima</i>, <i>Hypsipetes crassirostris</i>, <i>Falco araea</i>, <i>Nectarinia dussumieri</i>, <i>Trachylepis sechellensis</i>, <i>Trachylepis wrightii</i>, <i>Phelsuma spp</i>, <i>Grandisonia spp</i>, <i>Aphanoconia theobaldiana</i> etc...</li> <li>Native : <i>Onychoprion fuscata</i>, <i>Anous stolidus</i>, <i>Anous tenuirostris</i>, <i>Gygis alba</i>, <i>Puffinus Pacificus</i>, <i>Puffinus lherminieri</i>, <i>Phaethon lepturus</i>, <i>Sterna anaethetus</i> etc...</li> <li>Introduced : <i>Rattus spp</i>, <i>Mus musculus</i>, <i>Acridothores tristis</i>, <i>Geopelia striata</i>, <i>Foudia madagascariensis</i>, <i>Streptopelia picturata</i>, <i>Felis catus</i>, <i>Canis familiaris</i>, <i>Tenrec ecaudatus</i>, <i>Tyto alba affinis</i>, <i>Achatina fulica</i>, <i>Achatina immaculata</i> etc...</li> </ul> <p><b><u>Coraline Islands</u></b>                      Flora:  <ul style="list-style-type: none"> <li>Native: <i>S. sericea</i>, <i>Pemphis acidula</i>, <i>Pisonia grandis</i>, <i>Guettarda speciosa</i>, <i>Suriana maritima</i>,</li> <li>Introduced: <i>Cocos nucifera</i>, <i>Casuarina equisetifolia</i>,</li> </ul>                     Fauna:  <ul style="list-style-type: none"> <li><i>Onychoprion fuscata</i>, <i>Anous stolidus</i>, <i>Anous tenuirostris</i>, <i>Gygis alba</i>, <i>Puffinus Pacificus</i>, <i>Puffinus lherminieri</i>, <i>Sterna dougalli</i>, <i>Sterna sumatrana</i>, <i>Phaethon lepturus</i>, <i>Phaethon rubricauda</i>, <i>Sula spp.</i> <i>Birgus latro</i> etc...</li> <li>Endemic: <i>Dipsochelys dussumieri</i> (<i>Aldabrachelys gigantea/dussumieri</i>), <i>Cyathopoma picardense</i>, <i>Quickia aldabrensis</i>, <i>Rhachistia aldabrae</i> (Aldabra).</li> <li>Introduced: <i>Rattus spp</i>, <i>Felis catus</i>, <i>Capra hircus</i>, <i>Sus scrofa</i>, etc...</li> </ul> </p> </p>	<p>Resilience towards extreme weather events, climate/sea level change. Original forests were key source of timber. Secondary forests and plantations were historically centres of economic activity – coconut products, cinnamon oil, vanilla, rubber etc...</p> <p>The vast majority of human infrastructure and habitation is found on the coastal plateaux.</p> <p>Sea birds (and some land birds) historically provided a very important source of food through eggs and meat. Controlled harvest of <i>Sterna fuscata</i> eggs continues (see <b>Case Study 4</b>) while poaching remains an issue. <i>Rattus spp</i> are a notable vector of human disease, and have had major impact on native biodiversity as have various other IAS e.g. <i>F. catus</i>, <i>A. tristis</i>, <i>T. ecaudatus</i> etc...</p> <p>Coastal forests today are entirely secondary but there have been excellent small-scale restoration projects that serve to maintain endangered endemic species (see <b>Case Study 6</b>).</p>

<sup>7</sup> Status unclear possibly introduced through pre-settlement human visitation.

<sup>8</sup> Status unclear.

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<p><b>Intermediate Forest (200 – 500m asl)</b></p>	<p>Flora:</p> <ul style="list-style-type: none"> <li>• Endemic: <i>Northia hornei</i>, <i>Dillenia ferruginea</i>, <i>Colea seychellarum</i>, <i>Camptosperma seychellarum</i>, <i>Aphloia seychellensis</i>, <i>Pandanus hornei</i> etc...</li> <li>• Introduced: <i>Cinnamomum verum</i>, <i>Adenanthera pavonina</i>, <i>Paraserianthes falcataria</i>, <i>Sandoricum koetjape</i>, <i>Chrysobalanus icaco</i>, <i>Tabebuia pallida</i>, <i>Alstonia macrophylla</i>, <i>Swietenia macrophylla</i> etc...</li> <li>• For dry forest see Palm forest.</li> </ul> <p>Fauna:</p> <ul style="list-style-type: none"> <li>• Endemic: <i>Zosterops modestus</i>, <i>Alectroenas pulcherrima</i>, <i>Hypsipetes crassirostris</i>, <i>Falco araea</i>, <i>Nectarinia dussumieri</i>, <i>Otus insularis</i> (Mahé only), <i>Tachycnemis seychellensis</i>, <i>Sooglossus gardineri</i>, <i>S. pipilodryas</i>, <i>Grandisonia spp</i>, <i>Phelsuma spp</i>, <i>Trachylepsis sechellensis</i>, <i>Pteropus seychellensis</i>, <i>Aphanoconia theobaldiana</i>, <i>Cyathopoma blandfordi</i>, <i>Pachnodus niger</i> etc...</li> <li>• Introduced: <i>Rattus spp</i>, <i>Acridotheres tristis</i>, <i>Geopelia striata</i>, <i>Foudia madagascariensis</i>, <i>Streptopelia picturata</i>, <i>Tyto alba affinis</i>, <i>Felis catus</i>, <i>Canis familiaris</i>, <i>Tenrec ecaudatus</i>, <i>Achatina fulica</i>, <i>A. immaculata</i> etc...</li> </ul>	<p>Despite being almost entirely secondary and/or exotic dominated this vegetation type supports the greatest diversity of Seychelles endemic species. This vegetation band plays a vital role in maintenance of water and soil cycles.</p>
<p><b>Mountain Forest (500 – 910m asl)</b></p>	<p>Flora:</p> <ul style="list-style-type: none"> <li>• Endemic: <i>Northia hornei</i>, <i>Dillenia ferruginea</i>, <i>Roscheria melanochaetes</i>, <i>Pandanus sechellarum</i>, <i>P. Multispicatus</i>, <i>Timonius sechellensis</i>, <i>Randia sericea</i>, <i>Nepenthes pervillei</i>, <i>Excoecaria benthamiana</i>, <i>Mimusops sechellarum</i> etc...</li> <li>• Introduced: <i>C. verum</i>, <i>P. falcataria</i>, <i>Pterocarpus indicus</i>, <i>A. macrophylla</i> etc...</li> </ul> <p>Fauna:</p> <ul style="list-style-type: none"> <li>• Endemic: <i>Z. modestus</i>, <i>A. pulcherrima</i>, <i>H. crassrostris</i>, <i>F. araea</i>, <i>N. dussumieri</i>, <i>O. insularis</i>, <i>Aerodramus elaphrus</i> (roosts/breeding sites), <i>Sooglossus sechellensis</i>, <i>S. thomasseti</i>, <i>Grandisonia spp</i>, <i>Phelsuma spp</i>, <i>T. sechellensis</i>, <i>Aphanoconia theobaldiana</i>, <i>Edentulina moreleti</i>, <i>Punctum sechellarum</i>, <i>Pilula mahesiana</i>, <i>Pachnodus spp. etc...</i></li> <li>• Introduced: <i>Rattus spp</i>, <i>A. tristis</i>, <i>G. striata</i>, <i>F. madagascariensis</i>, <i>T. a. affinis</i>, <i>F. catus</i>, <i>C. familiaris</i>, <i>T. ecaudatus</i> etc...</li> </ul>	<p>Plays a vital role in maintenance of water and soil cycles. Important human aesthetic and leisure value.</p>
<p><b>Palm Forest</b></p>	<p>The islands of Praslin and Curieuse exhibit special palm forest climax vegetation communities including the presence of <i>Lodoicea maldivica</i> (endemic to the two islands). Palm forest communities also occur in dryer areas and on ridges of other forest categories e.g. intermediate and mountain forest.</p> <p>Flora:</p> <ul style="list-style-type: none"> <li>• Endemic: <i>L. maldivica</i>, <i>Verschaffeltia splendida</i>, <i>Roscheria melanochaetes</i>, <i>Phoenicophorium borsigianum</i>, <i>Nephrosperma vanhoutteana</i>, <i>Deckenia nobilis</i> accompanied by <i>Pandanus spp</i> &amp; <i>D. ferruginea</i> etc...</li> <li>• Introduced: <i>C. verum</i>, <i>Chrysobalanus icaco</i>, <i>Alstonia macrophylla</i>, various vine species etc...</li> </ul> <p>Fauna:</p>	<p>The <i>L. maldivica</i> dominated palm forest communities of Praslin and Curieuse are remnant fragments of the ancient forest of Gondwanaland this antiquity and subsequent isolation from continental evolutionary influence has resulted in a community of great biodiversity interest and high endemism.</p>

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	<ul style="list-style-type: none"> <li>• Endemic: <i>Coracopsis nigra barklyi</i> (Praslin and Curieuse only), <i>A. pulcherrima</i>, <i>H. Crassirostris</i>, <i>Stylodonta studeriana</i> (P only), <i>Pachnodus praslinus</i> (P only), <i>P. niger subfuscus</i> (P only), <i>Vaginula seychellensis</i>, <i>Ailuronyx trachygaster</i>, <i>A. Tachyscopaeus</i>, <i>Phelsuma spp</i> etc...</li> <li>• Introduced: <i>Rattus spp</i>, <i>A. Tristis</i>, etc...</li> </ul>	
<b>Inselbergs</b>	<p>Flora:</p> <ul style="list-style-type: none"> <li>• Endemic: <i>Medusagyne oppositifolia</i> (M only), <i>Pandanus multispicatus</i>, <i>Memecylon eleagnai</i>, <i>Erythroxylum sechellarum</i>, <i>Lophoschoeneus hornei</i>, <i>Excoecaria benthamiana</i>, <i>Soulamea terminaloides</i>, <i>Nepenthes pervillei</i> etc...</li> <li>• Introduced: <i>C. verum</i>, <i>Annas commosus</i></li> </ul>	Important refuges for specific endemic flora. Human aesthetic and leisure value.
<b>Riverine Forest</b>	<p>Flora:</p> <ul style="list-style-type: none"> <li>• Endemic: <i>Pandanus hornei</i>, <i>Pandanus sechellarum</i>, <i>Phoenicophorium borsigianum</i>, <i>Verschaffeltia splendida</i>, <i>Pandanus balfouri</i> and the indigenous <i>Heritiera littoralis</i> and <i>Barringtonia racemosa</i>.</li> <li>• Introduced: <i>Paraserianthes falcataria</i>, <i>Artocarpus spp</i>, <i>Bambusa spp</i> etc...</li> </ul> <p>Fauna:</p> <ul style="list-style-type: none"> <li>• Endemic: <i>Calumma tigris</i>, <i>O. Insularis</i> etc...</li> <li>• Introduced: <i>Rattus spp</i> etc...</li> </ul>	Vital for the preservation and maintenance of the water cycle. Higher reaches of the river gorges also still harbour relict flora assemblages.
<b>Notes</b>	1). Mangrove forests to be covered under Marine and Coastal Biodiversity.	



### 1.1.3 Trends in and Threats to Forest Biodiversity

As Seychelles moved away from an agrarian to a tourism/fisheries based economy (from the 1960s onwards) land use pressures likewise changed. Forest cover has expanded considerably since the 1960s due to natural regeneration and concerted reforestation programmes. This has been further fostered by the creation of an extensive terrestrial PAN and various conservation and habitat rehabilitation programmes. This has resulted in a great improvement in and security of ecosystem services such as the water and soil cycles, potential to provide forest products and also the notable recovery of various endemic species such as the Blue pigeon and Seychelles Bulbul.

Today the main threat to the conservation and sustainable use of Forest Biodiversity is presented by IAS. Forest fire and/or erosion are also a threat in some of the dryer forest habitat types (most notably on the islands of Praslin and Curieuse) but largely because the disturbance caused generally facilitates the further incursion and establishment of invasive species over the regeneration of the native.

Risks from exploitation of certain commodity non-timber forest products have been significantly reduced through active management interventions, education and awareness campaigns and through changing market pressures. The world famous Coco-de-mer palm produces the largest seed in the plant kingdom and hence has considerable curio value in addition to various reputed medicinal applications in Asian markets. The natural forests of this plant are restricted to the islands of Praslin and Curieuse. Extensive conservation measures have been put in place including the protection of the Vallee-de-Mai, a UNESCO World Heritage site, and the special management of Coco-de-mer forests on the island of Curieuse and in the Fond Ferdinand management area by the Seychelles National Park Authority (SNPA) and the Praslin Development Fund (PDF) respectively. The exploitation of the nut has been legislated with every nut for sale requiring a permit and a certain proportion being planted each year (see **Case Study 1**). The kernel is also exported on a commercial basis but controlled under CITES Appendix III. Education and awareness campaigns and the development of medicinal plant gardens have sought to address the unsustainable exploitation of medicinal plants in the wild whilst modern building materials have greatly reduced the demand for dried palm leaves etc... in construction.

There have been some very successful programmes in lowland forest ecosystem rehabilitation on various small islands which have in turn resulted in significant breakthroughs in the conservation of threatened endemic bird species (See **Case Studies 6** and **2** respectively). Aside from these however, the general trend in forest biodiversity is negative due to the ongoing incursion of IAS. The greatest concentration of endemic biodiversity in Seychelles<sup>9</sup> lies within the intermediate forest band 200 -500m ASL, but due to historical exploitation habitat in these altitudes is highly secondary. The areas in question and their terrain, particularly on the islands of Mahé and Silhouette, however mean that effective control of many existing IAS poses great logistical, resource and capacity challenges. Further attention will need to be focused in the future to develop and refine more effective field-based approaches to these challenges.

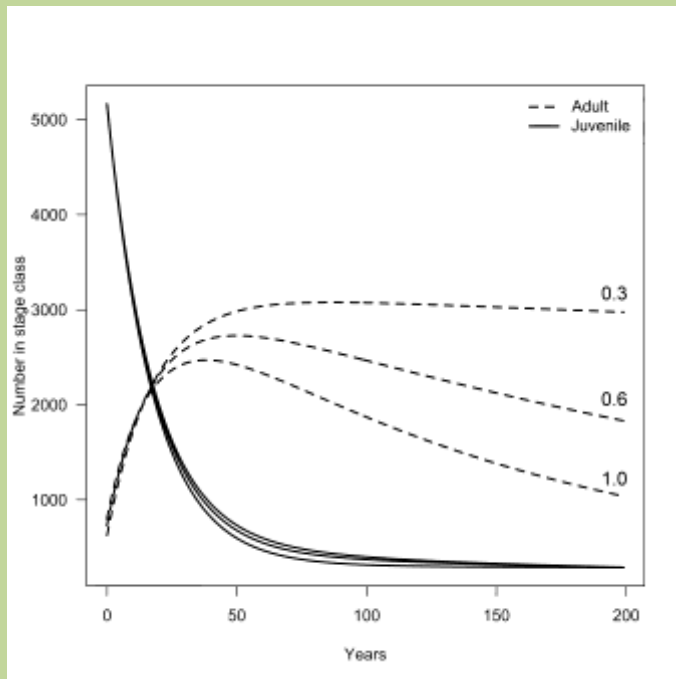
Trends in and threats to forest biodiversity are summarized in **Tables 5a & 6** respectively.

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<sup>9</sup> See **Shah 1997** and **GoS 1997** for details of occurrence and distribution of endemic forest biodiversity.

### **Case Study 1: Coco-de-Mer *Lodoicea maldivica* Management and Research by the Seychelles Island Foundation.**

The coco-de-mer palm *Lodoicea maldivica*, endemic to the Seychelles and classified as vulnerable by the IUCN, is a national flagship species for tourism and conservation. The species occurs in three main populations, with the largest at the World Heritage Site of the Vallée de Mai, which is managed by the Seychelles Islands Foundation. Other key populations occur in Fond Ferdinand (managed by Praslin Development Fund) and on the island of Curieuse (managed by the Seychelles National Parks Authority). Historically the main threats have been fire and development; however, over the last 30 years no drastic reductions in numbers have been recorded. The species famously bears the largest seed of any plant, for which it is in great demand. As a result it has been heavily exploited across its limited range for the last 15 years, when instructions were issued to ensure the complete removal of all nuts from the forest to prevent poaching. Even then it was known that such harvesting levels would not be possible to maintain indefinitely but because the coco-de-mer is so long-lived (up to several hundred years) many facets of its biology are still completely unknown, making it difficult to assess sustainable limits to harvesting. SIF has therefore been running a long-term programme of research and monitoring to improve management and ensure long-term viability of the coco-de-mer which has already led to several significant outcomes for the species.



was proposed which is currently being followed up and implemented by SIF (see Rist *et al.* 2010).

**Figure 1.** Results of varying annual adult mortality on population growth of *L. maldivica* under current harvesting intensities, mortality rates of 0.3, 0.6 and 1% are presented (reproduced with permission from Rist *et al.* 2010; Fig. 5).

**2. Population genetics and morphology:** Conservation depends on knowledge of ecological and genetic processes underlying population dynamics. With the same research group at the ETH, we quantified morphological and genetic differentiation among the three main coco de mer populations. A total of 16,766 *Lodoicea* trees were recorded in the three populations (72.6% of *Lodoicea* on both islands). Trees from the two Praslin populations differed in growth and morphology from those in the Curieuse population, which were shorter, grew more slowly and produced fewer seeds. The phenotypic differences were not mirrored in the genetic structure of the populations. All populations were relatively genetically diverse with remarkably little

**1. Sustainable harvesting:** Collaborating with researchers from ETH, Zurich, demographic modelling using population matrix models was applied to identify the life stages of the coco de mer with the strongest influence on population dynamics as well as the consequences of current harvesting intensities. An initial population model was developed based on available data. The populations' growth rate under current and alternative harvesting regimes was estimated, accounting for uncertainty regarding adult mortality and lifespan. Model projections of the population under current harvesting intensities predict a marked decrease in the proportion of juveniles in the population and a gradually declining population over the next 200 years. Population growth rates were most sensitive to adult survival, reflecting the long generation time of this species. Based on the preliminary model a precautionary sustainable harvesting limit for *L. maldivica*

differentiation among populations although genetic diversity of the Curieuse population was lower than that on Praslin. The results suggest that the coco-de-mer's capacity to dominate across a range of habitats may be due to high phenotypic plasticity. The results indicated that seeds should not be transferred between island populations (see Fleischer-Dogley *et al.* 2011).

3. **CITES listing:** Illegal harvest and export of coco-de-mer for its alleged aphrodisiac properties has constituted one of the main threats to the species in the past. Together with the Ministry of Environment, SIF worked to ensure that the species was listed on CITES Appendix III (October 2010). A description and pictures of the species is also included in an international ID manual of CITES-listed species for border control staff which will greatly help in supporting enforcement to limit this trade.



*The unique nut of the coco-de-mer dehiscent (left) and on the tree (right) has high commercial value.*

4. **Growth monitoring and other research:** Alongside the above, additional research is ongoing into growth parameters, reproduction and pollination of coco-de-mer and how the species functions as a key part of the palm forest ecosystem (e.g. Noble *et al.* 2010). Results from all of these research avenues will be drawn together to develop improved management strategies including, for example, fine-tuning the sustainable harvesting model (with more accurate data) and planting strategies.

The programme is a good example of integrated research and collaboration between local and international partners with clear management and conservation benefits.



*Replanting programmes are ongoing (left) and the main areas of remaining coco-de-mer (right) forest are incorporated into managed/protected areas.*

**Authors: Dr Frauke Fleischer-Dogley and Dr Nancy Bunbury, Seychelles Island Foundation.**

**Case Study 2: The Recovery of the Seychelles White-eye: a partnership success story combining island restoration, species management and capacity development.**

**Introduction:** The Seychelles White-eye (*Zosterops modestus*) has been the subject of focused conservation action since 1996 with a recovery programme that is an excellent example of a multi-partner, integrated ecosystem approach to conservation management. Historically abundant, the White-eye was thought to be extinct for a while in the mid-20<sup>th</sup> Century until re-discovered in 1961. A 1996 national survey<sup>10</sup> estimated the population at less than 50 birds, restricted to a few small areas of central Mahé, and indicated a sharp decline of c. 50% in both numbers and range since the mid-1970s. Following a public appeal for information an amazing discovery was made in 1997 of a previously unknown population on the small island of Conception (69 Ha) just 1.6km from Mahé. Extensive work then commenced on a species recovery programme combining intensive research, island rehabilitation and (re)introductions such that by the end of 2010 the species was present on 5 islands with a global population estimated at 520-650 birds.

**Conservation Action:** The Seychelles White-Eye Recovery Programme (SWERP) was started in 1998 by the Seychelles Environment Department (with financial support from the Dutch Government) and served to elucidate the species ecological requirements, genetic diversity (including genetic differentiation between the Mahé and Conception populations) and the main drivers of its decline. The Conception population was estimated at c. 275, a habitat model was developed to predict White-eye densities and the arboreal black rat (*Rattus rattus*) was identified as the major cause of nest failure.

In 2001 the first species action plan was developed, and following the assessment of several islands, an introduction project was developed in line with IUCN guidelines. In November 2001, 31 White-eyes were transferred to Frégate<sup>11</sup> Island from Conception and in 2003 a further 6 females were transferred to balance the population sex ratio.

Since the end of the SWERP (2002), the Island Conservation Society has been actively involved in the species recovery and the White-eye was made the flagship species of a 4 year FFEM project entitled: "Rehabilitation of Island Ecosystems". This project (2005-2009) enabled the implementation of various actions<sup>12</sup> under the Species Action Plan including the:

- Rehabilitation of and subsequent (re)introduction of White-eyes to North Island (201 ha) – eradication of *R. rattus*, control of the Indian Myna (*Acridotheres tristis*) a potential nest predator, production and implementation of a vegetation management plan (40ha of vegetation rehabilitated) and the introduction of 25 birds from Conception in July 2007.
- Eradication of *R. norvegicus* on Conception (Sept 2007) and rehabilitation of 4Ha of habitat.
- Establishment of permanent rat-control grids on half of known Mahé territories (2006).
- Monitoring of all populations and production of second Species Action Plan 2009-2013.

**Monitoring and Research:** Intensive monitoring and research has been undertaken since 1996 on various islands to guide conservation management. Capacity building has been a central theme of this work benefiting many conservation personnel from Governmental, NGO and private sectors; including the attainment of an MSc and PhD on the species by Ms. Elvina Henriette (under the FFEM project).

The Frégate and North Island populations have both shown steady increase - from 31 in 2001 to c. 130 birds in 2010 and from 25 in 2007 to c.45-50 in 2010, respectively. Both populations exhibited good fledgling productivity and low adult and juvenile mortality rate during their establishment stages. The Cousine Island population has been more problematic with the population declining from 23 in 2007 to 13 in 2010. High juvenile mortality has resulted from an unforeseen manifestation of inter-specific competition; in this case, the opportunistic harassment and killing of fledglings by the Seychelles magpie

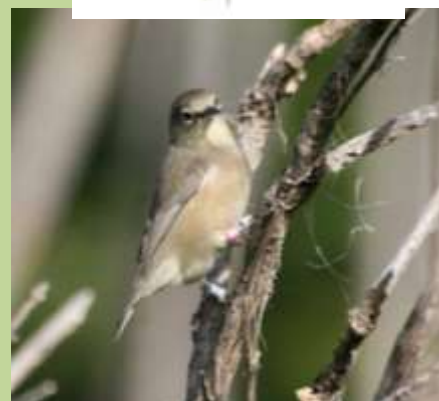
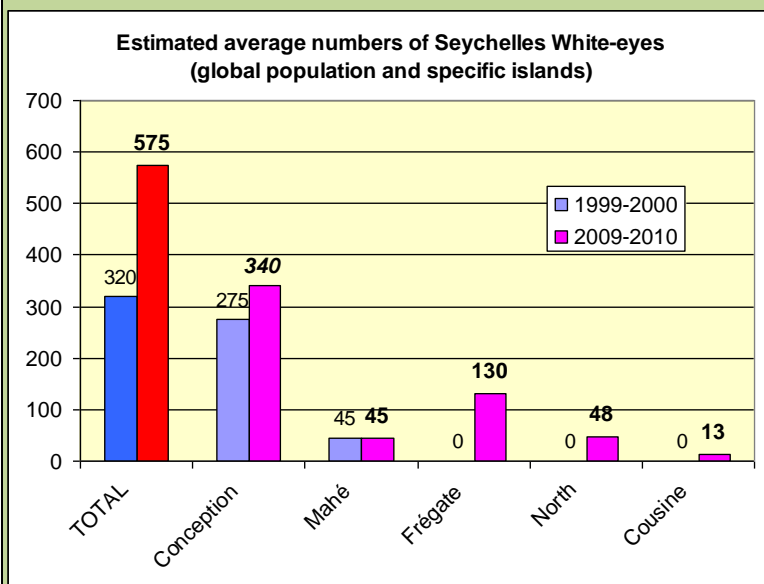
<sup>10</sup> Undertaken with assistance from BirdLife International and Glasgow University.

<sup>11</sup> For further information on the rehabilitation of Frégate Island, see **Case Study 6**.

<sup>12</sup> Assistance was also provided to a GEF project managed by Nature Seychelles to transfer 23 White-eyes to the island of Cousine (20 birds from Conception and 3 from Mahé) in November 2007, see **Case Study 6**.

robin<sup>13</sup>. The factors causing high adult mortality remain unknown.

**Figure 1: Seychelles White-eye populations**



The Conception Island population, relatively stable during 1999-2005, has shown steady growth in 2005-2008, most markedly after the brown rat eradication in 2007. Mahé supports two main sub-populations, where the minimum-maximum number of birds censused has shown a stable fluctuating trend from 1999 (34-40) to 2006 (34-41), in 2007 a peak was recorded (45-62) probably due to rat control measures. A significant decline followed during and after 2008 partly due to disturbance and habitat destruction, and subsequent dispersal of birds. Numbers went down to 29-50 in 2008 and to only 13-26 in 2010, although an increase has been observed in 2011 (23-41 birds).

**Achievements:** Overall and as a result of the island transfers, the global population of the Seychelles White-eye increased from c.320 on two islands in 1999, to 520-650 on five islands in 2010 causing the species to be down listed to Endangered in the IUCN World red data List. Many of the conservation actions conducted also benefit other species and Seychelles biodiversity as a whole.

**Lessons Learned:** Transfer protocols have been refined and optimized in terms of seasonality, captive management techniques and post introduction monitoring. The Cousine Island experience has shown the limits of introducing rare species into small islands with many species present and hence high-chance of inter-specific competition; re-enforcing the need to take an ecosystem, as opposed to species, approach to all transfers. Insight was gained into the considerable ecological plasticity of the species and its role in the seed dispersal of native plants.

**The Way Forward:** Conduct other island transfers with the objective of establishing White-eyes on 7 islands and down listing IUCN conservation status to Vulnerable (as per Action Plan 09-13). Further island restoration programmes are needed to enable introductions; the eradication of rats and cats on Grande Soeur Island in 2010 offers a possibility for 2012. Reverse the declining population trend on Mahé through rat control and habitat rehabilitation is a priority. Maintain ongoing rehabilitation of islands with transferred populations and monitor all transferred and source populations more regularly is also required.

**Authors:** Dr Gerard Rocamora (Island Conservation Society & Museum National d'Histoire Naturelle, Paris) and Dr Elvina Henriette (University of Seychelles & MNHN).  
Images courtesy of Dr. G. Rocamora.

<sup>13</sup> These species are known to have co-existed historically on Mahé.

## 1.2 Inland Waters Biodiversity

Isolated by nearly 1,000 miles of sea water and 65 million years of evolution from continental landmasses the inland waters of Seychelles exemplify the CBD terminology of the geographically and evolutionarily isolated ecosystems that are likely to be of particular biodiversity interest. The central archipelago does indeed support an interesting inland waters biodiversity including terrapins, caecilians, dragon and damsel flies, freshwater fish and crustacea etc... but surprisingly little research has been undertaken to assess the extent of the endemic component which may be limiting to the development and implementation of effective conservation and sustainable use measures.

A characteristic feature of many of the original coastal plains of the granite islands is the coastal dune formations which create a simple basin-like structure to the landward. These drainage barriers resulted in flooding of the coastal plains and the formation of extensive inland wetlands; the outlets of which would be formed temporarily when heavy rains would break through the beach sands to the sea.

For the purposes of this report inland waters are divided into 3 categories, highland wetlands, lowland wetlands and rivers and streams; description, status and representative species are summarized in **Table 2.**

1.2.1 Highland wetlands are a very specific habitat in the Seychelles context restricted to just three sites: Mare aux Cochons on Mahé, La Plaine Hollandaise on Praslin and the Mare Aux Cochons on Silhouette. All three sites were subject to extensive historical agricultural use and related introduction of species. Considerable progress has been made with habitat over the last 15 years, however: active rehabilitation has been undertaken at the Mahe, Mare Aux Cochons which lies within the Morne Seychellois National Park and was designated a Ramsar site in 2010; agricultural activities have long since ceased in all three sites and the Silhouette site now also falls within a recently designated national park. Trends of this habitat type can therefore be considered stable to positive. Future focus would be well directed towards conservation and management related research and the development of specific site management plans.

These locations are of considerable interest harboring unique wetland biodiversity assemblages – see **Table 2** for main species.

1.2.2 Lowland wetlands were historically utilised for agricultural purposes such as rice production. As other forms of agriculture and human infrastructure expanded these areas were increasingly drained to meet the demand for flat land. This trend has continued through the 20<sup>th</sup> century as infrastructure expanded and standards of living rose. The national shortage of flat land put this habitat type at the forefront of development pressures such that today it can be considered the most severely threatened habitat type in Seychelles. The largest remaining wetlands are Grande Barbe on Silhouette, Police Bay on Mahé and “La Mare Soupap” on the east coastal plain of La Digue. La Mare Soupap lies on West coastal plain of La Digue which is the centre of human development and habitation and hence faces diverse pressures. Several hectares of the wetland were purchased at the turn of the century with assistance from the Dutch Government and incorporated, for management purposes, into the La Digue Special

Reserve. This has served to mitigate to some extent some of the impacts but issues remain including enrichment pollution and peripheral canalisation to mitigate seasonal flooding risks.

Other smaller and vestige lowland wetland areas in the central archipelago are subject to ongoing ad-hoc reclamation, canalisation and pollution meaning this habitat and its natural denizens are in a particularly perilous state. To counter this wetland creation and rehabilitation initiatives have been undertaken on some smaller islands such as North, Fregate and Aride and an action plan for the conservation of Seychelles terrapins developed.

Since the 1990s wetland management has faced the additional challenge of IAS from the water hyacinth (*Eichornia crassipes*) and water lettuce (*Pistia stratiotes*) control programmes have been instituted but are costly and have yielded mixed results.

### 1.2.3 Rivers and streams

The 1903, Crown Lands and River Reserves Act (latterly the State lands and River Reserves Act 1976) lists 146 rivers and rivulets on the three main populated islands of Mahé, Praslin and La Digue. The topography of the granitic islands dictates that watercourses are typically of short length and steep gradient. The water courses on the three main islands are listed for protection in recognition of their importance to human populations and socioeconomic development.

This legislation contributed to the maintenance of catchment areas and river bank habitats through the 20<sup>th</sup> Century and was latterly enhanced by the establishment of extensive Protected Areas and the recovery of forest cover in the latter part of the century. These interventions have protected and rehabilitated many of the catchment areas and served to secure the vital water cycle and protect the biodiversity of the upper reaches of watercourses. Increasing demand for water, however, does pose a risk as ever greater quantities of water are being extracted from the upward reaches of water courses with inevitable downstream habitat and ecosystem effects. The lower reaches of streams have been impacted by human development activities in many regions including enrichment pollution, canalisation in built-up areas and the reclamation/drainage of associated lowland wetlands.

A 2003 study of selected watercourses on Mahé and Praslin was undertaken in cooperation with the Association Réunionnaise de Développement de l'Aquaculture to identify fish and crustacean species present. This survey investigated 12 permanent water courses (7 on Mahé and 5 on Praslin) surveys were focused primarily on the lower reaches of the rivers and identified 12 native species of crustacea, including the endemic crab (*Seychellum alluaudi*) and 17 native species of fish including the endemic *Panchypanchax playfairii* and the discovery of a new endemic species *Parioglossus multiradiatus* (Valade, P. et al 2004). Additional work is required on more rivers and in their higher reaches to gain a better overview plus a structured programme of research on freshwater invertebrates the diversity of which, modern surveys suggest, may have previously been underestimated (Malicky, H. 1993 & 1995).

Finally changing rainfall patterns – namely shorter more intense periods of rainfall – considered to be related to changing global climate patterns represent a key threat to the country's future water supplies and the health and resilience of watercourse and wetland ecosystems.

**Table 2**, overleaf, summarises the key species and importance of these freshwater ecosystems.

**Table 2: Description and Status of Inland Waters Biodiversity**

Main Habitats	Main Species	Importance for Ecosystem integrity/Human well-being
<p><b>Lowland wetlands</b></p>	<p>Flora. Native: <i>Typha javanica</i>, <i>Eleocharis dulcis</i>, <i>E. Variegata</i>, <i>Polygonum senegalense</i>, <i>Cyperus spp</i>, <i>Fimbristylis spp</i>, <i>Terminalia catappa</i> etc... Introduced: <i>Eichornia crassipes</i>, <i>Pistia stratiotes</i>, <i>Ludwigia octovalvis</i>, <i>Nymphaea lotus</i>, <i>Alocasia macrorrhiza</i>, Fauna. Endemic: <i>Pelusios castanoides intergularis</i>, <i>P. subniger parietalis</i>, <i>Hypogeophis rostratus</i>, Native: <i>Ixobrychus sinensis</i>, <i>Gallinula chloropus</i>, Introduced: <i>Ptychadaena mascareniensis</i>, <i>Rattus spp</i>, <i>Canis domesticus</i>, <i>Felis catus</i>, <i>A. tristis</i>, <i>Trachemys scripta elegans</i> (Mahé only to date), <i>Physella acuta</i>, <i>Gyraulus mauritanus</i> etc...</p>	<p>Important habitat for endemic/indigenous spp and sub-spp. Important habitat for diverse and abundant migrant birds that visit Seychelles annually - see <b>SBRC (2010)</b>. Important role in sedimentation of waters before discharge into the sea. Potentially important role in flood abatement – but now so greatly reduced in area this role largely now lost and flooding a regular occurrence. Formerly important for agricultural activities. Increasingly important for research and ecotourism activities.</p>
<p><b>Highland wetlands</b></p>	<p>Flora. Endemic: <i>Pandanus hornei</i>, <i>Verschaffeltia splendida</i>, <i>Gynura sechellensis</i>, <i>Mimusops sechellarum</i>, <i>Randia lancifolia</i>, <i>Allophylus sechellensis</i>, <i>Camptosperma sechellarum</i>, <i>Canthium sechellense</i> etc.. Introduced : <i>Cinnamomum verum</i>, <i>Chrysobalanus icaco</i>, <i>Paraserianthes falcataria</i>, <i>Alstonia macrophylla</i>, <i>Tabebuia pallida</i>, <i>Clidemia hirta</i> etc... Fauna. Endemic: <i>Sooglossus spp</i>, <i>Pachypanchax playfairii</i>, <i>Grandisonia spp</i>, <i>Trichoptera spp</i>, <i>Otus insularis</i> diverse molluscan spp - both endemic and indigenous* etc... Introduced : <i>Rattus spp</i>, <i>M. musculus</i>, <i>Tenrec ecaudatus</i> etc...</p>	<p>Provides important habitats for endemic biodiversity Vital areas for water catchment capacity and maintenance. Increasing importance for ecotourism and scientific research.</p>
<p><b>Rivers and streams</b></p>	<p>Fauna. Endemic: <i>Hypogeophis rostratus</i>, <i>Praslina cooperi</i>, <i>Tachycnemis sechellensis</i>, <i>Pachypanchax playfairii</i>, <i>Parioglossus multiradiatus</i>, <i>Paludomis ajanensis</i>, <i>Seychellum alluaudi</i>, <i>Allolestes maclachlanii</i>, <i>Leptocnemis cyanops</i>, <i>Zygonix luctifera</i>, <i>Hughscotiella auricapilla</i>, <i>Oxyethira sechellensis</i>, <i>Ecnomus maheensis</i>. Native: <i>Anguilla bicolor</i>, <i>Sesarmops impressum</i>, <i>Varuna litterata</i>, <i>Macrobrachium spp</i>, <i>Caridinia spp</i>, <i>Neritina gagates</i>, <i>N. Pulligera</i>, <i>Septaria borbonica</i>, <i>Ardea cinerea</i>, <i>Butorides striatus</i>, <i>Nycticorax nycticorax</i>, Introduced: <i>Poecilia reticulata</i>, <i>Oreochromis mossambicus</i>, <i>Lymnaea natalensis</i>, <i>Gyraulus mauritanus</i>, etc...</p>	<p>Important habitat for diverse and abundant migrant birds that visit Seychelles annually - see <b>SBRC (2010)</b> for full current details.</p>
<p>Notes</p>	<p>*: See <b>Gerlach, J. (2006)</b> for full current account. <b>SBRC(2010):</b> <a href="http://www.seychellesbirdrecordscommittee.com">http://www.seychellesbirdrecordscommittee.com</a></p>	



## 1.3 Marine and Coastal Biodiversity

The first European explorers to, and subsequent settlers of, Seychelles found a coastal zone rich in biodiversity. The main islands of the granitics supported populations of salt water crocodile, seals were found on the smaller granite and more isolated islands of the central archipelago and were abundant in the Amirantes. The brightly coloured coral reefs teemed with fish, rays and sharks, there were abundant seasonal pelagic resources and the beaches supported huge rookeries of hawksbill and green turtle. These biological resources supported the human population providing cheap high quality protein and spawning various export industries that drove the socioeconomic development of the colony. Today the coastal environment of Seychelles continues to drive the country's development; the beautiful coconut and Takamaka fringed white sand beaches and crystal clear tropical blue waters attract tourists from all round the world seeking to relax and revel in the beautiful natural surroundings. The coastal environment today however is very different from that of the 18<sup>th</sup> Century. Crocodiles were extirpated in the early to mid-19<sup>th</sup> Century as were the seals from the central archipelago and a few decades later from the outer islands also. The turtles supported prolonged exploitation that decimated their numbers (see **Case Study 3**). Sharks remained abundant on the Mahé plateau until a targeted fishery in the 1940s-1960s reduced their biomass to a small percentage of the former abundance and the populations on the smaller banks of the outer islands soon followed suit.

The removal of so many key species, entirely or functionally, will have destabilized the ecosystem driving changes that may well likely impact on productivity. Key steps however have been taken; all marine mammals and marine turtles have received complete legal protection since 1979 and 1994 respectively. There are management plans and management approaches for various fisheries (see fishery sections overleaf) and Seychelles was amongst the first ten countries globally to develop and commence implementation of a National Plan of Action for the Conservation and Management of Sharks.

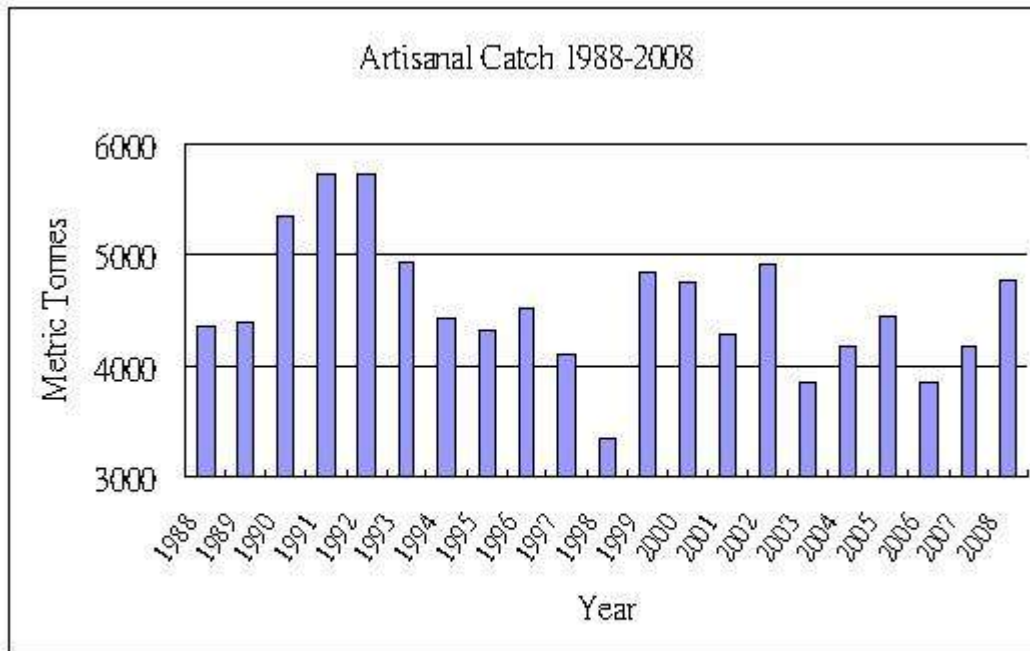
The marine environment is central to Seychelles development; artisanal, semi-industrial and industrial fisheries are central to Seychelles economy and local food security<sup>14</sup>.

### 1.3.1 Artisanal Fishery

The artisanal fishery has maintained a relatively stable catch over the last 25 years varying typically between 4,000 and 5,000 MT per annum (mean catch 1988 – 2008: 4497MT) these figures do not however reflect the increase in effort and improvement in fishing techniques. Inshore areas around the main populated islands and various demersal stocks are known to be overexploited due to concentration of fishing effort in those areas. The fishery consists primarily of pelagic carangids (Trevally and Bludger), *Lethrinidae*, *Lutjanidae*, *Scaridae*, *Serranidae*, *Siganidae*, Lobster spp, sea cucumber spp and octopus.

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<sup>14</sup> Seychelles has one of the highest global per capita fish consumption indices with estimations varying between 65-75kg per annum.

**Figure 1:** Summary of Seychelles Artisanal Catch 1988 – 2008.

### 1.3.2 Semi-industrial Fishery

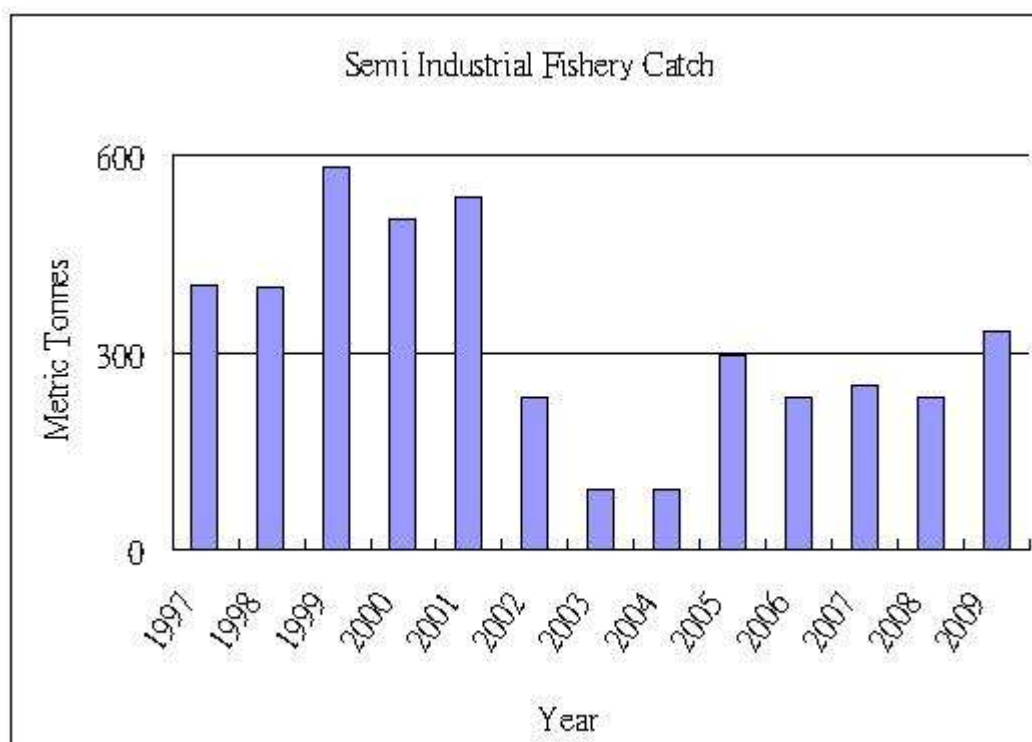
The semi-industrial pelagic long line fishery in Seychelles started in 1995 targeting swordfish and tuna with a significant shark by-catch component. The number of vessels active in the fishery has fluctuated from 7 to 11 (in 2008 and 2009, 9 vessels were active though only 7 were involved in targeting swordfish and tuna in 2008). A major shift in fishing effort in 2002-2005 was driven by a European Commission (EC) warning regarding the cadmium level<sup>15</sup> found in swordfish from Seychelles waters (cadmium in local swordfish registering at 0.3-0.5 parts per million) this caused the Seychelles Government to ban the export of swordfish to the EC until the situation could be negotiated. This forced the vessels to switch to the next viable commodity to pay their loans and that was shark fin, the export of shark fin in 2003 increased tenfold on the preceding year, and served to further impact the already depleted stocks on the Mahé plateau and other banks in the Seychelles EEZ. The EC ultimately changed its cadmium criteria<sup>16</sup> and swordfish export re-commenced in 2005 – several boats however remained targeting shark due to the transition costs (in terms of gear and hygiene requirements). This situation was not rectified until 2008 when an amendment to the fuel subsidy regulations under the Agriculture and Fisheries Incentive Act encouraged the fleet to shift back to the swordfish fishery with an 80% increase in effort to the fishery that year and a further 40% increase in 2009. There are concerns in this regard also however, as CPUE for the swordfish fishery has declined to its lowest point in the 2008-2009 period and close observation is now required (see **Table 3**). It is also considered probable that the declines in shark catch recorded 2008-2009 corresponding to this switch of effort may be due to shark fin landings being transshipped to artisanal vessels at

<sup>15</sup> European Commission regulation (EC) No. 466/2001 as regards heavy metals.

<sup>16</sup> European Commission regulation (EC) No 78/2005 amending regulation (EC) No 466/2001 as regards heavy metals.

sea and hence not declared so that the semi-industrial fleet can still benefit from fuel concessions.

**Figure 2:** Semi-Industrial Fishery Catch summary 1997-2009.



### 1.3.3 Industrial fishery

Fishery activity and economic importance has grown rapidly since the mid-1980s with the expansion of industrial tuna fishing in the western Indian Ocean and establishment and subsequent expansion of a tuna canning factory in Port Victoria. Seychelles is now a regional hub for industrial tuna fishing with substantial foreign fleets (purse seiners and long liners) licensed to fish in the Exclusive Economic Zone and the port offering ancillary services to vessels, in addition to the cannery and trans-shipment. Industrial tuna fishing now matches or exceeds tourism revenue to the country, whilst the wider fishing sector accounts for 15-20% of official employment.

Seychelles is a member of the Indian Ocean Tuna Commission (IOTC), an intergovernmental organization established under the FAO, mandated to manage tuna and tuna-like species in the Indian Ocean<sup>17</sup>. The IOTC has 28 members (27 countries and the EC) and 4 cooperating non-contracting parties. The objective of the Commission is:

*“To promote cooperation among its Members with a view to ensuring, through appropriate management, the conservation and optimum utilisation of stocks covered by this Agreement and encouraging sustainable development of fisheries based on such stocks”.*

<sup>17</sup> Full information on the IOTC its mission, objectives, function and responsibilities can be found on its website [www.iotc.org](http://www.iotc.org).

In such a huge ocean basin with so many active fishery participants, including IUU, (Illegal, Unreported and Unregulated fishing activities) and a complicated mix of target and by-catch species in the context of very complex and dynamic ecosystem this is a very considerable challenge and there are various reasons for concern. The report of the 13<sup>th</sup> session of the Scientific Committee of the IOTC (IOTC 2010) noted that the Yellow fin tuna (*Thunnus albacores*) stock is likely to be in an overfished state, that the stock status for Albacore (*Thunnus alalunga*) and Skipjack (*Katsuwonus pelamis*) tuna are uncertain and should be closely monitored, and that the lack of data for many other species was cause for considerable concern (see **Table 3** for details).

#### 1.3.4 Beach Crest and Beach

The beach, beach crest and adjacent low lying coastal land are of vital importance to Seychelles. Socially this area is the centre of human leisure and cultural activity on the main populated islands. Economically these habitats provide the basis for and appeal of the country's tourism industry. They are also consequently amongst the most disturbed habitats with vegetation of most sandy shores<sup>18</sup> in Seychelles having been severely modified with some coastal species driven to near extirpation from the larger granite islands e.g. *Pisonia grandis* and *Intsia bijuga*. Human resource exploitation, particularly historical but also ongoing, have had significant impacts on fauna: seals extirpated in the 19<sup>th</sup> century, turtle and sea bird populations dramatically reduced.

This habitat is vital for nesting turtle populations (*Chelonia mydas* and *Eretmochelys imbricata*) and key legal measures have been instituted since 1994 providing total protection to marine turtles, whilst the institution and effective management of certain key Protected Areas has seen significant success in terms of recovery of protected turtle rookeries (see **Case Study 3**). The habitat is also vital for wading birds (native and migratory), various species of nesting sea bird (see **Table 4** and **Case Study 4** respectively), and diverse crab species (see **Table 4**) etc... The habitat is also under ever increasing pressure from human activity and development causing ongoing degradation through physical alteration (hotels, infrastructure, sea walls, groynes etc...), removal of natural coastal vegetation, increasing pollution, and disturbance through human presence, artificial light and noise. This is further complicated by what are considered to be the impacts of climate change as evidenced by increasing coastal erosion and more intense storm surges. Institutional responses have been put in place in an attempt to protect coastlines: removal of sand from beaches is illegal and the coast<sup>19</sup> is recognized as a sensitive area under the 1996 EIA regulations thereby requiring all development proposals to be subject to a higher grade of EIA. There have likewise been various pilot projects to develop and refine better coastal management regimes including restriction of vehicle access and the management of beach access to protect coastal vegetation and limit coastal erosion.

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<sup>18</sup> For a thorough investigation of man's impact upon coastal vegetation see **Sauer 1967**.

<sup>19</sup> With the exception of the developed east coast of Mahé which supports the main port, the international airport and the vast majority of residential and light industrial infrastructure.

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Table 3 <sup>20</sup> : IOTC Species Stock Status Summary		
Stock	Stock status Comments	Advice to IOTC
<b>Major stocks: the main stocks under, in general, the highest exploitation and fishing pressure by industrial fisheries throughout the Indian Ocean.</b>		
Albacore <i>Thunnus alalunga</i>	Stock size and fishing pressure considered acceptable in 2008. A recent revision in catch data however, has resulted in much higher catch estimates for the past 5 years. Mean weight and catch rates have been stable for over 20 years.	Stock status is uncertain and should be closely monitored to assess the impact of recent changes in catch levels.
Bigeye tuna <i>Thunnus obesus</i>	Stock probably not overfished and probably not subject to overfishing. The stock is probably near full utilisation and the possibility of overfishing cannot be ruled out given the existing uncertainty and the continuing observed decline in catch rates.	Bigeye catches in the Indian ocean should be kept at or lower than the 2009 level of 102,000 t.
Skipjack tuna <i>Katsuwonus pelamis</i>	Skipjack is a highly productive species and robust to overfishing. However this does not exclude the possibility for it to become overfished. Recent trends in certain fisheries suggest the stock should be monitored closely.	Stock status is uncertain and should be closely monitored.
Yellowfin tuna <i>Thunnus albacares</i>	Stock is likely to be in or approaching an overfished state and overfishing has probably been occurring in recent years.	Catches should not increase beyond 300,000t in order to bring stock biomass to levels that could sustain MSY. If recruitment continues to be lower than average catches below 300,000t would be needed.
Swordfish <i>Xiphia gladius</i>	If the south-western region is analysed as containing a separate stock, results indicate that a substantive decline took place in that area. Recent declines in catch and effort might have brought fishing pressure to sustainable levels.	Catches in the southwest region should not exceed 2008 levels of 6,400t.
<b>Billfish (other than swordfish): including species not directly targeted by most fleets, but caught as by-catch of the main industrial fisheries.</b>		
Blue marlin ( <i>Makaira nigricans</i> )	No quantitative stock assessment is currently available for any of these species in the Indian Ocean and only preliminary stock indicators can be used. Aspects of the biology, productivity and fisheries for these species combined with lack of data on which to base a more formal assessment is a cause for considerable concern.	Stock status is uncertain
Black marlin ( <i>M. indica</i> )		Stock status is uncertain
Striped marlin ( <i>T. audax</i> )		Stock status is uncertain
Indo-Pacific Sailfish <i>Istiophorus platypterus</i>		Stock status is uncertain
<b>Sharks: frequently caught in association with other species as by-catch, and often they are as much a target as tuna for some fleets.</b>		
Blue shark ( <i>Prionace glaucus</i> )	No quantitative assessment is available. No reliable Indicators	Stock status is uncertain
Oceanic whitetip shark <i>Carcharhinus longimanus</i>		Stock status is uncertain
Silky shark ( <i>C. falciformis</i> )		Stock status is uncertain
Shortfin mako <i>Isurus oxyrinchus</i>		Stock status is uncertain
Scalloped hammerhead shark <i>Sphyrna lewini</i>		Stock status is uncertain

<sup>20</sup> Table adapted from IOTC 2010.

### 1.3.5 Rocky Shore

Rocky shore is the most common shore habitat in the granitic islands and is typified by a limited vegetation structure consisting of species such as *Hibiscus tiliaceus*, occasional stands of the endemic Balfour's pandanus (*Pandanus balfourii*) and more extensive and typically planted stands of *Cocos nucifera* and *Casuarina equisetifolia*. *Scaevola sericea* also occurs growing out of clefts and creepers (e.g. *Ipomea pes-caprae*) and grasses abound. In their natural state and particularly on promontories and rocky islets such habitats historically supported important seabird populations and and/or roosts - *inter alia* *Sterna anaethetus*, *Phaethon lepturus*, *Puffinus pacificus* – the type of which can still be seen on reserve islands like Cousin and Aride.

The intertidal zone is rich in gastropods some of which are commonly exploited for food (e.g. *Patella exusta* and *Cellana radiata*). The trochus *Monodonta australis* and the majority of Seychelles Nerites (*Nerita albicilla*, *N. plicata*, *N. polita*, *N. textilis*) are common in this zone; as are various species of Littorinid (*Littorina kraussi*, *L. scabra*, *L. undulata* and *Peasiella roepstorffiana*). *Planaxis sulcatus* occurs in large colonies in this zone, the Morulas, *Morula granulata* and *M. uva* are also common and the cowrie *Cypraea caputserpentis* is common in rocks clefts typified by stronger wave action. Rocky shores also harbour large crab populations (*Grapsus* and *Geograpsus* spp) and occasionally the distinctive chiton *Acanthopleura brevispinosa*.

Descending into deeper water, the granite cliffs support foliose and encrusting corals and various species of algae that attract various reef fish assemblages. Various herbivorous fish species are also associated with underwater granite faces – e.g. the lined surgeon fish *Acanthurus lineatus*, Butterfly fishes (*Chaetodon auriga*, *C. lunula*), Scissortail sergeant (*Abudefduf sexfasciatus*), Daisy parrot fish (*Chlorurus sordidus*) and Tripletail wrasse (*Cheilinus trilobatus*). Human impact is not absent however in particular two notable and formerly abundant species are now rare in this habitat following intensive exploitation in the latter half of the 20<sup>th</sup> century, namely the Potato grouper (*Epinephelus tukula*) and the Green snail (*Turbo marmoratus*). Other molluscs such as Drupes (*Drupa morum*, *D. ricinis*, *D. Rubusidaeus*) are still abundant and in deeper water *Murex* spp like *maurus* and *rosaries* can still be found.

### 1.3.6 Mudflats and Mangroves

The original mangrove forests on the East coast of Mahé were rapidly cleared after human settlement and the resulting mud flats progressively reclaimed over the next 200 years to meet the need for flat buildable land accessible to the harbour. Mangroves were also cropped for timber and for bark; such exploitation continued on Aldabra well into the 20<sup>th</sup> Century. Total natural mangrove area continued to decline through much of the 20<sup>th</sup> Century (falling more than 12% in the 1960s and 70s) but has been considered relatively stable since the 1980s at approximately 25km<sup>2</sup>.

Eight species of mangrove naturally occur in Seychelles (see **Table 4**). The mangrove fauna is characterized by limited species diversity when compared to its continental counterparts. In the central archipelago today mangroves are rather restricted; the last continuous belt exists between Port Launay and Port Glaud on the west coast of Mahé. Curieuse supports a diverse mangrove area on its west coast and Praslin retains a few isolated mangrove areas around river mouths; other very small areas also occur on other islands such as Cousin. In the outer islands mangroves are only found in atoll environments, which provide the sheltered lagoon habitat

suitable for their establishment. The most extensive forests are found in Aldabra, Cosmoledo and Astove.

In recent years there has been some notable secondary expansion along the east coast of Mahé where successive land reclamation programmes have created inshore lagoons. These new mangrove areas, dominated by the colonizing species *Avicennia marina* and *Rhizophora mucronata*, are very disturbed being subject to periodic pollution events and regular cutting/clearance to maintain navigable channels and drainage capacity. Despite this the habitat clearly supports significant populations of crabs, molluscs and fish and hence provides important habitat for native heron species and migratory wading birds.

Mangrove habitats are considered to serve important environmental roles such as coastal protection, sedimentation of solids from freshwater sources and as a nursery habitat for various fish species. Mangrove habitat management has received considerable attention over the last 15 years with for example: the development of pilot management projects and ecotourism (boardwalks and canoeing) activities. Perhaps most significant has been the incorporation of the Port Launay mangroves into the Morne Seychellois National Park providing for protection of a complete watershed from mountain top to mangrove forest. The importance of this area was highlighted by its inclusion in the 2004 declaration of the Port Launay Coastal Wetlands (121ha) as a Ramsar site.

The main threat to mangroves is ongoing coastal development and also, in the longer term, climate change and rising sea levels must be considered a significant threat to mangrove forests in the Seychelles.

#### 1.3.7 Sea Grass Beds

The extensive shallow submarine banks of Seychelles support significant sea grass areas. A particularly large sea grass bed (estimated at 45km long and 15km at its widest) lies on the Providence-Cerf bank. Many of the outer islands, such as the lagoons of Aldabra, Cosmoledo and Astove, support large sea grass communities. Sea grass habitats are also common around the granitic islands notably in the St Anne Marine National Park and off Grand Anse-Amities coast of Praslin.

Sea grass beds play an important role in stabilizing sand and sediment thereby protecting corals from sedimentation and coasts from erosion. Sea grasses are considered important as nursery and breeding habitat for commercial fish and diverse invertebrate communities – a brief survey of inshore sea grass bed substrate around the island of Mahé recorded 58 species of infaunal invertebrates. Sea grass beds are also essential for many marine herbivore species including megafauna such as the green turtle and the Dugong.

There is evidence however that sea grass beds around the main populated islands are in decline due to a combination of anthropogenic factors – pollution, reclamation, coastal development and climate change.

It is also likely that the historical exploitation of the main sea grass grazers e.g. green turtle, and possibly dugong in some localities, and ongoing fishery activities mean that the natural grazer/growth balance in sea grass beds has been lost potentially leading to marked changes in community structure and health.

### 1.3.8 Reef flats

This construct of mixed habitats is included due to the singular nature of its importance and exposure to human impacts. This habitat complex has been subject to intensive disturbance due to its proximity and accessibility to human populations. In the central archipelago reef flats are utilised extensively for gleaning fisheries (e.g. octopus and shell fish) and shell collecting activities. In the last 20 years damage to this habitat type in the central archipelago has escalated in particular through major land reclamations off the east coast of Mahé, but pollution and increased sedimentation are also factors of concern.

Most reef flats consist of a complex patchwork of habitats: areas of sand and gravel interspersed between areas of coral rubble, coral outcrops, sea grass and algal growth. In their natural state these habitats are rich in life and commodity species such as octopus, lobster and sea cucumber. Mollusc fauna can be very rich with Cowries (*Cypraea moneta*, *C. annulus*, *C. Lynx*, *C. caurca* and *C. helvola* being common), Cones (*Conus leopardus*, *C. litteratus*, *C. virgo*, *C. maldivus*, *C. betulinus* and *C. quercinus*) readily found in the seagrass; whilst species such as *Bittium zebrum* and *Smaragdia rangiana* can be found in algal mats.

Concerns raised by the impact of shell collection resulted in four shell reserves being declared in the 1960s, these were subsequently incorporated under the 1986 Fisheries Act (1987 Shell Reserve Regulations) but the areas are not managed or enforced. Reef flat areas are also covered in other Protected Areas most notably Aldabra.

### 1.3.9 Coral Reefs

It is estimated that Seychelles has some 1,700 km<sup>2</sup> of coral reef the vast majority of which occurs around the south eastern islands. Prior to 1998 the coral reefs of Seychelles exhibited good live coral cover, rugosity and reef community diversity. Only some localised outbreaks of crown of thorns starfish in 1996 and '97 hinted that fishing pressure and enrichment pollution might be an issue of concern on reefs near the main populated islands of the central archipelago.

The whole scenario changed however with the ENSO-related severe bleaching event in 1998. The impact of the coral bleaching was most severe in the Western Indian Ocean and for Seychelles particularly on the Mahé Plateau. The reefs of the central archipelago were particularly badly affected with 80-90% mortality. Fast growing Acroporas and Pocilloporas suffered most and a phase shift from live coral cover to coral rubble/macroalgae dominated-reefs was initiated. The outer islands were in general less badly affected with coral mortality more in the region of 40% and it has been postulated that this may reflect greater resilience due to reduced anthropogenic stress and an existing natural adaptation to greater temperature fluctuations.

Reef fish diversity showed a lag effect following the bleaching event with some impact noted on certain live-coral dependent species but in general diversity was maintained. However as time progressed recruitment of new individuals to fish populations appeared to be reduced possibly related to degradation of reef structure. Furthermore studies on herbivorous fishes suggest that they will not prove effective in preventing the spread of macroalgae over the reef surface. This bodes ill for future coral reef community diversity and for various economically important fisheries.



In the ten years following the bleaching event natural recovery has been slow. Various factors are believed to have contributed to this:

- The loss of live coral was so extensive and widespread that sources of coral larval influx for recruitment are greatly reduced.
- The spread of algae coverage is limiting to coral recruitment and development<sup>21</sup>.
- There have been further bleaching events in 2002, 2003 and 2010 that have accounted for much of the natural recovery.

Live coral cover in the central archipelago is still below 10% with less than 1% composed of the fast growing branched species so vital for the development of habitats.

General climate trends suggest that raised sea-temperature events will occur with increasing regularity in the future and as such temperature induced coral bleaching remains the primary threat to coral reefs and their wider recovery in the Seychelles.

#### 1.3.10 Marine Plateau

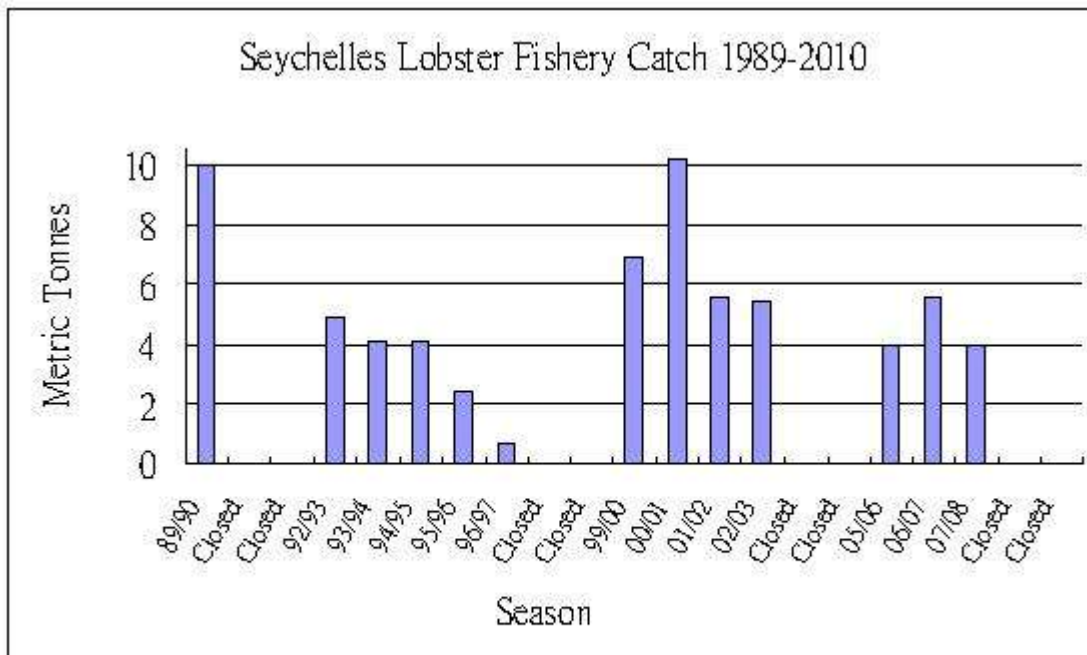
The submarine banks of the Seychelles have been central to the islands' food security and economic development throughout its human history. The Seychelles (Mahé) plateau is of particular importance. This shallow (generally not more than 50m in depth) bank of some 39,000 km<sup>2</sup> supports important demersal fisheries such as: *Lethrinidae*, *Lutjanidae*, *Scaridae*, *Serranidae*, *Siganidae*. Concerns about overfishing of the plateau resources have come to the fore in the last 15-20 years. The Seychelles Fishing Authority has long recognized that the inshore reefs and plateau area are over fished and has pursued various means of spreading the fishing effort further across the plateau and reducing the focus of the fishing impact. However as fishing capacity and technology has advanced high value commodity fisheries (e.g. lobster, sea cucumber and Emperor red snapper) have in particular proven difficult to effectively manage. Furthermore the activities of the semi-industrial long-line fleet have significantly impacted an already heavily depleted shark fishery, on the banks, driven by the commodity value of shark fin on the international markets (see section on semi-industrial fishery above).

Management of demersal resources remains a challenge with the SFA continuing to develop and refine management mechanisms. The lobster fishery is managed on a cyclical basis with limited licenses being issued for two to three year periods and the fishery then closed for a number of seasons to allow stocks to recover.

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<sup>21</sup> Coral recovery has been better on granite reefs – i.e. granite as opposed to a carbonate substrate - where algal incursion is less marked but these areas have still been impacted by subsequent bleaching events.

**Figure 3:** Seychelles Lobster Fishery Catch Summary 1989-2010.



The sea cucumber fishery is also operated on a limited license basis as opposed to a Total Allowable Catch approach and there is considerable concern that the various species stocks are being significantly overexploited.

The potential for recruitment overfishing of the Emperor red snapper (*Lutjanus sebae*) fishery has been identified for some years – the slow growth and low recruitment rates and late maturation making it vulnerable to over-fishing. Real concern, however, has been engendered by the dramatic increase in yields in recent years as this species has been further targeted due to its high commodity value. A total population biomass on the Seychelles bank was estimated at 2360mt with a sustainable yield of 208mt, catches have risen however, from 349.4 t in 2003 to 823.5 t in 2005. The increase in catch indicates an intensive and unsustainable targeting of spawning aggregations and constitutes clear evidence that management of this fishery requires urgent attention.

A good example of a monitoring dataset which has informed conservation and management regimes for non-consumptive sustainable resource use is the Seychelles whale shark monitoring programme (see **Case Study 5** for details).

Management of the marine banks of Seychelles is vital for the socioeconomic development and food security of the country – overfishing of various stocks (see example above) is a clear matter of concern, along with ongoing degradation of habitats through anthropogenic stressors including climate change (see **Tables 5c** and **6**). Also of concern is the impact of historical and ongoing fishing down of the food web which has extirpated (crocodile and seals) or likely

rendered ecologically extinct (turtles and various shark species) various key species with unknown ramifications for the stability and overall production of the system.

#### 1.3.11 Pelagic

The pelagic zone has become of key importance to Seychelles with the expansion of the industrial tuna fishery in the western Indian Ocean and the establishment of a tuna cannery on the main island of Mahe in the mid-1980s.

The expansion of industrial fishing raises considerable concern about sustainable use of pelagic resources in the (Western) Indian Ocean. Seychelles is a member of the IOTC that seeks to manage this complex fishery but there are substantive reasons for concern (see section on **Industrial Fishery** and **Table 3**).

The entire Seychelles EEZ falls within the Indian Ocean Whale Sanctuary which was established in 1979 under the auspices of the International Whaling Commission. Seychelles played a lead role in the negotiations for and establishment of the sanctuary and indeed all marine mammals are protected under Seychelles Fisheries Act. Seychelles' waters supported an active whaling industry in the 19<sup>th</sup> and early 20<sup>th</sup> centuries focused primarily, but by no means exclusively, on sperm whale (*Physeter macrocephalus*) with the best fishing grounds lying to the North of the Mahé Plateau. There is anecdotal evidence to suggest that the waters around Seychelles are seeing a gradual increase in certain cetacean populations but as yet no substantive data has been collated to support this and further research should be considered a priority.

Seychelles is also Party to the Convention on Migratory Species and specifically the Indian Ocean Southeast Asian Sea Turtle Agreement and the Migratory Sharks Memorandum of Understanding.

The pelagic ecosystem of the western Indian Ocean has experienced major historical and ongoing fishery impacts (whaling and industrial tuna fisheries respectively) the impacts of which are not clear and are likely still evolving. The reduction or extirpation of mega fauna (whales, pinnipeds, turtles, sharks etc...) can reasonably be expected to have significant cascade effects through the food chain and on overall productivity. By-catch issues (e.g. with regard to sharks and marine turtles) are an ongoing concern as are other potential secondary fishery effects – such as the impact on sea bird feeding success caused by reduced tuna standing stocks.

Isolating different factors of cause and effect from the overwhelming “white noise” of ongoing fishery activity and impact is however very difficult and leaves great cause for concern as so much about the ecosystem's health, stability and resilience remains unknown. This hinders informed management of current industrial fisheries which themselves are approaching or have exceeded optimal yields (see **Table 3**). Seychelles continues to work with regional and international partners through the IOTC and other mechanisms (e.g. the regional seas programme) to enhance the understanding, and hence advance the management, of pelagic stocks.



**Table 4: Description and Status of Marine and Coastal Biodiversity**

Main Habitats	Main Species	Importance for Ecosystem integrity/Human well-being
<b>Beach Crest &amp; Beach</b> (and open or grassland interiors of coralline islands)	Flora: <i>Scaevola sericea</i> , <i>tournefortia argentea</i> , <i>Pemphis acidula</i> , <i>Sideroxylon inerme</i> , <i>Cocos nucifera</i> , <i>Casuarina equisetifolia</i> , <i>Calophyllum inophyllum</i> , <i>Terminalia catappa</i> , <i>Cordia subcordata</i> , <i>Hernandia nymphaefolia</i> , <i>Guettarda speciosa</i> etc... Fauna: <i>Eretmochelys imbricata</i> , <i>Chelonia mydas</i> (nesting habitat), <i>Coenobita spp</i> , <i>Birgus latro</i> , <i>Ocypode spp</i> , wading/coastal birds (see <b>SBRC 2010</b> ), <i>Donax spp</i> , <i>Atactodea glabrata</i> etc... Sea bird colonies: <i>Onychoprion fuscata</i> , <i>Sula dactylatra</i> , <i>S. Leucogaster</i> , <i>Anous stolidus</i> , <i>Puffinus pacificus</i> , <i>Phaethon lepturus</i> , <i>Hydroprogne caspia</i> , <i>Thalasseus bergii</i> , <i>Sterna dougalli</i> , <i>S. sumatrana</i> etc...	The beach crest is vital to the resilience of coastal ecosystems, including lowland forest, to extreme weather events and rising sea levels. Important habitat for diverse and abundant migrant birds that visit Seychelles annually - see <b>SBRC (2010)</b> for full details. The beach is also a vital economic asset attracting high paying tourism and as the focal area for many social and cultural activities of the local population.
<b>Rocky shore</b>	Flora : <i>Pandanus balfouri</i> , <i>Hibiscus tiliaceus</i> , <i>Cocos nucifera</i> , <i>Casuarina equisetifolia</i> , Fauna: <i>Sterna anaethetus</i> , <i>Phaethon lepturus</i> , <i>Puffinus pacificus</i> , <i>Groupers (Epinephulus spp)</i> <i>Blennidae spp</i> , <i>Chitonidae spp</i> , <i>Grapsus spp</i> , <i>Geograpsus spp</i> , <i>Littorina spp</i> , <i>Cellana cernica</i> , <i>Tetraclita spp</i> , <i>Nerita spp</i> etc...	Important habitat for diverse and abundant annual migrant birds - see <b>SBRC (2010)</b> for details.
<b>Mudflats and Mangroves</b>	Flora: <i>Avicennia marina</i> , <i>Sonneratia alba</i> , <i>Bruguiera gymnorhiza</i> , <i>Rhizophora mucronata</i> , <i>Lumnitzera racemosa</i> , <i>Ceriops tagal</i> , <i>Xylocarpus granatum</i> , <i>Xylocarpus moluccensis</i> , Fauna: <i>Terebralia palustris</i> , <i>Bivalvia spp</i> : <i>Gafrarium tumidum &amp; pectinatum</i> , <i>Ctena divergens</i> etc... <i>Littorina scabra</i> , <i>Cardisoma carnifex</i> , <i>Scylla serrata</i> , <i>Geograpsus spp</i> , <i>Metopograpsus spp</i> , <i>Sesarma spp</i> , <i>Uca spp</i> etc... <i>Periopthalmus kalolo</i> , <i>P. argentilineatus</i> , <i>Sula sula</i> , <i>Fregata spp.</i> , <i>Dryolimnas aldabranus</i> (aldabra only), <i>Ardea cinera</i> , <i>Butorides striatus</i> , <i>numerous migratory wading bird species</i> , <i>Dugong dugon</i> (aldabra only),	Important habitat for diverse and abundant annual migrant birds - see <b>SBRC (2010)</b> for details Mangrove trees were historically extensively exploited for its bark and timber - mangroves are no longer directly exploited. Mangroves on the developed islands are still extensively fished for fish and crab on a leisure non-commercial basis.
<b>Sea grass</b>	Flora: <i>Thalassodendron ciliatum</i> , <i>Thalassia hemprichii</i> , <i>Syringodium isoetifolium</i> , <i>Cymodocea rotundata</i> , <i>Cymodocea serrulata</i> , <i>Halodule uninervis</i> , <i>Halophila ovalis</i> , <i>Enhalus acocroides</i> . Green algae e.g. <i>Caulerpa spp</i> , <i>Codium spp</i> etc... Fauna: <i>Chelonia mydas</i> , <i>Eretmochelys imbricata</i> , <i>Dugong dugon</i> (Aldabra only), Grazing fish species e.g. <i>Siganus spp</i> , diverse species of invertebrates e.g.: polychaete worms, amphipods, molluscs, crustacean, bivalves (e.g. <i>Pinna muricata</i> , <i>Gastropods</i> , <i>C. moneta</i> , <i>C. tigris</i> , <i>Strombus spp</i> , <i>Morula margariticola</i> etc...	Seagrass beds: 1) play a vital role in trapping and stabilising sand and sediment thereby protecting shores from erosion and providing coral reefs with water clarity. 2) Provide an important habitat/nursery for important commercial fish and invertebrate species.
<b>Reef flat</b>	Fauna: Rissoidae: <i>Rissoina ambigua</i> & <i>R. plicata</i> . Strombidae: <i>Strombus gibberulus</i> , <i>S. mutabilis</i> Bursidae: <i>Bursa bufonia</i> , <i>B. cruentata</i> . Cowries ( <i>Cypraea moneta</i> , <i>C. annulus</i> , <i>C. Lynx</i> , <i>C. caurca</i> and <i>C. helvola</i> being common), Cones ( <i>Conus leopardus</i> , <i>C. litteratus</i> , <i>C. virgo</i> , <i>C. maldivus</i> , <i>C. betulinus</i> and <i>C. quercinus</i> ). <i>Bittium zebrum</i> , <i>Smaragdia rangiana</i> . Octopus, lobster and sea cucumber spp.	Important habitat for diverse and abundant migrant birds that visit Seychelles annually - see <b>SBRC (2010)</b> for full current details. Important for gleaning fishing practitioners and as a leisure resource.

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<p><b>Coral Reef</b> (Incl: reef ridge, slope, patch reefs etc)</p>	<p>Fauna: Scaridae (Parrot fish: e.g. <i>Scarus prasiognathus</i>, <i>Chlorurus sordidus</i>), <i>Epinephulus spp</i> (Groupers: e.g. <i>E. fuscoguttatus</i>, <i>E. polyphkadion</i>), <i>Siganid spp</i>, <i>Lutjanus sebae</i>, <i>Amphiprion fuscocaudatus</i> (endemic), Octopus, lobster <i>spp</i>, <i>Eretmochelys imbricata</i>, more than 400 coral species. Numerous mollusc <i>spp</i> (including <i>Lambis chiragra artritica</i>, <i>Cypraea helvola</i>, <i>C. histro</i> etc...). Diverse elasmobranch populations including: <i>Carcharhinus amblyrhynchos</i>, <i>C. melanopterus</i>, <i>C. limbatus</i>, <i>Triaenodon obesus</i> etc... <i>Himantura uarnak</i></p>	<p>Important habitat for diverse and abundant biodiversity and specific biodiversity assemblages. Important source of protein and recreation to local population. Important tourism resource.</p>
<p><b>(Mahé) Plateau</b></p>	<p><i>Carangid spp</i> (<i>Trevally and Bludger</i>), <i>Lutjanid spp</i> (e.g. <i>Lutjanus sebae</i> - <i>Snappers and green jobfish</i>), <i>Lethrinids</i> etc... Shark <i>spp</i><sup>22</sup>: <i>Carcharhinus albimarginatus</i>, <i>C. leucas</i>, <i>C. limbatus</i>, <i>C. plumbeus</i>, <i>Nebrius ferrugineus</i>, <i>Galeocerdo cuvier</i>, <i>Sphyrna spp</i>, <i>Rhincodon typus</i> etc... <i>Aetobatus narinari</i>. Sea cucumber <i>spp</i>. (<i>Holothuria nobilis</i>, <i>H. fucogilva</i>, <i>H. fuscopunctata</i>, <i>H. atra</i>, <i>H. edulis</i>, <i>H. scabra</i> etc...)</p>	<p>Historical and ongoing socioeconomic importance in terms of fishery development, protein provision for local population, fishery exports, commodity value fisheries – shark fin, sea cucumber, lobster. Various fisheries are subject to overexploitation with cascading and potential phase shift effects for the plateau ecosystem.</p>
<p><b>Pelagic</b></p>	<p>Tuna <i>spp</i> (<i>Katsuwomus pelamis</i>, <i>Thunnus albacores</i>, <i>T. obesus</i>, <i>T. alalunga</i> etc...). Billfish (<i>Xiphias gladius</i>, <i>Makaira spp</i>, <i>Tetrapturus audax</i>, <i>Istiophorus platypterus</i>). Shark <i>spp</i> (<i>Prionace glauca</i>, <i>Carcharhinus falciformis</i>, <i>C. longimanus</i>, <i>Isurus spp</i>, <i>Sphyrna spp</i>, <i>Carcharodon carcharias</i>, <i>Rhincodon typus</i> etc...). <i>Manta birostris</i> Turtles: <i>Chelonia Mydas</i>, <i>Eretmochelys imbricata</i>, <i>Dermochelys coriacea</i>, <i>Caretta caretta</i>, <i>Lepidochelys olivacea</i>. Marine Mammals: 25 species of cetacean have been recorded in Seychelles waters including : <i>Megaptera novaeangliae</i>, <i>Physeter macrocephalus</i>, <i>Tursiops truncates</i>, <i>Stenella longirostris</i>, <i>Grampus griseus</i>, <i>Pseudorca crassidens</i>, <i>Globicephala spp</i> etc... Seabirds : <i>Sterna bengalensis</i>, <i>S. caspia</i>, <i>Onychoprion fuscata</i>, <i>Sula dactylara</i>, <i>S. leucogaster</i>, <i>Macronectes giganteus</i> etc...</p>	<p>Vital and growing importance since mid-1980s to national economic development through industrial and semi-industrial fishing activities and secondary land based value adding processes. Management of said fisheries and by-catch issues is vital for regional fisheries productivity.</p>
<p><b>Deep Sea Bed</b></p>	<p>Limited Data.</p>	
<p><b>Notes</b></p>	<p>For the purposes of this report the open and/or grassland interiors of coralline islands are considered with beach crest vegetation. For a good overview of crab species in Seychelles see Haig, J. 1984. For details of the artisanal and industrial fishery catch and species content see the Seychelles Fishing Authority website and document download section <a href="http://www.sfa.sc">www.sfa.sc</a></p>	

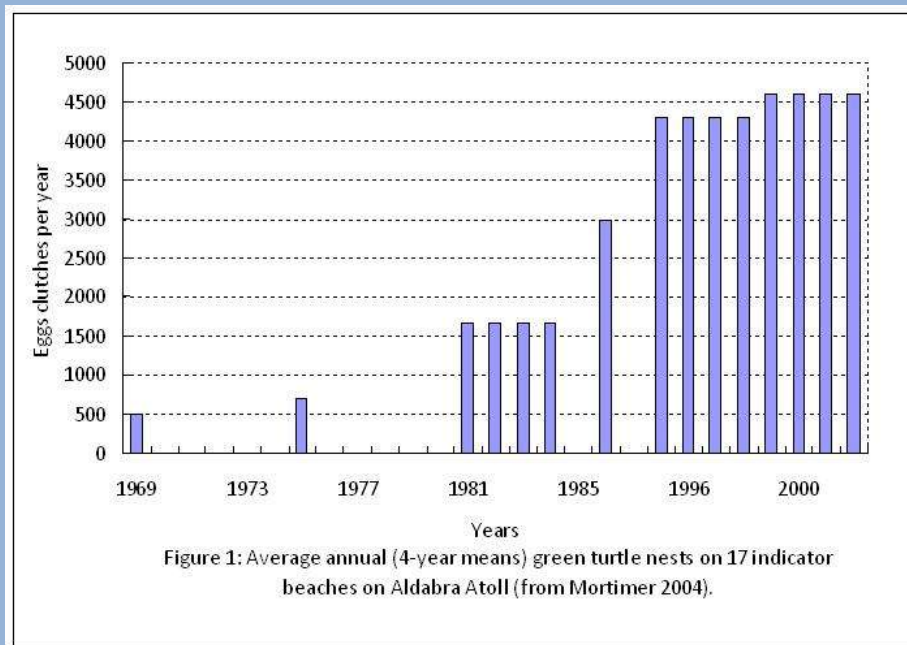
<sup>22</sup> For updated shark species list for Seychelles see **Nevill, J. et al 2007**.

[http://www.fao.org/fi/oldsite/eims\\_search/1\\_dett.asp?calling=simple\\_s\\_result&lang=en&pub\\_id=222579](http://www.fao.org/fi/oldsite/eims_search/1_dett.asp?calling=simple_s_result&lang=en&pub_id=222579)

**Case Study 3: Managing Nesting Marine Turtle Populations in the Seychelles Archipelago.**

**Introduction:** Two species of marine turtle commonly nest in the Seychelles archipelago the Hawksbill turtle (*Eretmochelys imbricata*) and the Green turtle (*Chelonia mydas*). The first explorers and settlers recorded a great abundance of turtles throughout the islands. The settlers soon focused on the exploitation of both species – the hawksbill for its valuable shell and the green for its meat and also for its oil. Green turtle exploitation was also latterly driven by the value of its calipee that was dried and exported to Europe to make turtle soup. Even from the early to 1800s concern about the sustainability of the exploitation was expressed and various accounts recorded observed declines in populations; good data on turtle exports and populations are only available however from the 20<sup>th</sup> century onwards. Despite various attempts over the years to regulate the fishery the unsustainable exploitation continued. Populations declined such that the green turtle was driven to near extinction in the central archipelago with less than 10 females nesting each year by the early 1980s. Both species are now protected under the law and monitoring of most nesting sites are conducted during nesting season.

**Protected Areas:** Some protected areas provided hope and in particular the cases of Cousin Island and Aldabra atoll for the hawksbill and green turtles respectively. Cousin was designated a Nature Reserve in 1966 (GoS 1966a) and a Special Reserve in 1979 (GoS 1979). Aldabra, which had been managed under conservation objectives since 1968 was designated a Special Reserve (GoS 1981) and a UNESCO World (biodiversity) Heritage Site in 1981. For Aldabra monitoring of nesting beaches has indicated a 500-800%<sup>23</sup> increase in the population of green turtles since 1968 (Mortimer *et al.* In press 2011) see **Figure 1**. Cousin Island has likewise recorded an eight-fold<sup>24</sup> increase in annual numbers of hawksbill turtle between 1973 and 2008 (Allen *et al* 2010) see **Figure 2**.

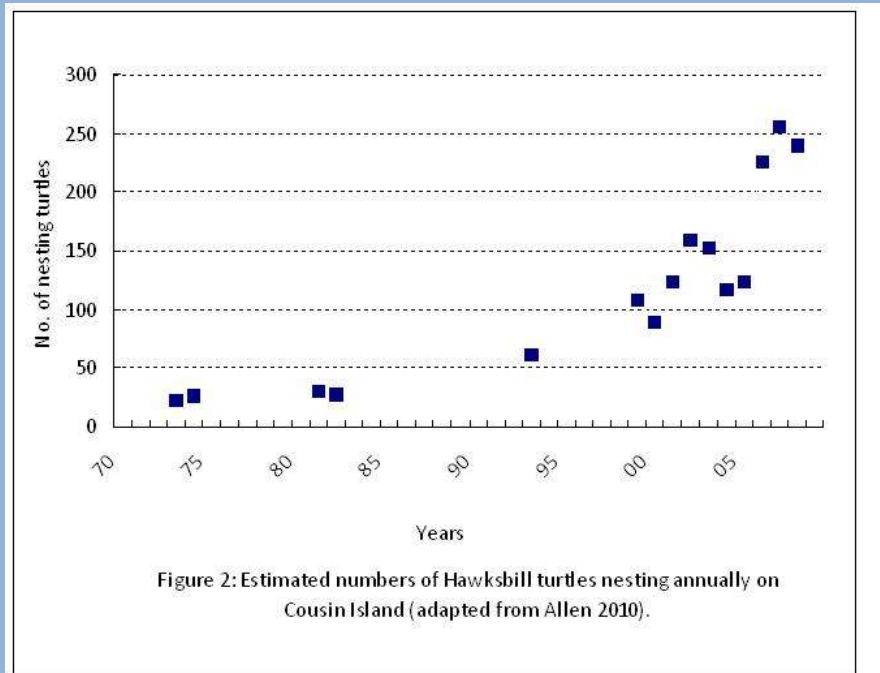


The extensive monitoring of turtle rookeries over four decades on Aldabra and Cousin have shown how sound management of near shore waters and coastal nesting habitat can result in effective turtle conservation. Unfortunately these positive examples are not reflected by the broader national trends in terms of range and/or populations of nesting rookeries throughout the country. The GEF funded SEYMEMP project showed that from the early 1980s to the early 2000s (i.e. within a single generation) a decline of approximately 25% in the number of hawksbill turtles nesting in the central archipelago – this trend reflected a 60% decline in rookeries on unprotected islands against the 70% increase for rookeries

<sup>23</sup> This figure is calculated from recorded nests per annum: 2000-3000 in the late 1960s to a mean of 15,700 in the period 2004-2008 – green turtle females typically nest between 3 and 5 time in a season giving the nesting female population range of 3,140 – 5233

<sup>24</sup> The maximum number of individuals nesting in a single season was 23 in 1973 as compared to 256 in the 2007/2008 season.

on protected islands.



The overall trend in green turtle populations is less clear – by the early 1980s the rookery on Aldabra alone already constituted approximately 50% of the overall national population (Mortimer 1984) and this population has continued to grow (Fig 1). Throughout the Amirantes and other southern islands however accounts suggest an ongoing decline, whilst the nesting population in the central archipelago still only numbers in a few tens of individuals. It may be therefore that the overall national nesting population of green turtles is now growing simply due to the predominance of the Aldabra population but continues to decline in terms of range.

**Legal Protection:** Turtles received full protection under law in all stages of their lifecycle in 1994 (GoS 1994c) and nesting sites were classified as sensitive areas under the 1996 EIA regulations. These measures however have not served to address the decline of turtles outside of protected areas. On the main developed islands coastal development and increasing human utilisation of nesting beaches are the key factors in the ongoing decline. Monitoring of southern nesting beaches on the main island of Mahe (Talma 2005-2009) also indicates that illegal poaching remains a key factor. By 2004 a third of all hawksbill turtles nesting in the central archipelago were to be found on the tiny (26Ha) island of Cousin. Assessment of trends in biodiversity reflects more than just simple numbers it is also a factor of range and distribution.

**Moving Forward:** Seychelles harbours globally significant populations of the critically endangered hawksbill and endangered green turtle and as such has a responsibility in this regard under the CBD. Several private island reserves, building on the examples of Cousin and Aldabra, have since the mid-1990s started to contribute with their own rookeries showing signs of recovery. This coupled with the development of a sound national policy that seeks to maintain a specific minimum range of viable rookeries throughout the archipelago offers hope for a better future for Seychelles’ marine turtles.

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**Case Study 4: Management of Sooty tern (*Onychoprion fuscata*) Populations in Seychelles****Historical occurrence and abundance in Seychelles**

Reports from 18<sup>th</sup> and 19<sup>th</sup> centuries indicated huge colonies on some islands. Government records of egg harvests from 1928 onwards show the continued survival of large colonies on Bird Island, Desnoeufs, Wizard (Cosmoledo Atoll) and Goelettes (Farquhar Atoll). An inventory of western Indian Ocean Sooty Terns (Feare *et al* 2007) estimated a Seychelles population of c. 3 million pairs in the late 20<sup>th</sup>/early 21<sup>st</sup> centuries but recognised the loss of many small colonies and reductions in size of some larger ones (see table).

**Factors in colony loss and population decline**

Commercial harvest of Sooty Tern eggs has been practiced in Seychelles since at least 1928 for human consumption but also in some years (in the 1930s-50s) egg yolks were exported for industrial and culinary use leading to estimates that more than 5 million eggs were harvested.

On some islands habitat change has been a significant factor in population decline e.g. the establishment of coconut plantations on Bird Island and possibly Remire. The post 1967 clearance of an area of plantation on Bird led to a dramatic increase in the number of nesting pairs in. Two colonies, North Island of African Banks and Etoile disappeared following erosion of the nesting islands. The effects of the industrial tuna fishery in the Seychelles region on Sooty Tern populations have yet to be determined.

<b>Status of Known Sooty Tern Colonies*</b>			
<b>Colony</b>	<b>Population (Pairs)</b>	<b>Trends</b>	<b>Threats/Notes</b>
<i>Central Archipelago</i>			
Aride	c. 300,000	↔	Colony protected, but periodic poaching.
Booby Island	Small numbers	?	Eggs poached.
Cousin	?	E	Excessive harvesting and loss of habitat
Cousine	(?) 200	↑	Recent natural re-colonisation
Ile Seche	Small numbers	E	Excessive harvesting.
Ile aux Vaches Marins	Small numbers	E	Excessive harvesting.
Ilot Fregate	Few	?	Poaching of eggs.
Mammelles	Small numbers	E	Excessive harvesting.
Recif	c. 47,000	↔	Colony protected.
Bird	c. 700,000	↔	Major recovery of colony since late 1960s due to management intervention. Periodic legal harvest.
Denis	Large	E	Ongoing attempt to re-establish colony.
<i>Outer Islands</i>			
Petit Astove (Astove)	Small numbers	?	Status unknown.
Grand Ile (Cosmoledo)	c. 1,140,000	↔	IAS, possible poaching.
Goelette (Farquhar)	c. 260,000	↔	Threats unknown.
Desnoeufs	c. 500,000	↔	IAS, legal egg harvest.
Etoile	?	?	Status uncertain.
Remire	?	E	Formerly harvested, habitat loss, IAS.
North Is. African Banks	< 5,000	↓	Heavily poached population much reduced from 20,000 plus in 1970s.
South Is. African Banks		E	Island lost to erosion.
Ile Platte	Large numbers	E	
*: Table adapted from Feare <i>et al</i> 2007			

**Measures taken to ensure sustainability of the harvest**

Following apparent reduction in the Seychelles Sooty Tern population, restrictive measures designed to

limit harvest to sustainable levels were imposed in the 1950s including a quota system for each island and providing islands with rest years from harvest. The first detailed research, in the 1970s, suggested that limitation of the geographical area of colonies that could be harvested to 20% of the total area of the Seychelles and Amirantes colonies, with no quota or closed season, would allow sufficient pairs to breed successfully to sustain the population. In 1997 a further recommendation was made that the price of eggs should be raised above that of chicken's eggs, to recognise the "special" nature of this natural resource and that 15% of the income should go to support Department of Environment monitoring of the harvest.

#### **Current population trends and drivers**

The two main colonies of the central Seychelles, Bird and Aride Islands, have declined since 1997, both mainly due to habitat change in the form of increased tree cover. The situation of Desnoeufts, the main colony in the Amirantes, is unclear; in the 1990s the protected or "reserve" half of the island was dominated by an invasive introduced plant, *Stachytarpheta jamaicensis*, which in most years severely restricted the number of Sooty Terns that could nest there. Management of this plant was recommended and being implemented by the Island Development Company, especially in 2008-2010 when eggs were not harvested.

The recommendation that no more than 20% of the area of Seychelles/Amirantes colonies should be harvested each year in practice means that only half of the Bird Island colony, **or** half of Desnoeufts should be harvested in any one year. If eggs are to be taken from both islands in any one year, only a quarter of the area of each colony should be harvested. In some recent years both colonies have been harvested but in each a half has continued to be exploited. This will exceed the sustainable maximum harvest. The impact on the current population of the islands is not known but could have been deleterious.

Poaching is a persistent problem on all islands. The emigration of unprecedented numbers of ringed Sooty Terns from Desnoeufts to Bird Island in 2010, when there was no official harvest, suggests that in that year Desnoeufts experienced unusual disturbance.

Since 2002, small numbers of Sooty Terns have returned to Cousine Island after an absence of c. 50 years, but to date few fledged young have been produced. On Denis Island Sooty Terns have been attracted to an area, prepared for them, with Sooty tern plastic models and colony sound broadcast through loudspeakers; although over 800 birds settled in 2010, no young have yet been produced. Both of these events suggest that with good habitat management and in the absence of mammalian predators, Sooty Terns may re-establish populations on islands from which they have disappeared.



#### **Prognosis and recommendations**

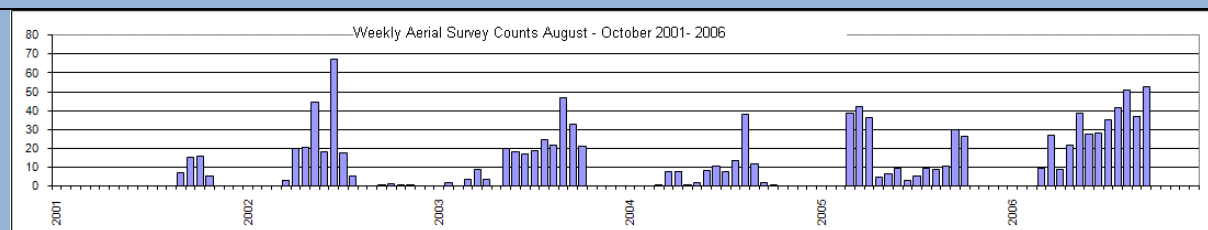
Once recently acquired data on survival have been peer reviewed, development of a new harvesting model incorporating the latest data is required. Its development and implementation will need enhanced resources, and monitoring, rigid policing and enforcement respectively to ensure effectiveness.

**Author:** Prof. Chris Feare, WildWings Bird Management, UK.

### Case Study 5: Whale Sharks In Seychelles

**Introduction:** Whale sharks (*Rhincodon typus*) are pan-oceanic planktivores that were first described from a specimen captured in the Western Indian Ocean in 1828 (Smith, 1828). They are listed by the IUCN as Vulnerable based on observed reductions in landings, actual levels of exploitation and because further population decline is deemed likely to occur if directed fisheries remain unmanaged (IUCN, 2009). They are known to aggregate seasonally around the islands of the Seychelles with some of the earliest research on the species being undertaken here by Percival Wright in the 1870's (Wright 1880).

**Research:** Since 1996, Dr. David Rowat and the Marine Conservation Society Seychelles (MCSS) have been monitoring the occurrence of whale sharks in the area (Rowat 1997). With initial funding from the Global Environment Fund (GEF) and Save Our Seas Foundation, the temporal and spatial extent of their distribution has been monitored intensively since 2001. This body of research has shown that the aggregation comprises mainly juvenile male sharks which are a mixture of both site-faithful and migratory individuals (Rowat & Gore 2007; Rowat *et al.* 2008; Rowat *et al.* 2009a). Using firstly marker tags and then computerised matching programmes to compare photo-identities, a total of 443 individual sharks were identified from 2001-2009. Of those for which sex was established 82.5% were males and 17.5% were females. The mean size of individuals identified each year was 5.8 m ( $\pm 1.2$  m), that is juvenile / immature size (Brooks *et al.* 2010). Using this data in open-population models gave an abundance estimate of 469 to 557 sharks (95% C.I.) but that there was an equal number of individuals that were only seen once. As this aggregation comprises mainly juvenile male sharks, it is has to be regarded as a component of a larger as yet un-surveyed population. Satellite tagging studies have shown that some of the sharks migrate significant distances from Seychelles both toward the African continent and also towards Asia (Rowat & Gore 2007). Daily aerial surveys undertaken by the MCSS programme have shown that there are some significant variations in numbers between weeks and between years; however, such inter-annual fluctuations are probably due more to a change in the distribution of the larger population (possibly in response to food availability) than a change in its size (Rowat *et al.* 2009b).



**Management:** Based on the results of this programme the whale shark was protected by the Government of Seychelles in 2003. The programme is now self-funding through eco-tourism participation (Rowat & Engelhardt 2007) and developed a Code of Conduct to limit impacts of tourism activities through stakeholder workshops; this has been approved by the Government of Seychelles but has yet to be formally endorsed.

Records have shown that globally whale sharks are prone to boat collisions, largely due to their habit of swimming just below or at the sea surface. A combined study in the Indian Ocean has shown that those found around Seychelles have a high incidence of boat induced injuries (Speed *et al.* 2008). Although this study could not correlate a higher risk of mortality with such injuries, it is thought they are likely a significant factor in population level drivers. With this in mind, a new programme is starting in Seychelles to develop means to better conserve protected marine vertebrates, such as whale sharks and turtles, when they are outside of traditional Marine Protected Areas. The project starts in May 2011 and will run for four years with funding from the GEF.

The highly mobile and migratory nature of these sharks require that management approaches are both regional (or international) as well as national to properly ensure their conservation; this has prompted the development of a Memorandum of Understanding on Migratory Sharks under the Convention of Migratory Species which may go some way to providing regional frameworks for their timely conservation.

**Author:** Dr. David Rowat, Marine Conservation Society, Seychelles.

## 1.4 Trends in Biodiversity

Ecosystem Type	National Indicators	Trends		
		Habitat	Trend	Notes
<b>Forest Biodiversity</b>	Forest cover, Area of native broadleaf forest, Flora Indicator spp: <i>Medusagyne oppositifolia</i> , <i>Vateriopsis seychellarum</i> , <i>Mimusops sechellarum</i> , <i>Lodoicea maldivica</i> , <i>Rothmannia annae</i> , <i>Calophyllum inophyllum</i> , <i>Terminalia catappa</i> . Fauna Indicator spp: <i>Acrocephalus sechellensis</i> , <i>Copsychus sechellarum</i> , <i>Terpsiphone corvina</i> , <i>Coracopsus nigra barklyi</i> , <i>Otus insularis</i> , <i>Falco araea</i> .	Coastal and Lowland	↔	√: In general the trend is for further but controlled development 25 metres from the high water mark. √: IAS (especially vegetation, rats, cats and dogs) are established on the main granitic islands. ↗: There are, however, some very notable rehabilitation projects ongoing in this habitat. ( <b>Case Study 6</b> ).
		Intermediate	↔	↔: The primary issue is the dominant presence of IAS – status in that regard during the reporting period however is considered relatively stable. √: Increased habitation, infrastructure and small scale agriculture (farming, tea, timber plantations). √: Fire is also a regular occurrence in this habitat.
		Mountain	↓	√: The primary issue is the ongoing incursion of rats, cats and dogs; more than three quarter of Seychelles forests are composed of invasive exotics.
		Palm	↔	√: Fire is a particular issue of concern for palm forests on Praslin and Curieuse. ↗: Notable exceptions are in the management areas of the Valle-de-Mai and Fond Ferdinand. ↗: Sustainable management of c-d-m initiative and the planting of a certain proportion of nuts each year.
		Riverine	↔	↗: Long history of legal protection and expansion of protected areas and general forest cover are assumed to have positive impact.
		Inselbergs	↔	↗: Research Indicates that the temperature variation and aridity of this habitat are limiting to IAS incursion.

**Table 5b: Trends in Biodiversity**

Ecosystem Type	National Indicators	Trends		
		Habitat	Trend	Notes
<b>Inland Waters Biodiversity</b>	Area, water quality, endemic species occurrence and assemblages, Flora Indicator spp: presence and extent of invasive spp: e.g. <i>E. crassipes</i> , Fauna Indicator spp: <i>Pelusios spp</i> ,	Lowland	↔	↘: Physical change - reclamation, drainage (often also leading to salt water intrusion but also mitigating against flood during rainy season. ↘: Pollution – illegal point source chemical in flow, general enrichment pollution are not alarming
		Highland	↑	↘: Ongoing incursion of IAS. ↘: Current and potential future expansion of water extraction from the Mahé and Praslin sites. ↗: Conservation management interventions at Mare aux Cochons, Mahé. ↗: 2 of the 3 sites now fall within National Parks.
		Rivers and Streams	↔	↘: Encroachment, canalisation and pollution particularly in lower reaches of watercourses. ↘: Water extraction ↗: Long history of river reserve management ↗: Improved catchment management with increased forest cover and wider protection through Protected area network particularly in higher reaches of watercourses.

**Table 5c: Trends in Biodiversity**

Ecosystem Type	National Indicators	Trends		
		Habitat	Trend	Notes
<b>Marine and Coastal Biodiversity</b>	Areas of different ecosystem types, coral cover, sea grass area etc... Fauna Indicator spp: <i>Eretmochelys imbricata</i> , <i>Chelonia mydas</i> , <i>Onychoprion</i>	Beach Crest and Beach	↓	↘: Increasing coastal development (tourism developments and private habitations). ↘: Increasing intensity of human activity. ↘: Resource harvesting and poaching. ↘: Coastal erosion/ rising sea level.
		Rocky Shore	↓	↘: Increasing development. ↘: Resource exploitation. ↔: Significant areas still relatively inaccessible by land.
		Sea Grass	?	↘: Evidence of localised decline in inshore grass beds around main populated islands due to factors such as reclamation, dredging, siltation and pollution. ? : Insufficient data on large offshore seagrass beds to provide baseline – though removal of/dramatic reduction in key grazer

<i>fuscata, Sula spp, Rhincodon typus,</i> various fishery data (e.g. Lobster, sea cucumber, tuna, bill fish and reef fish fisheries)			species (e.g. <i>Chelonia mydas</i> ) and climate change factors suggest likelihood of decline.
	Reef Flat	↓	✎: Extensive land reclamation on the main granitic islands. ✎: Excessive disturbance, utilisation and increasing pollution.
	Coral Reef	↓	✎: Ongoing phase shift following 1998 bleaching event. ✎: Recurrent bleaching events 2002, 2003, 2010 inhibiting recovery. ✎: Anthropomorphic stresses on reef systems near main populated islands: over fishing, sedimentation, physical damage etc... ✎: Reclamation.
	Mudflats and Mangroves	↔	⚠: Direct exploitation of mangroves has ceased and some localised natural expansion in area has been noted. ⚠: Mangrove recolonisation of the east coast of Mahé. ✎: Mangroves on Mahé east coast are disturbed and subject to periodic clearance and pollution events. The mudflats created in the same areas are equally disturbed.
	Mahé Plateau	↓	✎: Expanding effort, range & sophistication of fishing pressure. ✎: Ongoing habitat degradation (see habitats above). ✎: Ongoing decline in marine megafauna impact on ecosystem structure and function: e.g. shark population decline.
	Pelagic	↓	⚠: Total protection of cetacean population in EEZ and wider Indian Ocean Whale Sanctuary. ✎: Ongoing impacts of historical reduction in large cetacean populations. ✎: Ramifications of significant and ongoing reduction in shark populations. ✎: Cause for concern in various large predator populations subject to the industrial tuna fishery.
	Deep Sea Bed	?	No data.

**Table 6: Threats to Biodiversity**

Ecosystem type	Threats	Drivers of Threats		Implications
		Direct Drivers	Indirect Drivers	
Forest Biodiversity	Invasive Alien Species	Change in land use Development – increased trade & tourism. Lack of public awareness on horticultural introductions.	Capacity lacking in border control and inter-island movements of boats,	Degrading biodiversity although , decline in environmental service provision, and loss of future development potential.
	Fire	Human activity	Climate Change.	Loss of forest cover, facilitation of IAS spread,

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				increase of erosion, increase of sedimentation (see Inland waters), decline in environmental services provision.
	Disease	Increase of disease linked to IAS pests. Climate Change?	Climate change?	Loss of economic resources, diversion of limited resources to address disease outbreak.
<b>Inland Waters Biodiversity</b>	Drainage/Canalisation	Economic development	Lack of management capacity, policy implementation etc...	Loss of biodiversity and environmental services, increased sedimentation in marine environment.
	Sedimentation	Change in land use, deforestation.	Lack of management capacity	Decline in water quality and related loss of biodiversity and environmental services.
	Pollution	Economic development Lack of awareness	Lack of management capacity	Decline in water quality and related loss of biodiversity and environmental services.
	Invasive Alien Species	Lack of awareness		Loss of biodiversity and environmental services.
<b>Marine and Coastal Biodiversity</b>	Over Exploitation	Economics	Lack of management capacity, inappropriate incentives.	Unsustainable exploitation of resources, extensive future income loss and impact upon livelihoods, cost of living etc... Potential phase shift in some habitats.
	Pollution	Economic development	Lack of management capacity	In Seychelles context impact upon certain localised coastal habitats and production (also much broader threat of oil shipping and exploration).
	Coral Bleaching	Climate Change,	Sedimentation, pollution, over exploitation etc...	Economic loss in artisanal fisheries and tourism industry, rise in cost of living, potential for ecosystem phase shift and increased coastal erosion.
	Sea Temperature change	Climate Change		Change in occurrence and distribution of pelagic resources, change in weather patterns, increased frequency of coral bleaching events etc...
	Sea Level Change	Climate Change		Loss of biodiversity, coastal erosion, potentially disastrous socioeconomic impact as economic activity and human habitation focused on coastal plains.

## Chapter 2: Status of National Biodiversity Strategy and Action Plan

### 2.1 Introduction

The Republic of Seychelles received a GEF enabling activities grant to develop its NBSAP in 1997. The NBSAP was preceded by and based upon a biodiversity assessment compiled from available information. An iterative and participatory process of stakeholder consultation was utilised to formulate the NBSAP including: the utilisation of experts in the generation of the biodiversity assessment, the establishment of a stakeholder “Task Force” to oversee the NBSAP development process, two national stakeholder workshops and numerous stakeholder meetings and interviews.

The NBSAP format and contents were formulated in line with the WRI/UNEP/IUCN 1995 “National Biodiversity Planning” manual which recommended identification of:

- The components of Biodiversity
- Areas for action to be undertaken by existing organisations
- Need and Gaps
- Pragmatic and cost-effective projects
- Tasks and priorities.

The resulting NBSAP set out a Vision for biodiversity in Seychelles that encompassed existing commitments under the Seychelles Constitution and provisions of the primary national biodiversity legislation (The National Parks and Nature Conservancy Act) as well as being in line with the objectives set out in Article 1 of the CBD. The Vision states:

*“The Republic of Seychelles recognises the right of every person to live and enjoy an ecologically sound natural environment and undertakes to take necessary measures to maintain essential ecological services and life support systems, to promote the protection, preservation and in certain cases the improvement of its indigenous biological diversity, and to judiciously use and manage species and ecosystems so as to ensure a sustainable socio-economic development of the country”*

The NBSAP established 11 major goals (with related policy objectives) closely aligned to the active articles of the CBD and geared to bridge the gaps identified in the assessment:

1. Support general measures for conservation and sustainable use (supports CBD Article 6).
2. Strengthen identification and monitoring of biodiversity (supports CBD Article 7).
3. Increase in-situ conservation of biodiversity (supports CBD Article 8).
4. Promote ex-situ conservation (supports CBD Article 9).
5. Introduce ways and means for sustainable use of biodiversity (supports CBD Article 10).
6. Introduce incentive measures for biodiversity conservation (supports CBD Article 11).
7. Improve appropriate biodiversity related research and training (supports CBD Article 12).



8. Augment public education and awareness of all facets of biodiversity (supports Article 13).
9. Minimise adverse impacts on Biodiversity (supports CBD Article 14).
10. Ensure access to and judicious control of genetic resources (supports CBD Article 15).
11. Evaluate and use appropriate technology (supports CBD Article 16).

The NBSAP then sets out 43 projects as identified by stakeholders during the consultation process which cascade logically from the eleven goals through the policy objectives. The projects were classified in to various categories of priority as determined by stakeholders 1 being highest priority and 4 lowest:

- |          |   |   |
|----------|---|---|
| <b>0</b> | : | funds already secured   |
| <b>1</b> | : | urgent projects or prerequisite to other projects.            |
| <b>2</b> | : | projects addressing matters of high biodiversity significance |
| <b>3</b> | : | projects to address longer terms issues                       |
| <b>4</b> | : | projects to be phased in.                                     |

**Table 7** overleaf sets out the projects, their linkage to goals and objectives and priority categorization.

**Table 7: NBSAP Project Elaboration and Prioritisation**

Goal	Policy Objective	Project	Project Priority Rating				
			0	1	2	3	4
1). Support general measures for conservation and sustainable use	1.1). Develop, strengthen or adapt national strategies and plans for the C&SU of BD and adopt measures to implement these.	Implementation of Turtle Management plans for Seychelles					
		Action plan and implementation project for globally threatened birds					
	1.2). Establish or strengthen institutional mechanisms and capacity in the Ministry of Environment, other Government organisations, NGO and private sectors for the C&SU of BD.	Establishment of a supporting mechanism to implement the NBSAP.					
		Establishment and support of an environmental NGO centre.					
	1.3). Introduce standard operational procedures, and establish management policy for the C&SU of BD.	Introduction of Standard Operational Procedures for SU of Marine National Parks.					
1.4). Integrate as appropriate, the C&SU of BD into relevant sectoral plans, policies and projects.	Project to be formulated by NBSAP Secretariat.						
2). Strengthen identification and monitoring of Biodiversity.	2.1). Identify key components of BD important for C&SU.	Establishment of key Biodiversity Indicators					
	2.2). Monitor key components of BD through standardised methods, gather priority data through rapid assessment techniques and establish a reporting mechanism.	Conservation of endangered Seychelles Scops Owl.					
		Saving the Seychelles Grey White-eye.					
2.3). Maintain, organise and disseminate data on BD through standardised databases and integrated networks.	Data Management system for BD management						
3). Increase in-situ conservation of biodiversity	3.1). Consolidate the existing system of Protected Areas, improve knowledge of appropriate classification, configuration and design, and develop, where necessary, legislation, guideline, system plans and management plans.	Management of Praslin National Park, Curieuse National Park and Fond Ferdinand.					
		Restoration and preservation of World Heritage sites.					

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Goal	Policy Objective	Project	Project Priority Rating					
			0	1	2	3	4	
3). Increase in-situ conservation of biodiversity (cont).	3.2). Ensure wider participation in planning and management of protected areas, with opportunities for the involvement of NGOs, district-based organisations, the private sector and international organisations.	Forest conservation on Silhouette island.						
		Establishment of Important Bird Areas (IBAs) in Seychelles.						
	3.3). Identify, monitor and manage physical and natural resources important for the conservation of BD whether within or outside PAs, with a view to ensuring its C&SU.	Mapping and Monitoring of River Reserves.						
	3.4). Strengthen the protection of sensitive ecosystems and critical habitats outside protected areas.	Forest conservation in La Reserve/Brulee, Mt. Sebert, Bernica and Mt. Cauvin on Mahe.						
	3.5). Determine the ecological relationship between Protected Areas and their surroundings. Protect these adjacent areas by legislative and other measures and where appropriate promote environmentally sound and sustainable development in them with a view to furthering protection.	Acquisition of woodland and wetland habitats for the extension of the Veuve Special reserve on La Digue.						
	3.6). Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, <i>inter alia</i> , the rough the development and implementation of plans , special projects or other management strategies.	Curieuse National Park habitat assessment.						
	3.7). Where appropriate introduce artificial habitats in natural surroundings to supplement or augment those that have been destroyed or degraded.	Rehabilitation of coral reefs						
	3.8). Identify, prevent the introduction of, control or eradicate those alien species which threaten , or could potentially threaten, native ecosystems, habitats and species.	Eradication of mice and rats on Curieuse island.						

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Goal	Policy Objective	Project	Project Priority Rating				
			0	1	2	3	4
3). Increase in-situ conservation of biodiversity (cont).	3.9). Identify organisms potentially useful in biological control, identify the risks associated with their release, and if appropriate, introduce under controlled conditions as far as possible.	Control of freshwater aquatic weeds in Seychelles.					
	3.10). Identify the risks associated with the use and release of LMOs and if necessary establish means for regulation and control.	<u>None in the plan period.</u>					
	3.11). Research and document local peoples knowledge and practices which are relevant for C&SU of BD.	<u>None in the plan period.</u>					
	3.12). Consolidate, harmonise and/or revise legislation for the protection of threatened species and sensitive ecosystems.	Consolidation of Biodiversity Legislation – noted as “ <i>project pending</i> ”.					
4). Promote ex-situ conservation.	4.1). Adopt measures for ex-situ conservation of BD, regulate collection from natural habitats for ex-situ conservation purposes, and establish or strengthen facilities for ex-situ conservation with a view to complementing in-situ conservation.	Creation of the Seychelles Botanical Centre and Arboretum.					
	4.2). Adopt measures for the recovery and rehabilitation of threatened species and their re-introduction into their natural habitats under appropriate conditions.	An evaluation of selected inner islands for the conservation of endangered species – noted as “ <i>project pending</i> ”.					
5). Introduce ways and means for sustainable use of biological diversity.	5.1). Continue to integrate consideration of the value of Biodiversity and sustainable use of biological resources into decision making across sectors.	Integrated management of water catchments on Mahe, Praslin and La Digue.					
	5.2). Strengthen measures relating to the use of biological resources to avoid or minimise adverse impacts, and encourage co-operation between government and the private sector in developing methods for sustainable use of biological resources.	Establishment and implementation of a critical marine protected area.					
	5.3). Encourage and support BD C&SU by local groups and communities.	Pilot project on Cascade nature trails.					
		Establishment of medicinal plant					

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		gardens at the local level.				
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Goal	Policy Objective	Project	Project Priority Rating				
			0	1	2	3	4
6). Introduce incentive measures for the conservation and sustainable use of biodiversity.	6.1). Introduce techniques and mechanisms for adoption of socioeconomic incentive measures for the C&SU of BD.	Introduction of environmental economics.					
7). Improve biodiversity related research and training.	7.1). Strengthen scientific and technical education and training for identification, C&SU of BD, and encourage participatory learning and research between, professionals, students and the public.	Augmenting ecology monitoring and management skills.					
	7.2). Encourage and promote research which contributes to the C&SU of BD.	Sustainable management of the Coco-de-Mer.					
		Sustainable management of bats.					
	7.3). Seek international cooperation in the use of appropriate advances in research and technology in developing methods for the C&SU of biological resources.	Seychelles whale shark programme – telemetric tracking proposal.					
8). Augment public education and awareness of all facets of biodiversity.	8.1). Promote and increase public understanding of the importance of and the measures required for the C&SU of BD through strategies and participatory methodologies.	Resources and training for environmental education.					
	8.2). Seek local and international co-operation to strengthen capacity for PE&A programmes on the C&SU of BD.	Improving the management and effectiveness of Wildlife Clubs of Seychelles.					
	8.3). Facilitate the access to and exchange of information on the C&SU of BD from publicly available sources.	<u>None in the plan period.</u>					
9). Minimise adverse impacts on biodiversity.	9.1). Continue to identify and monitor processes and activities having or likely to have significant adverse impacts on the C&SU of BD and take appropriate actions.	Control impact of wastewater on Praslin island.					
		Identification of river pollution impact on biological diversity.					

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Goal	Policy Objective	Project	Project Priority Rating				
			0	1	2	3	4
9). Minimise adverse impacts on biodiversity (cont).	9.2). Research monitor and where appropriate introduce alternative methods of production, manufacturing, harvesting and other use categories that would foster sustainability and reduction of impacts.	Reduction of POPs through use of indigenous organic materials as fertilisers.					
	9.3). Strengthen and harmonise the procedures within the EIA legislation pertaining to biodiversity and improve the ecological knowledge base to assist this.	Assessment of Lowland habitats					
		Scientific justification for ecologically sensitive areas in EIA legislation – noted as “ <i>project pending</i> ”.					
9.4). Promote appropriate institutional, legislative and technical arrangements to ensure that the environmental consequences of sectoral programmes and activities that are likely to have impacts on biodiversity are reduced.	Seychelles soil analysis and conservation.						
10). Ensure access to and judicious control of genetic resources.	10.1). Promote/strengthen legislative, policy, administrative and other measures to determine access Seychelles indigenous biodiversity.	<u>None in plan period.</u>					
	10.2). Promote appropriate measures for legal access to genetic resources deemed important for agriculture, forestry and animal husbandry.	Conservation of genetic diversity of plant species used in agriculture.					
11). Evaluate and use appropriate technology.	11.1). Promote measures to research, evaluate and determine access to technologies relevant to the C&SU of BD.	Evaluation of bio-technological development and application.					
		Protection of coral reefs from anchor damage.					

## 2.2 CBD Targets and Indicators.

The NBSAP was developed in 1997 and published in December of that year. At that time, though the CBD had held three Conferences of the Parties (COPs), it was still largely structured and driven by direct reference to the active articles of the Convention<sup>25</sup>. As such the NBSAP is likewise article oriented with the key “active” articles of the Convention covered by the logical framework of Mission, Goals and Policy Objectives (see Table 1), with the articles themselves embodied in the 11 Goals.

The shortcomings in the operation of the NBSAP resulted from flaws in its administration. It was intended to have a 5-year lifespan and to be overseen and coordinated by a special unit to be established within the Department of Environment (DOE). The unit however was not instituted and the NBSAP never revised and updated. Instead the primary biodiversity strategic document was subsumed into the Biodiversity, Forestry and Agricultural thematic area of the Environmental Management Plan of Seychelles 2000 -2010 (EMPS). The EMPS is the primary overarching national environmental strategic document that seeks to integrate environmental issues into all other development sectors (<http://www.emps.sc>). The Biodiversity thematic area was developed through national stakeholder consultation in 1999 and built upon the foundation provided by the NBSAP. The EMPS was intended to be reviewed regularly through a process of annual audits and where necessary updated. A unit was established to oversee its coordination and implementation, and a broad national stakeholder steering committee was formed to guide its implementation. With the primary national mechanism being, and stakeholder involvement focused upon, the EMPS; the DOE decided that biodiversity issues would be addressed by the biodiversity thematic area in the EMPS rather than the NBSAP which would rather fill a sectoral supporting role as a reference and guidance document.

This offered a viable, structured and mainstreamed approach with various practical benefits. Unfortunately the EMPS Coordination Unit never actually fulfilled its role of monitoring, review and continual improvement so the annual audits and periodic revisions were not undertaken and hence the national strategic biodiversity management document was not updated in line with evolving CBD commitments. These shortcomings were highlighted in assessments (Nevill, J. 2004b and GoS 2005a) but went unaddressed.

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<sup>25</sup> The first COP in 1994 was largely procedural in nature and output whilst the second and third, in 1995 and 1996 respectively, whilst setting out enabling decisions for the development of thematic programmes of work were still largely structured by direct reference to the articles of the Convention.

Other parallel initiatives however, have served to keep major national projects in line with CBD commitments in particular the GEF funding preparatory mechanisms such as the old PDF pathway and current PPG mean that major initiatives such as medium and full-sized GEF projects have incorporated the updated CBD commitments in their conceptualization, elaboration and implementation.

### **2.3 Contribution to National Implementation of the CBD.**

Despite the administrative shortcomings in the longer term, the NBSAP was effectively structured at the time of its development and does directly target the “active” articles of the Convention. CBD Articles 6 -16 inclusive are embodied in the eleven goals of the NBSAP and how they relate to the policy objectives and projects identified in the NBSAP is set out in **Table 7**.

### **2.4 Project Implementation.**

The NBSAP set out 43 specific projects of which: 16 were successfully implemented and 14 partially implemented. This however can rightly be considered a significant underestimation of the actual implementation of the NBSAP due to the fact the NBSAP was not reviewed periodically as had been intended. As a result key issues and projects evolved through the period and implementation adapted accordingly – something that cannot be reflected by assessing the implementation of the original project components. To balance this under assessment, the strategic implementation of the NBSAP is summarized in **Section 2.5**.

Of the successful projects 37.5% were implemented by NGOs, 37.5% by Government and 25% as direct Government/NGO partnership. Of the partially implemented projects 7% were implemented by NGOs, 64% by Government and 29 % were government/NGO partnerships. This indicates that CBD implementation on the national level has been embraced effectively across the sectors.

**Table 8** summarises project implementation under the NBSAP.

### **2.5 Strategic implementation.**

**Table 9** summarises how the NBSAP was implemented in terms of its strategic content and hence in terms of national implementation of the active articles of the CBD. This gives a much more



balanced representation of national implementation of the NBSAP over time than the simple project analysis above.

Table 8: NBSAP Project Implementation

Priority	Project	Implementation
0	Implementation of Turtle Management Plans for Seychelles.	<b>Successfully Implemented.</b> The specific NBSAP project was modified and incorporated into a joint Government/NGO <sup>26</sup> Medium-sized GEF Project “The Seychelles Marine Ecosystem Management Project” (SEYMEMP) 2001 - 2004. Building on previous national initiatives the project further developed and rolled out a standardised monitoring system enabled by associated capacity building in national and civil society agencies. Since that project monitoring activity and capacity has continued to expand with some 20 agencies now involved. Key beaches on Mahe, Praslin, La Digue and various smaller islands have annual monitoring protocols in place. Notable turtle conservation success stories have been realised e.g. the Special Reserves of Cousin, Aldabra and Aride islands and more recent initiatives on some private island rookeries (e.g. Cousine and Bird islands) and further initiatives recently launched on some of the outer islands (e.g. Alphonse, D’Arros and Desroches). These locations have demonstrated that effective nesting habitat management and turtle protection can result in growth of nesting populations. However the SEYMEMP project showed that the overall population of both nesting species ( <i>E. imbricata</i> and <i>C. mydas</i> ) continues to decline (See <b>Case Study 3</b> ). Other related initiatives have included 1998 amendments to the law <sup>27</sup> increasing the existing penalties for turtle poaching and also outlawing the possession of raw turtle shell. An MCSS project, funded by the British Government, developed a national turtle conservation action plan, established a national turtle database and established a new National Stakeholder NGO to operate the database.
0	Conservation of endangered Scops Owl	<b>Successfully Implemented</b> by Nature Seychelles with GEF/IBRD funds. The project succeeded in elucidating the ecology of this previously poorly understood species and enabled the development of a species action plan. The Scops owl is confined to the main island of Mahe with most of its contemporary range lying within the Morne Seychellois National Park. The DoE carry out annual monitoring of the population.
0	Saving the Seychelles Grey White-eye	<b>Successfully Implemented</b> by Government of Seychelles with DTF funds. This project succeeded in elucidating the ecology of the species and enabled the development of subsequent conservation action plans – see <b>Case Study 2</b> for further information.
0	Management of Praslin National Park, Curieuse National Park and Fond Ferdinand	<b>Partially Implemented.</b> A management plan was drafted for Praslin National Park. A Coco-de-Mer ( <i>Lodoicea maldivica</i> ) replanting programme was undertaken. The Fond Ferdinand Area has been placed under the management of a parastatal organisation (Praslin Development Fund), a conservation/ecotourism management plan developed and under implementation.
0	Restoration and preservation of	<b>Successfully implemented.</b> Aldabra research station completed and management plans

<sup>26</sup> Marine Conservation Society, Seychelles (MCSS)

<sup>27</sup> Wild Animals and Birds Protection (Amendment) Act and Wild Animals (Turtles) Protection (Amendment) Regulations respectively.

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	World Heritage Sites	produced and under implementation for both sites. Considerable progress has been made on the financial sustainability of the sites. The Vallee-de-Mai traditionally subsidised the management of Aldabra. Aldabra however became financially independent in 2008 but this progress is now curbed as the rise of piracy in the Indian Ocean has curtailed tourism activities.
0	Forest conservation in La Reserve/Brulee, Mt. Sebert, Bernica and Mt. Cauvin on Mahe.	<b>Partially Implemented.</b> Surveys were undertaken and boundaries identified – but the areas have yet to be incorporated within PA boundaries due to complications over private ownership etc....
0	Acquisition of woodland and wetland habitats for the extension of La Veuve Special Reserve.	<b>Successfully implemented</b> by Government of Seychelles with DTF funds resulting in a 150% increase in area of protected habitat.
0	Control of freshwater aquatic weeds in Seychelles	<b>Partially Implemented.</b> The specific project was not implemented as permission for introduction of bio-control species was not granted. Other methods were however pursued: a wetlands unit was formed in 2000 and physical removal campaigns initiated on the three main islands. Efforts have faltered however in recent times and invasive aquatic plants are again dominant.
0	Establishment and implementation of a critical marine protected area.	<b>Not Implemented.</b> Whilst there has been significant improvement in terms of staff presence it cannot be said environmental management and status has improved in the area (Port Launay and Baie Ternay Marine Parks) the parks in question were not linked by a connecting extension and no aspect of the management of the area has been privatised - indeed SNPA policy has moved away from such initiatives. Many stakeholders consider the status of the parks to have been undermined by the incorporation of a major tourism development.
0	Pilot project on Cascade nature trails.	<b>Partially Implemented.</b> A trail was prepared and related educational materials drafted. The initiative was adopted by the local district administration but yet to be implemented.
0	Sustainable management of bats	<b>Not Implemented.</b> At the time of formulating the NBSAP this project was incorporated into the draft of an imminent IBRD project but was dropped from the final draft. Hence project not implemented. The populations of Seychelles fruit bat appear to be healthy despite direct exploitation for food. The Seychelles sheath-tailed bat however is critically endangered and confined to only two islands with populations distributed among only four known roosting sites. Recent research has identified pesticide use and habitat degradation as key threat factors.
0	Seychelles whale shark programme – telemetric tracking proposal.	<b>Successfully Implemented</b> by the Marine Conservation Society, Seychelles (MCSS) with GEF funds under the SEYMEMP MSP and significant further work carried out since. See <b>Case Study 5.</b>
0	Resources and training for environmental education.	<b>Successfully Implemented.</b> Environmental education adopted by Ministry of Education as a cross cutting element of the school curriculum – ongoing training programme for leaders in environmental education in partnership with Wildlife Clubs NGO.

Priority	Project	Implementation
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<b>1</b>	Establishment of a supporting mechanism to implement the NBSAP	<b>Not implemented.</b>
<b>1</b>	Introduction of standard operational procedures for SU of Marine National Parks.	<b>Partially Implemented.</b> This project was expanded and an Integrated Marine Protected Area Systems Plan (IMPASP) was developed, under the GEF SEYMEMP MSP, through stakeholder consultation and endorsed by the then SCMRT-MPA. Unfortunately the IMPASP was not implemented.
<b>1</b>	Establishment of key biodiversity indicators.	<b>Partially Implemented.</b> Whilst the specific capital project was not implemented various key species data sets have been established over time that could be utilised to this end.
<b>1</b>	Data management system for BD management.	<b>Partially Implemented.</b> Whilst the specific capital project was not implemented some agencies (e.g. DoE. Nature Seychelles, NPTS) have placed biodiversity data/papers on websites available for download. This issue remains on the priority agenda however and national database initiatives are being developed under two GEF projects.
<b>1</b>	Mapping and monitoring of river reserves.	<b>Not Implemented.</b>
<b>1</b>	Curieuse National Park habitat assessment.	<b>Partially Implemented.</b> The explicit project was not undertaken but the island was assessed for its restoration and rehabilitation potential under the Nature Seychelles Island Biodiversity GEF MSP project. Unfortunately a DTF/GOS funded attempt to eradicate rats from the island in 2000 proved unsuccessful.
<b>1</b>	Integrated management of water catchments on Mahe, Praslin and La Digue.	<b>Not Implemented.</b> Integrated water catchment management has, however, remained on the agenda throughout and capital funds have been allocated to it under the current GEF cycle.
<b>1</b>	Establishment of medicinal plant gardens at local level.	<b>Partially Implemented.</b> Public awareness campaigns undertaken and some gardens established in partnership with schools and local communities.
<b>1</b>	Introduction of environmental economics.	<b>Not implemented.</b> Programme transferred in full to the Environmental Economics, Mainstreaming and Sustainable Financing thematic of the EMPS 2000-2010 but this also was not implemented in that time span.
<b>1</b>	Assessment of lowland habitats.	<b>Not Implemented.</b> The specific project was not undertaken, but considerable work of this nature has been undertaken as part of other projects see project "An evaluation of selected inner islands for the conservation of endangered species".

<b>Priority</b>	<b>Project</b>	<b>Implementation</b>
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2	Establishment and support of an environmental NGO centre.	<b>Partially Implemented.</b> Whilst the specific project was not implemented the environmental NGO community has continued to expand and strengthen such as today there are five biodiversity NGOs headquartered on Mahe with permanent staff. NGOs have also established facilities on several other islands.
2	Establishment of important Bird Areas (IBAs).	<b>Successfully implemented.</b> Terrestrial IBAs assessed and published (Rocamora, G. & Skerret, A. 2001).
2	Eradication of mice and rats on Curieuse island.	<b>Successfully Implemented.</b> Project expanded to 3 islands and implemented with DTF, GoS and Private sector funds. Whilst the Curieuse eradication was not itself successful the two other islands (Fregate and Denis) ultimately were. This opened a new phase of Biodiversity conservation in Seychelles with further islands following suit (see <b>Case Study 6</b> ) and several rare endemic species benefiting as a result.
2	Creation of the Seychelles Botanical Centre and Arboretum.	<b>Successfully Implemented.</b> The Barbarons Biodiversity centre was established in 2000 to operate as a centre for the conservation of endemic plant species with various nurseries and out planting programmes. Facilities for seed storage and other ex-situ facilities are planned.
2	Augmenting ecology monitoring and management skills.	<b>Partially Implemented.</b> Whilst the specific capital project was not implemented various other initiatives have contributed to this objective. Including the establishment of various monitoring protocols for various native species on the main granitic islands. Despite various training programmes, however, national institutional capacity is often limited by high staff turnover.
2	Improving the management and effectiveness of Wildlife Clubs.	<b>Successfully Implemented.</b> Great advances have been made in the national role of the Wildlife Clubs. The vast majority of primary and secondary schools have active Wildlife Clubs that participate in various national Biodiversity related campaigns. The clubs and their activities enable youth education on biodiversity and also provide scope for expression and active participation in national programmes and initiatives, fostering the next generation of Seychelles biodiversity professionals.
2	Seychelles soil analysis and conservation	<b>Not Implemented.</b>
2	Protection of coral reefs from anchor damage.	<b>Successfully Implemented.</b> The specific capital project was successfully by MCSS with GEF SEYMEMP funds and created the national capacity for the installation and maintenance of environmentally moorings. Subsequent initiatives have also seen this capacity expanded to the SCMRT-MPA.

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Priority	Project	Implementation
3	Develop and implement action plans for globally threatened birds.	<b>Successfully Implemented.</b> This project was led by Nature Seychelles with contributions from various other agencies. Most of the resulting plans have been successfully implemented and updated.
3	Forest conservation on Silhouette island.	<b>Not implemented.</b> Though the specific project was not undertaken focus has recently shifted back to this area with the 2010 declaration of more than 90% of the island as a National Park.
3	Sustainable management of the Cocode-Mer.	<b>Successfully Implemented.</b> Assessment undertaken and management recommendations (harvesting/planting of nuts) made and under implementation.
3	Control impact of wastewater on Praslin island.	<b>Not Implemented.</b>
3	Identification of river pollution impact on biodiversity.	<b>Not Implemented.</b> Some biodiversity freshwater survey undertaken however under various initiatives but never integrated to assess and quantify Biodiversity impact.
3	Reduction of POPs through use of indigenous organic fertilisers.	<b>Successfully Implemented.</b>
3	Conservation of genetic diversity of plant species used in agriculture.	<b>Partially Implemented.</b> An assessment and collection of rarer varieties was undertaken to enable propagation of locally adapted varieties.
3	Evaluation of bio-technological development and application.	<b>Partially Implemented.</b> This specific project was not undertaken however, GEF funds were received for the development of a National Biosafety Framework (2004 -2006) in order to support national implementation of the Cartagena Protocol – the resulting bill has still to be promulgated however.
4	Rehabilitation of coral reefs.	<b>Partially Implemented.</b> The mineral accretion method was considered but ultimately rejected because suitable substrate for settlement was not considered the limiting factor to coral settlement post the major bleaching event of 97/98. Rather the distance from suitable sources of recruitment was the problem coupled with ongoing local habitat degradation and repeated bleaching events. Attempts at coral transplantation were undertaken with initial indications of success but ultimately proved unsuccessful.

"Project Pending" Category	
Project	Implementation
Consolidation of Biodiversity Legislation.	<b>Not Implemented.</b> Under consideration for the GEF Mainstreaming of Biodiversity project.
An evaluation of selected inner islands for the conservation of endangered species.	<b>Successfully Implemented</b> by Nature Seychelles (NGO) with GEF funds – this project produced very important baseline information on various small granite island ecosystems and a island assessment protocol. It furthermore provided supporting information for and additional impetus to various island rehabilitation projects and related species conservation action plans (see <b>Case Study 6</b> ).
Scientific justification for ecologically sensitive	<b>Not Implemented.</b> Ecologically sensitive areas being reviewed under GEF Mainstreaming

areas in EIA legislation.	Biodiversity project.
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**Table 9: NBSAP Strategic Implementation**

Goal	Implementation
<p><b>1). Support general measures for conservation and sustainable use.</b></p>	<p><b>1.1). Develop, strengthen or adapt national strategies and plans for the C&amp;SU of BD and adopt measures to implement these.</b></p> <p>The need for conservation and sustainable use management approaches has been thoroughly inculcated and mainstreamed across sectors at the strategic and systemic levels. This is exemplified in key environmental, development and economic sectors:</p> <ul style="list-style-type: none"> <li>• <u>Fisheries</u>. The Seychelles Fishing Authority is legally empowered on the basis of the 1984 Seychelles Fishing Authority (establishment) Act (www.sfa.sc), sustainable use of renewable resources is the conceptual base behind the artisanal and industrial fishery strategies and is embodied in specific fishery plans such as the NPOA for the conservation and management of sharks, and in other specific fishery measures such as regulations licensing and/or providing for closed seasons as in the sea cucumber and lobster fisheries respectively.</li> <li>• <u>Tourism</u>. Tourism as the other (with fisheries) key economic sector has a key role to play in biodiversity management. The strategic document “<b>Vision 21: Tourism Development in Seychelles 2001 -2010</b>” addresses environment and biodiversity in throughout its formulation in aspects such as:             <ul style="list-style-type: none"> <li>○ Mainstreaming environmental issues into tourism infrastructure development.</li> <li>○ Promoting ecotourism and community benefits – with ecotourism and nature-based tourism being identified as a key sector with growth potential.</li> <li>○ Integrating Tourism for environmental sustainability – specifically addressing <i>inter alia</i> protected area management, coastal zone and marine resource management and waste management.</li> </ul> </li> <li>• <u>Agriculture</u>. Significant progress has been made in the fields of soil conservation and water management with new technologies (including drip irrigation) being instigated. The use of Persistent Organic Pollutant chemicals has been banned and the national stock pile of such chemicals disposed of in line with international best practice.</li> <li>• <u>Physical development</u>. The development cycle in Seychelles is primarily managed by two key pieces of legislation the 1972 Town and Country Planning Act (TCPA) and the 1994 Environment Protection Act (EPA) and its 1996 EIA Regulations. The TCPA governs building standards and norms and establishes the Planning Authority a cross-sectoral body that assesses and rules upon planning applications. The EPA governs the management of the physical environment and addresses the development cycle in all environmental aspects through the 1996 EIA regulations (the regulations incorporate priority biodiversity issues through the sensitive areas atlas). Weaknesses have been identified in the implementation of these two laws in terms of their distinct, equal and mutually supportive roles as determined by the Attorney General in the late 90s. There being a broad perception in the environmental community that clauses for Ministerial discretion under the TCPA have been used to overrule environmental concerns on the Planning Authority. The ongoing (2008 – 2013) full-sized GEF Mainstreaming Biodiversity project has identified the need to review and harmonise (without subjugating one to the other) the two laws and it is to be hoped that it will be</li> </ul>

successful in effectively integrating their provisions accordingly to provide for a balanced and oversight and implementation of the national development cycle.

- **Biodiversity management.** There have been diverse initiatives on national strategies and plans for the C&SU of BD:
  - Endemic Bird Species Action Plans have been developed for all endemic bird species in the central archipelago considered threatened. Championed primarily by partnerships between the NGO and private sector, supported and enabled by Government, major successes have been realised for the following species: the Seychelles warbler (*Acrocephalus sechellensis*), Seychelles magpie-robin (*Copsychus sechellarum*), Seychelles White-eye (*Zosterops modestus*), Seychelles fody (*Foudia sechellarum*) and Seychelles black paradise flycatcher (*Terpsiphone corvina*).
  - National strategies/management plans have been established for marine turtles (*Eretmochelys imbricata* & *Chelonia mydas*) and Seychelles Terrapins (*Pelusios castanoides interularis* & *P. subniger parietalis*)
  - Preliminary attempts have been made at developing a national wetlands policy.
  - As mentioned above various strategies and plans to manage resource species have been developed and implemented in the fisheries sector.

Implementation and realisation of the mainstreaming of biodiversity across development sectors has proven far more difficult with sectoral objectives and priorities still tending to hold sway.

**1.2). Establish or strengthen institutional mechanisms and capacity in the Ministry of Environment, other Government organisations, NGO and private sectors for the C&SU of BD.**

The biodiversity management capacity within the DoE has been progressively scaled down from around 2003 onwards. This has occurred due to dual objectives of shifting to policy guidance (i.e. facilitation rather than implementation) and cost cutting. Economic imperatives have seen a rapid down-scaling of Government employment since 2008 with the DoE reduced to a primarily policy staff with regard to the C&SU of BD.

Progressive attempts have been made since 1997 to amalgamate and enhance the management and financial sustainability of Government administered protected areas. The Marine Parks Authority (MPA) was established in 1997 and developed to become the Seychelles Centre for Marine Research and Technology (SCMRT-MPA) in 2001 but with limited success in terms of re-investment in the C&SU of BD. The latest stage in this evolution is the formation of the Seychelles National Parks Authority (SNPA), which saw the responsibility for nearly all protected areas (terrestrial and marine) under government management merged under this parastatal authority. It is too early to assess its impact upon the C&SU of BD but it is to be supported, in part, by review and innovation in systemic PA management through a full-sized GEF project scheduled to begin in 2011. The Seychelles government has made a very large policy and legislative commitment to protected areas with nearly half the country's landmass legally protected for environmental reasons.

Seychelles has a vibrant and dynamic environmental NGO sector with a very strong focus on the C&SU of BD which has seen rapid expansion since 1997 realised through societal/stakeholder interests.

The private sector has also become a key player in the C&SU of terrestrial BD most notably in the tourism domain where major advances have been realised in ecosystem rehabilitation and rare species conservation on private island resorts – this has been driven in part by philanthropy but also by the growth of the international ecotourism and nature-based tourism market.

**1.3). Introduce standard operational procedures, and establish management policy for the C&SU of BD.**

An Integrated Marine Protected Areas Systems Plan (IMPASP) was developed through extensive national stakeholder consultation under the Seychelles Marine Ecosystems Management Project (SEYMEMP) – a medium-sized GEF project managed



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	<p>by the MCSS – and endorsed by SCMRT-MPA but it was never implemented by the organisation. Various other protected areas and private properties have detailed management plans for the C&amp;SU of BD but there are no national standard operational procedures in this regard. The issue of Standard Operational Procedures is to be addressed under a full-size GEF PA project 2011 -2014.</p> <p>The development of National Biodiversity Policy was identified as a work programme under the EMPS 2000 - 2010 but was not implemented under that time span. This is a matter of considerable importance that needs to be addressed to enable a strategic approach to C&amp;SU and BD and provide a transparent and predictable working environment for all partners.</p> <p><b>1.4). Integrate as appropriate, the C&amp;SU of BD into relevant sectoral plans, policies and projects.</b></p> <p>The national initiatives to integrate the C&amp;SU of BD in sectoral activities are summarised in section 1.1 above.</p> <p>The Environmental Management Plan for Seychelles (EMPS) 2000 – 2010 is the primary national environmental strategic document that seeks to mainstream environmental concerns through the development sectors as a key tool in the country’s pursuit of sustainable development. The EMPS has 10 thematic areas one of which focuses on the mainstreaming of biodiversity, forestry and agriculture. The 3<sup>rd</sup> generation EMPS (to be called the “Seychelles Sustainable Development Strategy 2011 -2020” or SSDS) is currently under development and is seeking to learn from and correct flaws in the implementation of its predecessor.</p>
<p><b>2). Strengthen identification and monitoring of Biodiversity.</b></p>	<p><b>2.1). Identify key components of BD important for C&amp;SU.</b></p> <p>No systematic analysis and assessment of Seychelles ecosystems has been undertaken to identify keystone species. Rather biodiversity indicators identified for various habitats have typically focused on high trophic level (e.g. endemic land bird and reptile) species, though certain iconic plant species such as the endemic Coco-de-Mer (<i>Lodoicea maldivica</i>) have also been studied in depth.</p> <p>In marine ecosystems attention has focused primarily on species of high economic importance (tuna, coral reef fisheries, demersal grouper fisheries, lobster and sea cucumber fisheries) or iconic megafauna – such as marine turtles and whale sharks.</p> <p><b>2.2). Monitor key components of BD through standardised methods, gather priority data through rapid assessment techniques and establish a reporting mechanism.</b></p> <p>Standardised monitoring methods have been established for a broad variety of biodiversity components <i>inter alia</i> marine turtles (<i>E. imbricata</i> &amp; <i>C. mydas</i>), terrapins (<i>Pelusios spp</i>), Sooglossid frogs, various endemic bird species, various commercial fisheries, the whale shark (<i>Rhincodon typus</i>), the Coco- de-mer, seabird colonies and coral reef cover/diversity monitoring schemes.</p> <p>A standardised method of biodiversity assessments on small islands has been elaborated.</p> <p><b>2.3). Maintain organise and disseminate data on BD through standardised databases and integrated networks.</b></p> <p>The Seychelles Fishing Authority is widely recognised as the national agency with the best maintained national databases relating to the C&amp;SU of BD but as per its mandate these databases are restricted to marine fishery resources.</p> <p>A national marine turtle database was established in 2003, with 17 turtle rookery management partners (Governmental and civil society) agencies, to enable adaptive management of turtle rookeries on the national scale. An NGO was formed to operate it but this has fallen moribund.</p> <p>Many other biodiversity surveys have been undertaken over the years and documented and various have ongoing monitoring protocols. Various NGOs and some private islands have their own effective and well-maintained BD databases.</p> <p>A biodiversity information metadata base is being established under the GEF Biodiversity mainstreaming whilst a database to</p>

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	<p>enable better global environment management (i.e. implementation of and reporting to the Rio Conventions) is to be established under a separate GEF capacity building project.</p>
<p><b>3). Increase in-situ conservation of biodiversity.</b></p>	<p><b>3.1). Consolidate the existing system of Protected Areas, improve knowledge of appropriate classification, configuration and design, and develop, where necessary, legislation, guideline, system plans and management plans.</b></p> <p>The Seychelles has a very extensive network of terrestrial protected areas (PA) constituting nearly 50% of the country's surface area though it is recognised that a large proportion of this area is without effective management intervention. The Seychelles was also the first country in the western Indian Ocean to declare a network of Marine National Parks – they are rather small however and fall far short of the international target of 10% of area – constituting only 0.03%. The MNPs furthermore were largely selected for multi-use nature-based tourism activities rather than for high biodiversity interest as such they are not necessarily covering and protecting areas of key biodiversity interest today though this is countered by other categories of MPA such as the Aldabra Special Reserve.</p> <p>The primary PA legislation in Seychelles is the National Parks and Nature Conservancy Act (1969) whilst other laws also provide or are utilised for PA designation <i>inter alia</i>: the 1961 Wild Animals and Birds Protection Act (through its 1966 Nature Reserves Regulations) and the 1986 Fisheries Act which subsumed legislation dating back to the 1920s and 1960s for Fishery Reserves and Shell Reserves respectively. The PA legislation has been reviewed a few times since the 1980s and the need to update and harmonise it with international norms (IUCN criteria) has been widely recognised. This is to be addressed by a full-size GEF project entitled “<i>Strengthening Seychelles’ Protected Area System through NGO Management Modalities</i>” that is due to start in 2011.</p> <p>State managed PAs have been recently consolidated under the newly formed Seychelles National Parks Authority (SNPA) (Seychelles National Parks Authority) Order, 2009 (S.I. 30 2009) it is intended that this body corporate will re-vamp the management of government run PAs and raise revenues from their use and nature-based tourism activities such that they ultimately become financially self-sufficient. Two protected areas Cousin and Aride Island special reserves are managed by local NGOs –Nature Seychelles and the Island Conservation Society respectively. Another body corporate, the Seychelles Island Foundation, manages the country's two biodiversity world heritage sites of Aldabra and the Vallee-de-Mai. In the last 15 years various private islands have been rehabilitated and operate as private nature reserves with increasingly high biodiversity interest due in part to the (re)introduction of endemic endangered species. It is intended that the above referenced GEF PA project will also investigate means of incorporating these properties into the legislated PA network and facilitate the involvement of the private sector in PA management in general.</p> <p><u>Management Plans</u>: most protected areas have management plans though in many cases they require review whilst implementation in state PAs has often proved problematic in the past due to lack of resources.</p> <p><u>Systems Plans</u>: An Integrated Marine Protected Areas System Plan (IMPASP) was developed through stakeholder consultation in 2003/2004 and approved but never implemented.</p> <p><b>3.2). Ensure wider participation in planning and management of protected areas, with opportunities for the involvement of NGOs, district-based organisations, the private sector and international organisations.</b></p> <p>Whilst widely recognised as desirable this has yet to be embraced fully by the authorities. The IMPASP (see pt 3.1 above) was developed through national stakeholder consultation and approved by Government but not implemented. Otherwise recent</p>

initiatives such as: the ongoing review of the Fisheries Act (which has relevance to protected areas) and the declarations of Silhouette National Park and Recif Island Special Reserve did not utilise processes of stakeholder consultation as the current legislation does not require it beyond the posting of a statement of intent in the national gazette. Recommendations to change this are incorporated into the proposed NGO protected area project (title) scheduled to start in 2011.

**3.3). Identify, monitor and manage physical and natural resources important for the conservation of BD whether within or outside PAs, with a view to ensuring its C&SU.**

Aldabra Special Reserve the largest PA has extensive monitoring protocols some of longstanding. Some of the smaller protected areas (e.g. Cousin and Aride Island Special Reserves) have extensive and longstanding monitoring and adaptive management regimes so as to enable particular biodiversity conservation objectives. The same is true of some non-legislated private islands managed as reserves such as Cousine, Fregate and North islands. Certain endemic species found on main granitic islands of Mahe. Praslin and La Digue are also the focus of long-term monitoring regime.

The State Land and River Reserves Act (1903) makes provision to protect watercourses and vegetation buffers around them on the main islands but this is little enforced and the reserves need assessment, mapping and monitoring – such a project was proposed under the NBSAP but not implemented.

The Sensitive Areas Atlas utilised under the EIA regulations sets out a variety of areas considered sensitive and requiring special consideration relative to pertinent planning applications.

An assessment for terrestrial Important Bird Areas was undertaken and published (Rocamora & Skerret 2001) this has not had a direct impact upon national monitoring and management regimes however.

**3.4). Strengthen the protection of sensitive ecosystems and critical habitats outside protected areas.**

The Sensitive Areas Atlas (SAA) utilised under the EIA regulations sets out a variety of areas considered sensitive and requiring special consideration relative to pertinent planning applications. These categories include various classifications related to biodiversity interest – e.g. wetlands, turtle rookeries, habitat for rare birds etc.... The SAA however is outdated having been finalised in 1996 and requires review and updating – such a review has recently been initiated under the GEF full-size Mainstreaming Biodiversity project.

The western plateau of La Digue Island is considered a sensitive area because it provides core habitat for the critically endangered Seychelles Black Paradise Flycatcher. The plateau is also the residential centre and focus of economic development on the island consequently much stricter development procedures and tree-felling permits are applicable to this area – this has served to slow the loss of habitat on the plateau over the last 20 years but post development enforcement EIA requirements need strengthening.

Major advances have been made on certain private islands where extensive ecosystem rehabilitation has been undertaken including, critically, the eradication of rats and cats enabling the subsequent (re)introduction of endangered endemic species. This has seen the major advances in the conservation of coastal biodiversity in the country.

**3.5). Determine the ecological relationship between Protected Areas and their surroundings. Protect these adjacent areas by legislative and other measures and where appropriate promote environmentally sound and sustainable development in them with a view to furthering protection.**

The extra measures targeted at controlling the felling of trees on the western plateau of La Digue around the La Digue Veuve Special Reserve can be considered such a measure – but there are no systemic national measures to promote buffer zone management.

**3.6). Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through**

***the development and implementation of plans , special projects or other management strategies.***

Significant progress has been made in this regard in the last 15 years. Seychelles has no indigenous terrestrial mammals except for species of bat and the introduction of mammalian predators in particular rats (*R. Rattus and R. Norvegicus*) and Cats (*Felis catus*) has caused enormous damage to ecosystems. Since 1996 rats have been eradicated from Bird, Fregate, Denis, North, and Conception islands in the central archipelago and D'Arros and islands of the Cosmoledo atoll in the outer islands. This has enabled the rehabilitation of habitats and ecosystems and the (re)introduction of endemic species in line with species recovery plans in particular for endemic land birds (see **Case Study 6**). The eradication of rats has also seen the natural re-establishment of ground nesting seabird colonies on some islands e.g. Denis and North islands.

Other islands that have had very successful ecosystem rehabilitation projects include Cousin and Aride island Special Reserves and Cousine island all of which support important sea bird colonies and have played significant roles in rare species conservation through habitat rehabilitation programmes and endemic species (re)introductions (see **Case Study 6**).

***3.7). Where appropriate introduce artificial habitats in natural surroundings to supplement or augment those that have been destroyed or degraded.***

One prime example of such work in Seychelles is the design and installation of nest boxes for the Seychelles black parrot (*Coracopsis nigra barklyi*) these serve to replace the natural nesting sites (dead palm tree trunks) which have been greatly reduced by modern forestry management practices and are also rat proof to event chick predation by rats (*Rattus rattus*). These nest boxes have proven to be successful with on average one in three occupied and the breeding success greater than in natural sites. A project for nest boxes for the endemic Kestrel (*Falco araea*) has also been undertaken in particular targeting public buildings on Mahé.

***3.8). Identify, prevent the introduction of, control or eradicate those alien species which threaten, or could potentially threaten, native ecosystems, habitats and species.***

A National Biosecurity Strategy (NBS) for Seychelles was developed and finalised through national stakeholder consultation in 2010 under the full-size GEF project: “*Mainstreaming Prevention and Control Measures for Invasive Alien Species into Trade, Transport and Travel across the Production Landscape*”. It seeks to put in place and empower an integrated and comprehensive policy, legal and institutional framework for the prevention, eradication, control and mitigation of IAS in Seychelles in line with the country’s international commitments and based on the Global Invasive Species Programme Model.

The GEF project laid the foundations for the NBS through various precursor studies and assessments inter alia: An institutional Review of IAS Quarantine and Control Functions (Ikin, R. & Dogley, W. 2009), the Economic Valuation of the Influence of IAS on the National Economy (Mwebase,P. et al 2009), the Evaluation of Threats of Introduction and Threats of IAS (Dogley, W. 2009) and the National IAS Baseline (Nevill, J. 2009). A Toolkit of best practice in the management of IAS is also being developed. Seychelles has made great advances in the management of IAS over the last 15 years in particular through a series of successful rat and cat eradications on various islands (**Case Study 6**) enabling the reintroduction of endangered endemic species that cannot co-exist with rats. Work has also been undertaken on pilot projects in small areas of the larger islands e.g. IAS management in the Valle-de-Mai, rehabilitation of trial areas in MSNP but as yet wider scale IAS management in key areas of endemic biodiversity (i.e. between 200 -500 m elevation on the islands of Mahe and Silhouette) remains beyond the capacity of national agencies due to the very difficult terrain, large areas and manpower such activities would entail.

***3.9). Identify organisms potentially useful in biological control, identify the risks associated with their release, and if appropriate, introduce under controlled conditions as far as possible.***

Historical attempts at biological control, most notably the introduction of Barn Owls (*Tyto alba affinis*) in the 1950s in a

	<p>misguided attempt to control rat populations, have resulted in unintended impacts and created a reluctance to examine the modern-day options for bio-control. A proposal to utilise bio-control insects to control inland water invasive plants was refused in the late 90s.</p> <p><b>3.10). Identify the risks associated with the use and release of LMOs and if necessary establish means for regulation and control.</b></p> <p>National Biosafety Framework project undertaken 2004-2006 – but resultant framework yet to be implemented.</p> <p><b>3.11). Research and document local peoples knowledge and practices which are relevant for C&amp;SU of BD.</b></p> <p>Some work has been undertaken on the local usage of medicinal plants and an association of herbalists formed to foster such knowledge. Other knowledge, e.g. related to artisanal fishery practices and key locations, is typically jealously guarded by the practitioners and therefore hard to assess and document.</p> <p><b>3.12). Consolidate, harmonise and/or revise legislation for the protection of threatened species and sensitive ecosystems.</b></p> <p>A new plant protection bill was drafted some years ago but was not promulgated.</p> <p>Development of an overarching Biodiversity Act has been proposed on various occasions, following legislative reviews, over the last 20 years but this has yet to be realised – this is still a possible output of the ongoing GEF Biodiversity Mainstreaming full-size project.</p>
<p><b>4). Promote ex-situ conservation.</b></p>	<p><b>4.1). Adopt measures for ex-situ conservation of components of BD, regulate collection from natural habitats for ex-situ conservation purposes, and establish or strengthen facilities for ex-situ conservation with a view to complementing in-situ conservation.</b></p> <p>On the national level the Barbarons Biodiversity centre was established with a key ex-situ mandate for Seychelles flora. Extensive work has been undertaken with some 50% of endemic flowering plant species having been successfully propagated ex-situ. Further investment is required however before the Centre can cater for seed banks and the propagation of certain problematic endemic species e.g. the critically endangered Jelly fish tree (<i>Medusagyne oppositifolia</i>).</p> <p>On an agency level some very successful work has been undertaken in limited programmes of ex-situ management of fauna e.g. the NPTS (Nature Protection Trust of Seychelles) captive breeding programme for the endemic sub-species of terrapin (<i>Pelusios spp</i>),</p> <p>The captive management of various endemic bird species most notably the Seychelles Magpie robin (<i>Copsychus sechellarum</i>) (Digney <i>et al</i> 2001) but also the Seychelles fody as part of rat eradication and endemic species (re)introduction programmes. Aside from protected species and PA legislation (e.g. Wild Animals and Birds Protection Act, National Parks and Nature Conservancy Act, Bread Fruit and Other Trees Act, Coco de Mer Management Decree) there is no legislation yet established for the collection and export of endemic species for example. Extensive work went into the development of an Access and Benefit sharing Bill in 2005 that covered these issues (Lewis-Lettington &amp; Dogley 2006) but it has yet to be promulgated. The Imminent coming into force of the Nagoya Protocol will presumably see this Bill re-visited. Access agreements are currently developed and signed on an ad-hoc basis with foreign agencies undertaking work in the Seychelles.</p> <p><b>4.2). Adopt measures for the recovery and rehabilitation of threatened species and their re-introduction into their natural habitats under appropriate conditions.</b></p> <p>A policy/protocol for such procedures has been the subject of considerable debate amongst stakeholders over the last decade but no standardised criteria have been put in place. Measures are usually identified through the development and stakeholder approval of species action plans.</p> <p>(Re)introduction requires the approval of the DoE when it pertains to protected species and the IUCN re-introduction</p>

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	<p>guidelines provide a basis for such decision-making. In the absence of an official national policy or legislation for re-introduction cases have been assessed on an ad-hoc basis. A National re-introduction policy setting out species and location priorities and a harmonising of the two would be very useful for long term threatened species management.</p>
<p><b>5). Introduce ways and means for sustainable use of BD.</b></p>	<p><b>5.1). Continue to integrate consideration of the value of BD and SU of biological resources into decision making across different sectors.</b>  The Environmental Management Plan of Seychelles (EMPS 2000-2010) through its biodiversity/forestry thematic area sought to integrate biodiversity issues throughout the national development sectors. The EMPS is the primary national strategic document for environment and also provides the foundation for the national pursuit of sustainable development. The EMPS embodies the mainstreaming of environmental issues nationally and in its structure and formulation shows the national commitment to this end. The implementation of the EMPS however, demonstrated various shortcomings in particular the administrative capacity to oversee and adaptively manage the document in the way that had originally been intended. The 3<sup>rd</sup> generation EMPS (SSDS 2011 -2020) is currently under development and will hopefully address some of these shortcomings. Various sectoral documents also integrate the C&amp;SU of BD see section 1.1 above.  The ongoing GEF Mainstreaming Biodiversity project is also investigating and seeking to develop additional mechanisms to advance the integration of BD concerns across other sectors including the development of local land use and integrated watershed management plans as well as seeking to harmonise the national legislation that addresses management of the development cycle – namely the Town and Country Planning Act (1972) and the Environment Protection Act (1994).  <b>5.2). Strengthen measures relating to the use of biological resources to avoid or minimise adverse impacts, and encourage co-operation between government and the private sector in developing methods for SU of biological resources.</b>  See sections 1.1 and 5.1 above.  <b>5.3). Encourage and support biodiversity conservation and sustainable use at the district (local-community) level and by local groups and communities.</b>  Local level initiatives have been fostered by the Government facilitation of small project funds from international and bilateral donor agencies (including: the GEF, MFF, EU and the governments of UK and USA) that target such initiatives.</p>
<p><b>6). Introduce incentive measures for the conservation and sustainable use of biodiversity.</b></p>	<p><b>6.1). Introduction of Environmental Economics.</b>  A programme to build national capacity in environmental economics was included in the NBSAP and latterly the EMPS 2000-2010 but not implemented and there are currently no qualified environmental economists in the country. Some studies have been undertaken on an ad-hoc basis but no national mechanism is in place. The Environment Trust Fund initially embodied such a role by offering tax benefits to private sector donors but these benefits were subsequently reduced.</p>
<p><b>7). Improve biodiversity related research and training.</b></p>	<p><b>7.1). Establish or strengthen scientific and technical education and training for the purpose of identification, C&amp;SU of BD, and encourage participatory learning and research between professionals, students and the public.</b>  Various agencies have their internal monitoring and training programmes and the Government’s Human Resources Development Programme sends students overseas each year to study degrees in environmental sciences. A University has recently been established in Seychelles and it has been stated that it will in the future be focusing on environment as one of its key areas of activity.  <b>7.2). Encourage and promote research which contributes to the C&amp;SU of BD.</b></p>

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	<p>The Government has actively facilitated international cooperation in research and enabled the local establishment of various international donors that promote research in diverse agencies – e.g. GEF Small Grants Programme, Mangroves for the Future etc...</p> <p><b>7.3). Seek international co-operation in the use of appropriate advances in research and technology in developing methods for the C&amp;SU of biological resources.</b></p> <p>Seychelles has utilised various international collaborations to enhance its C&amp;SU of BD <i>inter alia</i>: Rat and cat eradication programmes utilising New Zealand expertise and methodologies; telemetric satellite tagging of both turtles and whale sharks; radio-tagging of goats on Aldabra to enable the “Judas Method” of population control. Perhaps most prominent has been the utilisation of genetic analysis in the conservation management of critically endangered species (particularly endemic land bird species) both in terms of maintaining diversity in transferred sub-populations and for identifying genetically distinct populations within a species.</p>
<p><b>8). Augment public education and awareness of all facets of biodiversity.</b></p>	<p><b>8.1). Promote and increase public understanding of the importance of, and the measures required for, the C&amp;SU of BD through established strategies and participatory methodologies.</b></p> <p>Numerous and extensive public education and awareness (PE&amp;A) campaigns relating to the C&amp;SU of BD have and continue to be carried out in Seychelles. The Department of Environment has a division devoted to PE&amp;A and collaborates with the national broadcasting company in the development of environment related programmes on both television and radio. The primary national Newspaper has a weekly environmental section and covers many other stories on a daily basis. Other newspapers also have environmental sections. The majority of NGOs have very active PE&amp;A campaigns including websites, blogs, regular press articles, TV and radio coverage, poster campaigns etc... There is however, no overarching national strategy in this regard.</p> <p><b>8.2). Seek local and international co-operation in strengthening the capacity for educational and public awareness programmes with respect to C&amp;SU of BD.</b></p> <p>It is standard for agencies to incorporate PE&amp;A programmes within their projects and activities and this is also generally a requirement of international donors.</p> <p><b>8.3). Facilitate the access to and exchange of information from publicly available sources, relevant to the C&amp;SU of BD.</b></p> <p>The Department of Environment operates a Documentation Centre, the National Archives and the Seychelles Bureau of Standards maintain extensive Biodiversity related collections that are all accessible to the public. Various Agencies operate websites with documents available for download e.g. EMPS website, UNDP PCU documentation site, Nature Seychelles, NPTS. Two national databases are currently under development under GEF projects a biodiversity meta-database and a broader environmental conventions database see section 2.3 above.</p>
<p><b>9). Minimise adverse impacts on biodiversity.</b></p>	<p><b>9.1). Continue to identify and monitor processes and categories of activities having or likely to have significant adverse impacts on the C&amp;SU of BD and take appropriate actions.</b></p> <p>The Environmental Assessment and Pollution Control (EAPC) section in the DoE is the primary Governmental agency that monitors activities that are likely to have adverse impacts on the C&amp;SU of BD – i.e. the developmental cycle and production sector activities. This monitoring is embodied in the EIA regulations that form one component of the development approval process as prescribed by the TCPA and EPA. This also typically incorporates environmental management plans for the operational phase; follow up on these matters is however recognised as a short-coming due the rate of development in Seychelles and the limited capacity of EAPC. EAPC is supported in its identification and enforcement of conditions by the Seychelles Bureau of Standards and the Licensing Authority.</p> <p>The Government also operates a “Green Line” – a 24/7 telephone line service where members of the public can reports matters</p>

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	<p>of environmental concern and this assists greatly in the early identification of pollution events etc... Various other biodiversity monitoring programmes, Governmental and civil society, also allow for the identification of impacts on BD.</p> <p><b>9.2). Research, monitor and where appropriate introduce alternative methods of production, manufacturing, harvesting and other use categories that would encourage sustainability and reduction of impacts.</b></p> <p>This is an ongoing open-ended process nationally of developing enhanced productivity and socioeconomic indicators whilst seeking to reduce impact wherever feasible. Examples include: the reduction of chemical use (fertilisers and pesticides) and water usage efficiency in agriculture, harvesting/ limited take regimes in various fields (e.g. the management of the Coco-de-mer nut harvest, licensed operations and closed seasons in various fisheries, the management of sea bird egg harvest on Desnoeuufs and Bird islands) incentives for the expansion of domestic water storage capacity and the utilisation of solar water heaters etc...</p> <p><b>9.3). Strengthen, harmonise or clarify the procedures, categories and other appropriate elements within the environmental impact assessment legislation as they pertain to impacts on biological diversity, and improve the scientific and ecological knowledge base to assist in this.</b></p> <p>Significant advances in the knowledge of the status and distribution of endemic biodiversity have been realised during the reporting period that require an updating of the Sensitive Areas Atlas (SAA) that serves as the basis for initial EIA scoping procedure. The SAA is being revised accordingly under the GEF Biodiversity Mainstreaming project.</p> <p><b>9.4). Promote appropriate institutional, legislative technical, or other arrangements to ensure that the environmental consequences of sectoral activities that have or are likely to have impacts on BD are taken into account and reduced.</b></p> <p>A sustainable Tourism label is under development that will provide incentives to tourism operations to meet a common national standard. Otherwise see <b>Section 9.1</b> above.</p> <p><b>9.5). Promote or strengthen national, and international co-operation, arrangements for emergency response to activities or events. Whether caused naturally or otherwise, which present a grave and imminent danger to BD.</b></p> <p>The Government of Seychelles established a dedicated department of Risk and Disaster Management in 2006 – which in addition to its priority role of protecting human life and property has also addressed various issues relevant to biodiversity including: international cooperation for preparedness for marine oil spill events, the ongoing development of industrial and terrestrial petroleum product disaster contingency plans, the mapping of hazard areas in the context of biodiversity hotspots etc...</p>
<p><b>10). Ensure access to and judicious control of genetic resources.</b></p>	<p><b>10.1). Promote or strengthen legislative, policy, administrative and other measures to determine access to, research on and collection of indigenous biodiversity within the country's territory.</b></p> <p>See section 4.1 above.</p> <p><b>10.2). Promote appropriate conditions and measures for legal access to genetic resources deemed important for agriculture, forestry and animal husbandry.</b></p> <p>Limited relevance in Seychelles as not a centre of origin for commercial species. Otherwise see section 4.1 above.</p>
<p><b>11). Evaluate and use appropriate technology.</b></p>	<p><b>11.1). Promote measures to research, evaluate and determine access to technologies that are relevant to the C&amp;SU of BD.</b></p> <p>There is currently no systemic promotion of such measures.</p>



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## **2.6 Funding.**

Following the formal submission of the NBSAP to the Convention in 1998, it took the government of Seychelles about 2 years to plan for and acquire the funds that was necessary to kick-start most of the implemented objectives of the plan. The plan truly came into force in the year 2001.

Since then some of the major funding of the projects developed under the NBSAP stemmed from the Environment Trust Fund (ETF) of Seychelles, the Global Environment Facility (GEF). In 2006 a Program coordination Unit was set up and this entity has been working closely with UNDP and other such bodies to ensure that Seychelles gets and properly manage all international funds.

Several of the smaller scale objectives such as Education and Awareness were done in joint ventures between the Environment Department and other national agencies which therefore imply that funds were provided directly by the Government of Seychelles.

## 2.7 Successes, Obstacles and Lessons Learned.

### 2.7.1 Successes

The NBSAP realised a positive impact upon the biodiversity stakeholder community both through its process of development and its implementation. The development of the NBSAP brought together and galvanised the conservation community through its preparation process. It allowed for a national stakeholder discussion of biodiversity status and trends and the identification of key national priorities for action.

Once completed, the NBSAP empowered NGOs by providing a basis and framework for civil society involvement and implementation of agreed national priorities. Evidence of this can be seen in the rapid expansion and development NGO biodiversity sector during the 4-5 year period after the finalisation of the NBSAP. This has been maintained to date with establishment of broad and full-time capacity in this domain. This is furthermore reflected in the proportion of successful projects implemented by NGOs.

Finally in addition to the mandate the NBSAP provided to the NGO sector it also served as sound tool for leverage new and additional funds for the conservation and sustainable use of biodiversity in Seychelles.

### 2.7.2 Obstacles

Shortcomings were most evident in the administration and coordination of the NBSAP. The intended coordinating unit was not formed and the NBSAP was latterly subsumed under the EMPS 2000 – 2010. In retrospect the decision to make the EMPS the primary biodiversity management mechanism was a mistake because:

- Biodiversity issues forming only one of 10 thematic areas were greatly diluted in this forum and hence biodiversity stakeholders on the EMPS SC were distanced from their core issues of concern.
- The EMPS, unlike the NBSAP with the CBD, did not directly relate its activities to the implementation of international commitments under the Rio Conventions which has posed numerous implementation, coordination and reporting problems (for further information in this regard see: **GoS 2005** and the Seychelles test case on the *tematea* website - <http://www.tematea.org> ).
- Finally and perhaps most critically the administration and adaptive management mechanisms intended for EMPS governance were never properly implemented (see **Section 2.2** for further information).

### 2.7.3 Lessons Learned

There is a need and a place for a properly supported NBSAP document guided by a stakeholder Steering Committee. Such a national document and forum will provide a national focus for Biodiversity action, that can be adaptively managed, and function as a means for the integrated and targeted national implementation of the CBD.

This mechanism should independent from the 3<sup>rd</sup> generation EMPS (SSDS 2011-2020) in terms of its operation, but closely integrated in terms of its implementation by regular updates submitted to and liaison with the SSDS steering committee.

#### 2.7.4 Next Steps

The current NBSAP, written in 1997, is a dated document and is not sufficient to address the concerns identified in Chapter 1 or to address the national capacity, implementation or reporting issues identified in the 2005 National Capacity Self Assessment exercise (GoS 2005).

It is therefore recommended, as endorsed by stakeholders in the national workshop to this process, that a new NBSAP be developed as a matter of some urgency. The NBSAP, if operated as described in section 2.7.3 above, should provide a sound platform and new impetus for the national implementation of the CBD.

## **2.8 Information requested in COP VIII Decisions.**

### **2.8.1 Decision VIII/5: Article 8(j) and related provisions – para 2.**

The definition of local communities<sup>28</sup> is difficult to determine in the context of Seychelles a country of tiny terrestrial surface area and population (455km<sup>2</sup> and approx 85,000 people), it is often easier to consider the entire population as a single local community. Seychelles is divided into 25 districts for electoral and local governance purposes, but the boundaries of these areas are somewhat arbitrarily determined. The local people are more likely to identify themselves as coming from one of the three populated islands – Mahe, Praslin and La Digue. Some 90% of the total population resides on Mahe. Certainly Seychelles does not exhibit isolated local communities (e.g. coastal fishing communities etc...) as may be traditionally and stereotypically applied to the African continent.

Civil society has however been greatly empowered in over the last 20 years with the country transitioning from a one-party socialist state towards a multi-party free-market system where the socioeconomic role of Government is increasingly being ceded to the private and NGO sectors. This transition has seen a significant increase in the role of local communities in the decision-making and implementation process as it pertains to the conservation and sustainable use of biodiversity.

Seychelles has a very active and growing environmental NGO community and government stakeholder consultation is increasingly the norm for development of new initiatives although this is not the case in all areas – e.g. declaration of Protected Areas and the development of legislation.

The environment sector, can however, be said to be at the forefront of national stakeholder emancipation; the steering committees of the EMPS and various large projects being prime examples. Furthermore Government has facilitated the establishment of various international

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<sup>28</sup> Seychelles has no indigenous population having been uninhabited until settled by Europeans and their slaves in 1770.

donor mechanisms locally which target the building of capacity in local and NGO groups to address the conservation and sustainable use of Biodiversity – e.g. the GEF small grants programme, the MFF initiative and ReCoMaP.

**2.8.2 Decision VIII/21: Marine and Coastal Biodiversity – Conservation and sustainable use of deep seabed genetic resources beyond the limits of National jurisdiction – para 3.**

Seychelles has no activities under its control and jurisdiction that may have significant adverse impacts on deep seabed ecosystems and species in these areas.

**2.8.3 Decision VIII/22: Marine and Coastal Biodiversity – enhancing the implementation of integrated marine and coastal area management – para 5.**

Seychelles' existing mechanism of addressing IMCAM is based primarily with the Planning Authority, established under the Town and Country Planning Act 1972, which in balance with the Environment Protection Act 1994 (EPA) and its 1996 EIA regulations governs the development cycle. The EPA also governs aspects of this pertaining in particular to solid waste management and pollution events etc... Other sector policies also address these issues e.g. the Fisheries Policy.

Seychelles is a party to the Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African region, one of the 17 regional seas agreements, which came into force in 1996 (amended and adopted 2010). Seychelles is an active participant in its IMCAM-related and ecosystem approach initiatives most notably: the project addressing land-based activities in the Western Indian Ocean (WIO-LaB), the South West Indian Ocean Fisheries Project (SWIOPF) and the Agulhas and Somalia Current Large Marine Ecosystem Project (ASCLME).

Since 2009 Seychelles has furthermore been involved on the Convention's regional working group to develop an ICZM protocol – this process is ultimately intended to provide a regional protocol that would be incorporated on the national basis as an additional set of criteria for the Planning Authority to work with.

**2.8.4 Decision VIII/24: Protected Areas – para 4.**

Not applicable – see Appendix 3b for details on PA PoW implementation.

**2.8.5 Decision VIII/28: Impact Assessment – voluntary guidelines on biodiversity-inclusive impact assessment – para 5.**

Seychelles has had substantive legislation covering the application of Impact Assessments in the management of the development cycle since the mid -1990s. The 1994 Environmental Protection Act established the legal framework for EIAs and this was elucidated and detailed in the 1996 EIA regulations. The EIAs are governed by the standard international framework of screening, scoping, development of terms of reference, assessment, public inspection etc... The 1996 Sensitive Areas Atlas<sup>29</sup> establishes the baseline for the EIA regulations, setting out 22

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<sup>29</sup> GoS 1996. Atlas des Zones d'Environnement Sensible des Seychelles.

categories of sensitive area. Six of these categories relate directly to matters of biodiversity concern (e.g. Habitats of rare and/or endemic species) and five others in a secondary manner.

There has however been no review of procedures in light of the voluntary guidelines and there are clear shortcomings in the Seychelles EIA process, including:

- No strategic environmental assessments meaning the cumulative impact of developments is not properly catered for; the lack of mandated Land Use Plans compounds this.
- There are no specific parameters and variables (i.e. critical levels for species and habitats) or policies to govern the application of EIAs leading to inconsistent application and further cumulative impacts.
- Lack of qualified technicians to undertake or assess EIAs.
- The sensitive areas atlas is outdated and requires review and amendment – this is scheduled to be addressed under the GEF Mainstreaming Biodiversity Project.

With regard to sub-target 5.1 of the 2010 biodiversity target; it is to be hoped that that the EIA process has been successful in decreasing the rate of loss and degradation of natural habitats – but there are no datasets available to assist in such an evaluation.

## Chapter 3: Sectoral and Cross-Sectoral Integration or Mainstreaming of Biodiversity Considerations

### 3.1 Cross-Sectoral Integration of Biodiversity

#### 3.1.1 The Environmental Management Plan for Seychelles 2000-2010 (EMPS).

The primary strategic mechanism for the integration of environmental concerns into socioeconomic sectors in Seychelles is the EMPS (**GoS 2000a**). The EMPS sets out ten thematic areas including one entitled “*Biodiversity, Forestry and Agriculture*” and another “*Fisheries and Marine Resources/Processes*”. These two chapters effectively cover Seychelles’ main biodiversity issues and their cross-sectoral integration. As discussed previously (see **Section 2.2**) the Biodiversity thematic area was conceived on the basis of the content of the existing NBSAP and then subject to stakeholder review and updating. The then Division of Environment, in light of the national profile and priority of the EMPS, opted to pursue the EMPS as its primary tool for the implementation of the national Biodiversity agenda.

The EMPS was developed through an iterative and comprehensive process of national stakeholder consultation and sets out a functional and rigorous administration procedure to ensure its effective review and adaptive management. The EMPS established a representative national stakeholder Steering Committee to advise the DoE on its implementation.

Unfortunately the EMPS was not administered as intended and the reviews and updating never took place resulting in various shortcomings in terms of the management and implementation of national biodiversity objectives (see **Section 2.2** for further information). It is intended that the 3<sup>rd</sup> generation EMPS (SSDS 2011-2020) will effectively address these shortcomings and enable enhanced mainstreaming of biodiversity as a contribution to Seychelles’ pursuit of sustainable development.

#### 3.1.2 Management of the Development Cycle.

Biodiversity is integrated in to the development cycle by two primary legal mechanisms<sup>30</sup> the 1972 Town and Country Planning Act (TCPA) and the 1994 Environment Protection Act (EPA) with its 1996 Environmental Impact Assessment regulations. The Acts working together provide the approval mechanism and conditions for developments through the Planning Authority.

Biodiversity issues are incorporated through ecologically sensitive areas set out in the sensitive areas atlas (see **Section 2.8.5** for further information). Shortcomings in this mechanism have been identified with regard to discrepancies between the two Acts and the need to update the

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<sup>30</sup> These laws are complemented by and applied in the context of the country’s Protected Area network and protected species legislation established under the National Parks and Nature Conservancy Act (NPNC), the Wild Animals and Birds Protection Act (WABPA), The Fisheries Act, the State Land and River Reserves Act and the Protected Areas Act.

1996 sensitive areas atlas. These issues are being addressed under the GEF mainstreaming of Biodiversity project.

### 3.1.3 Sectoral Strategies.

The key economic sectors of Seychelles are tourism and fisheries both of which depend upon the national collateral of a healthy, productive and aesthetically pleasing environment. The importance of sound environmental management and the sustainable use of biodiversity therein are therefore prominent in strategic documents for the sectors e.g. Vision 21: *Tourism Development in Seychelles 2001-2010 (GoS 2000b)* and The Fisheries Policy of Seychelles (**GoS 2005b**). The fisheries sector re-iterates and develops the objective of sustainable use in its various fishery management plans and strategies - e.g. An inshore management strategy for Seychelles (**Mees et al 1998**) and its shark NPOA (**Nevill et al 2007**) – for further information on fisheries management and the integration of biodiversity concerns therein see **Section 1.3.1**.

Forestry policy has, in particular amongst sectoral approaches, seen a fundamental shift within the last 15 years taking its emphasis from timber production to biodiversity conservation. The Agricultural Policy 2003-2013 (**GoS 2003**) also seeks to reduce environmental and biodiversity impact from its activities by lowering artificial chemical input, conserving soil and reducing water consumption by the application of biodiversity-friendly technologies.

### 3.1.4 Monitoring and Review.

Aside from sectoral implementation and project reports broader national assessments and reports provide insight into the effectiveness of biodiversity integration e.g. National Capacity Self Assessment (**GOS 2005a**) and the Millennium Development Goals Report (**GoS 2010b**) and enable review and adaption of ongoing initiatives.

## **3.2 The Ecosystem Approach and Mainstreaming Biodiversity.**

Implementing the ecosystem approach in tropical countries, where knowledge of the overall species content and complexity of ecosystems is often highly limiting, is a difficult task. Seychelles, in particular in the context of its ancient terrestrial ecosystems on the main granite islands and the unique assemblages and interactions of its coral reefs, faces real capacity limitations in this regard.

Indicator species, typically high food chain or key structural species, are utilised to provide insight into ecosystem health and guidance to management regimes. In the terrestrial domain apex species (e.g. birds or reptiles) and their relative occurrence and abundance have typically been used to guide ecosystem management. In the marine ecosystem productivity of commercially important species and estimates of their standing biomass and/or CPUE provide the main criteria guiding management; chapter 1 has highlighted the relative impact and success/efficacy of these measures.

Seychelles has programmed two major national initiatives aimed at increasing capacity to utilise the ecosystem approach to mainstream biodiversity -the GEF full-size projects “*Mainstreaming Biodiversity Management into Production Sector Activities*” (Mainstreaming Biodiversity Project



commenced in 2008)(GoS 2007) and the “*Strengthening Seychelles' Protected Area System through NGO Management Modalities*” (Protected Areas Project scheduled to commence in 2011). These two projects directly address these concerns by seeking to integrate biodiversity across development sectors and upgrading the protected area network and managing it in the context of the broader land and seascapes respectively.

One key example of the application of the ecosystem approach, and one where Seychelles has excelled, is the mainstreaming of biodiversity into the tourism sector in the case of small island ecosystems. Since 1995 several small islands (e.g. Bird, Denis, Fregate and North Islands) have undergone ground breaking IAS eradication programmes allowing for subsequent habitat rehabilitation and the introduction of critically endangered endemic species. This has taken place mostly on private tourist resort islands and been funded primarily by the tourism industry.

Other key examples of ecosystem restoration have taken place on the Special Reserves of Aride and Cousin – managed by the Island Conservation Society and Nature Seychelles respectively. Private island initiatives have also been undertaken – e.g. Cousine, Conception and D’Arros Islands. The combination of and synergies between these initiatives have constituted the major advance in the national conservation and sustainable use of biodiversity during the reporting period (see **Case Study 6**) and offer considerable hope, and provide a basic model, for further and more ambitious initiatives in the future.

#### CASE STUDY 6: ECOSYSTEM REHABILITATION

##### *The case of small islands in Seychelles – A government, NGO and private sector partnership.*

**Ecosystem Rehabilitation.** Seychelles has made remarkable progress in small island ecosystem rehabilitation – a field in which the country is definitely amongst the world leaders. The major breakthroughs in biodiversity conservation in Seychelles over the last 20 years have been directly related to such rehabilitation projects. This process can be considered to have started in 1968 with the purchase of Cousin island, by the Royal Society of Nature Conservation, in order to save the Seychelles warbler (*Acrocephalus sechellensis*) from extinction; the bird at that time, being restricted entirely to a wooded promontory on the tiny (26ha) island with a population of less than 30. This initiated a longstanding and ongoing rehabilitation programme. Aride Island followed suit in 1973 being purchased for conservation purposes and commencing its own rehabilitation programme. Cousin and Aride were designated Special Reserves, the highest protected conservation status utilised under Seychelles law, in 1974 and 1979 respectively.

Private islands also came on board with the eradication of cats, a significant Invasive Alien Species (IAS), on Fregate and Cousine Islands for conservation objectives in 1982 and 86 respectively. Cousine commenced its own extensive ecosystem rehabilitation programme in 1993. Activities really became mainstreamed however from the mid-1990s onwards. In 1995 Bird Island, a privately owned sand cay with an area of 101ha, successfully undertook a rat eradication<sup>31</sup> with the objective of enhancing the tourism product and protecting the important Sooty tern (*Onychoprion fuscata*) colony there. This showed the feasibility of the process in the tropics and led to the formulation of a much larger plan.

In 1998, with the financial support of the Dutch Government, the Department of Environment coordinated a project of multiple partners to undertake mammalian predator eradications on three islands: Curieuse, Denis and Fregate. Curieuse, the 5<sup>th</sup> largest island in the central archipelago at 286 Ha, offered scope for re-introduction of various endangered endemic species. Denis a privately owned coral island (143 Ha), had great potential having significant areas of lowland forest and offering scope for considerable further rehabilitation. Fregate, a granite island of 219ha, embodied a different scenario with rats (*R. norvegicus*) having only been introduced with building materials in 1995;

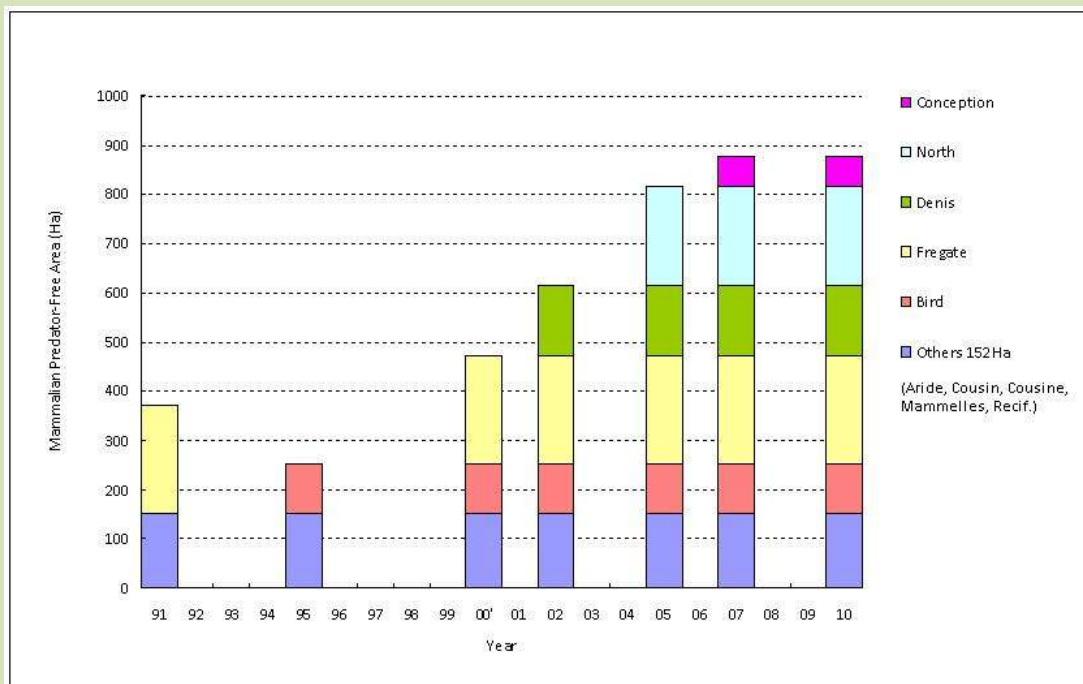
<sup>31</sup> Rats both *R. rattus* and *R. norvegicus* are particularly damaging IAS to Seychelles’ terrestrial ecosystems – the only indigenous terrestrial mammals in Seychelles being species of bat.

the subsequent rodent population explosion was threatening key populations of endemic species such as the Tenebrionid beetle (*Polposipus herculeanus*), the Seychelles Magpie Robin (*Copsychus sechellarum*) and the Seychelles Fody (*Foudia sechellarum*). Expertise, led by the late Don Merton, was brought in from New Zealand to spearhead the multi-partner<sup>32</sup> national project and after two years of careful preparation the project was implemented in 2000.

Unfortunately rats were found again on both Denis and Curieuse in the latter half of 2001 – initial reports however indicated small localized populations suggesting re-introductions. Importantly however Fregate, which was the most difficult and complicated eradication programme proved successful. The recent introduction of *R. norvegicus* meant that there was still significant endemic biodiversity interest on the island that had to be catered for through the eradication campaign. 39 magpie-robins (the entire Fregate population) and 330 Seychelles fodys were taken into captivity for 11 weeks to avoid risk of secondary poisoning; giant tortoises were likewise corralled and an ex-situ population of the Fregate Giant tenebrionid beetle was established at London Zoo prior to the operation. The captive management of the birds on Fregate greatly enhanced knowledge of the species and their management that has helped considerably in subsequent translocations. The Magpie-robins in particular prospered with pairs producing young whilst in captivity. After the eradication Magpie-robin post-fledgling mortality dropped dramatically; captive management had shown that for the first 3 or 4 days post fledging that juveniles roosted on or very near the ground making them very vulnerable to rat predation.

So despite the failures on Curieuse and Denis the process was proven to be possible. Since then Denis has tried again (2002) and been successful and North (201Ha) in 2005 and Conception (60Ha) in 2007 have followed suit<sup>33</sup>. These eradications have served to increase the area of mammalian-predator free land in the central archipelago nearly six-fold since 1994.

**Figure 1. Area of Mammalian Predator Free Land in Central Archipelago.**



<sup>32</sup> Denis Island Development (Pty) Ltd, Department of Environment, Fregate Island Private, Marine Parks Authority, Nature Seychelles.

<sup>33</sup> Darros Island and Cosmoledo Atoll in the outer islands have also recently undergone eradication programmes.

**Table 1: Island Mammalian IAS Eradications in Central Archipelago**

Island	Rats		Cats	Mice	Rabbits	Notes
	<i>Rattus rattus</i>	<i>R. norvegicus</i>	<i>Felis catus</i>	<i>Mus musculus</i>	<i>Oryctolagus cuniculus</i>	
Bird	1996				1996	Rabbits were present by the early 1900s. <i>R. rattus</i> was introduced in early 1970s. Undertaken to preserve native wildlife and facilitate tourism operation.
Conception		2007				<i>R. norvegicus</i> eradicated to increase breeding success of white-eye population.
Cousine			1986			Cat eradication to protect important (7 species) sea bird colony (the Sooty tern naturally re-colonised in 2003). Enabled subsequent species introductions.
Curieuse			2001			Eradications attempted to enable ecosystem rehabilitation and re-introduction of endemic species. Cats were eradicated but the rat programme failed.
Denis	2002		2001	2002		Eradications to facilitate tourism operation, rehabilitation of island ecosystem and introduction of endangered species. Sea bird colony also recovering.
Fregate		2000	1982	2000		Cat eradication to protect Magpie-robin population at that time the last one on the planet of only 20-25 birds. Rats were introduced in 1995
North	2005		2003			Eradications to facilitate tourism operation, rehabilitation of island ecosystem and introduction of endangered endemic species. Sea bird colony also recovering.

**Endemic Species Conservation.** The eradication of IAS mammalian predators coupled with extensive habitat rehabilitation programmes on various islands have combined to provide the basis for great advances in threatened endemic species conservation. This includes the downgrading of the IUCN red list status of the Seychelles warbler to Vulnerable, the Magpie-robin to Endangered and the Fody to Near Threatened. See **Table 2** for details on population increases.

**Table 2: Species (Re-)Introduction**

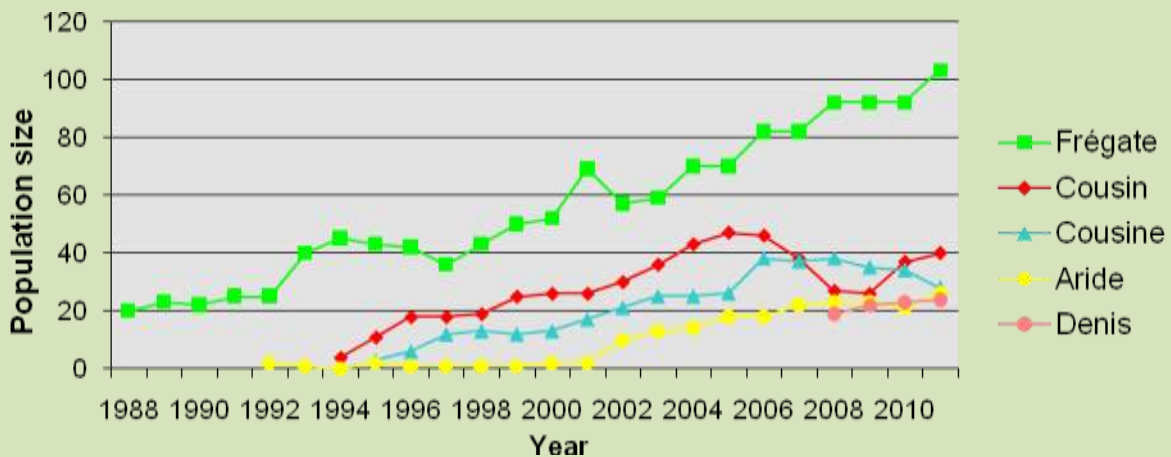
Species	Islands						Notes
	Arde	Cousin	Cousine	Denis	Fregate	North	
Seychelles warbler ( <i>Acrocephalus sechellensis</i> )	1989	Naturally Present	1990	2004			From 30 birds in 1968 on one small island to 2930 on four islands in 2010.
Seychelles magpie-robin ( <i>Copsychus sechellarum</i> )	2002	1994	1995	2008	Naturally Present		From c. 15 birds in one population in 1965 to 220 birds in five populations in 2010.
Seychelles fody ( <i>Foudia sechellarum</i> )	2002	Naturally Present	Naturally Present	2004	Naturally Present		From 3 to 5 breeding populations in the central archipelago.
Grey white-eye ( <i>Zosterops modestus</i> )			2007		2001	2007	From 320 birds in 2 populations in 1999 to 575 birds in 5 populations in 2009 (See <b>Case Study 2</b> ).
Black paradise flycatcher ( <i>Terpsiphone corvina</i> )				2008			Establishment of second breeding population.
Black mud terrapin ( <i>Pelusios subniger parietalis</i> )						2008	Introduction of captive bred terrapins to rehabilitated wetland site.

The Seychelles warbler is the country's flagship conservation success story with a phenomenal recovery from 30 birds in 1968 to nearly 3,000 birds divided between four island colonies in 2010. Work continues on the warbler with Fregate the next island identified for introduction with existing habitat there having been assessed sufficient to support a population of some 500 birds. The Magpie-robin is a larger bird with larger territorial requirements but its conservation is another great success. In 1965 the species was restricted to Fregate, island with a population possibly as low as just 12 birds. In 2011 the population was approximately 220 birds distributed between 5 islands with an ongoing upward population trend, **Figure 2** overleaf sets out the population trends on the 5 islands. An additional IAS problem, that of the Indian Myna bird (*Acridotheres tristis*) which was preying on eggs and chicks on Denis Island, is being addressed with more than 900 of the estimated 1000 mynahs on the island already accounted for. It is hoped that this will enable rapid growth in the Denis Magpie-robin population in the next few years as large areas of habitat are available.



Two great Seychelles conservation success stories: Seychelles warbler (left) and the Seychelles magpie-robin (right).

Figure 2: Seychelles Magpie-robin population trends (Provided courtesy of Nature Seychelles).



**Maintaining Gains.** The original problems faced by Denis and Curieuse islands highlighted the difficulties of maintaining islands rat free. All the islands have developed rat prevention protocols relative to their respective activities and circumstances to minimize risk of introductions. These islands represent models of conservation management that could be on other islands – indeed D’Arros Island in the Amirantes and islands of Cosmoledo Atoll have recently also undergone eradication programmes. To help secure these gains and encourage other islands to invest in similar projects several private islands have been lobbying since 2007 for the creation of a new protected area status that will allow them to control access to the island by visiting vessels and thereby further reduce the risk of inadvertent rodent introduction. Options for this are to be investigated in the forthcoming GEF full-sized PA project to commence in 2011. Once in place, such measures will constitute the final component, of an integrated national multi-stakeholder programme that mainstreams biodiversity conservation into tourism development and harnesses significant new and additional private sector resources in the advancement of national objectives for the conservation and sustainable use of biodiversity.

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## **Chapter 4: Conclusions – Progress towards the 2010 Target and Implementation of the Strategic Plan**

### **4.1 Progress towards the 2010 Target**

National progress and contributions towards the 2010 Target are assessed and summarized in **Table 10** overleaf using an adaptation of the framework for goals and targets set out in CBD decision VIII/15.

One of the key difficulties in preparing this report has been the discrepancy between the Seychelles' biodiversity strategic management cycle and that of the CBD. The CBD Conference of the Parties has met on a 2 year cycle since 1998 – resulting in new decisions and evolving national commitments for Seychelles every two years. Strategic biodiversity management in Seychelles over the last 20 years however has been driven by successive 10 year plans (EMPS 1990-2000 and 2000-2010). This ten year cycle coupled with certain flaws in the administration of the EMPS (see **Section 2.2** for details) means that the evolving commitments under the CBD have not been incorporated into national strategic documents in a timely and responsive manner. The 2010 target and its components have not therefore been, in general, established in national targets or incorporated into relevant sectoral or cross-sectoral strategies. A key exception to this is the National Strategy for Plant Conservation 2005-2010 a joint NGO/Government initiative written as a national strategic document to address the CBD's Global Strategy for Plant Conservation. Major projects however have been developed incorporating updated international commitments; the preparatory phase of GEF project development (PDF/PPG) has been particularly useful in this regard making up for the shortfall and currency of national strategic documents.

As discussed in **Sections 2.7.2 & 2.7.3** the development and operation of a second NBSAP, independent from the SSDS 2011-2020 could provide a mechanism whereby national activities in the domain of the conservation and sustainable use of biodiversity can be more responsive to evolving CBD commitments and targets.

**Table 10: Assessment of progress towards 2010 Biodiversity Target**

Goals and Targets	Target Integration and Indicators	Implementation, Obstacles and Notes
<i>Theme: Protect the Components of Biodiversity</i>		
<b>Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes.</b>		
Target 1.1: At least 10% of each of the world's ecological regions effectively conserved.	A target of more than 50% of landmass incorporated into PAs has been set by the political executive.  No national target developed for the marine environment so the CBD 10% by 2012 target applies.	Approximately 47% of land protected for environmental reasons by the end of 2010. The area effectively managed for C&SU of BD objectives however is much less and PAN coverage of priority biodiversity is not optimised.  Less than 0.1% of Seychelles marine environment is currently protected, areas not representative of biodiversity and capacity limiting to enforcement of legislation.
Target 1.2: Areas of particular importance to Biodiversity protected.	No national target developed so CBD target of coverage of representative and viable biodiversity assemblages applies.	Many key areas are covered including priority areas of endemic biodiversity – however no structured gap analysis of PAN BD coverage has been undertaken and various studies (e.g. Carlstrom 1996, Rocamora & Skerret 2001, Gerlach 2008a terrestrially and Engelhardt 2004b for coral reefs) have identified key biodiversity areas not covered by the current PAN. The existing PAN has been developed over the last 30-40 years in the absence of a strategic approach to incorporate priority viable and representative biodiversity areas e.g. the early marine parks were selected for tourism utility over biodiversity value.
<b>Goal 2. Promote the conservation of species diversity.</b>		
Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups.  &  Target 2.2: Status of threatened species improved.	Various targets established under action plans for threatened endemic bird species (also considered to be good indicator species) e.g.: <b><i>Acrocephalus sechellensis</i></b> : improve status from vulnerable d2 to vulnerable. Increase range to 5 populations and numbers to over 3,000. <b><i>Copsychus sechellarum</i></b> : improve status from critically endangered to endangered. 200 mature individuals on 6 islands by 2006. <b><i>Foudia sechellarum</i></b> : improve status from vulnerable to near threatened, 2000 individuals on 7 islands by 2006. <b><i>Zosterops modestus</i></b> : add an additional 2 islands to species range and increase the population to a minimum of 750. <b><i>Terpsiphone corvina</i></b> : improve status from critically endangered to Vulnerable, increase the number of breeding populations to at least 3 by 2006.	Excellent progress has been made on species action plans for threatened endemic bird species (see <b>Case Study 6</b> ): <b><i>A. sechellensis</i></b> : 4 populations, 2,930 birds, status improved to threatened. <b><i>C. sechellarum</i></b> : 5 populations, 220 birds, status improved to endangered. <b><i>F. sechellarum</i></b> : 6 populations, status improved to near-threatened. <b><i>Z. modestus</i></b> : 3 new populations established, 575 birds, status improved to endangered (see <b>Case Study 2</b> ) <b><i>T. corvina</i></b> : second breeding population established.  A successful ex-situ breeding programme was established by the

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	<p>The Seychelles Terrapin Action Plan (Gerlach 2002) sets out population targets for each endemic sub-species (<i>Pelusios castanoides intergularis</i> &amp; <i>P. subniger parietalis</i>), as well as programmes for habitat management and further population investigation.</p> <p>Other species plans developed include a marine turtle strategy and action plan (MCSS 2004) and a draft action plan for 3 species of endemic sooglossid frog (Doak 2007).</p>	<p>NGO NPTS that enabled the (re)introduction of <i>P. subniger parietalis</i> to a rehabilitated wetland habitat on North Island. In general however the status of natural populations of both subspecies continues to decline due to ongoing habitat degradation (Gerlach 2008b).</p>
<p><b>Goal 3. Promote the conservation of genetic diversity.</b></p>		
<p>Target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish, wildlife and other valuable species conserved, and associated local knowledge maintained.</p>	<p>Fisheries are managed by the SFA which has the overall mission to: “<i>Develop the fishing industry to its fullest potential and to safeguard the resource base for sustainable development</i>”.</p> <p>The National Strategy for Plant Conservation (NSPC) sets out 3 targets for crops:</p> <p>5a: National database for crop varieties – <i>update national database on local crop varieties in situ and ex situ.</i></p> <p>5b: Conserving rare crop varieties – <i>conservation of 60% of local crop varieties in ex-situ collections.</i></p> <p>5c: Local participation in rare crop conservation – <i>strengthen on-farm conservation by involving 500 home gardens in planting rare crop varieties.</i></p> <p>An extensive terrestrial PA network has been established with the C&amp;SU of BD as a primary objective.</p>	<p>Legislation, policies and fishery management plans have been developed and implemented (see <b>Section 1.3</b>). These however have focused predominantly on population abundance and distribution; genetic analysis of populations has been limited.</p> <p>5a: database of local agricultural varieties established and transferred to National Botanical Gardens Foundation.</p> <p>5b: 11 hectares have been set aside at the Barbarons Biodiversity Centre for the planting and maintenance of rare of agricultural varieties.</p> <p>5c: 7,000 homes are known to maintain agricultural gardens and these are believed to maintain important rare varieties – further work is required to catalogue and bring these varieties into ex-situ collections.</p> <p>Genetic assessment of the Coco-de-Mer populations, subject to commercial exploitation through harvesting of nuts, has been undertaken (see <b>Case Study 1</b>) to enhance conservation management. Some tree species made rare by historical timber exploitation –are subject to nursery and out planting schemes e.g. <i>Vateria seychellarum</i>, <i>Mimusops sechellarum</i></p> <p>The genetic make-up of the <i>Northia seychellana</i> population on Curieuse has also been assessed due to its apparent adaption to the dry and denuded hillside habitats of the island.</p>

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<i>Theme: Promote Sustainable Use</i>		
<b>Goal 4. Promote sustainable use and consumption.</b>		
Target 4.1: Biodiversity based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity.	<p>The NSPC sets out three targets for sustainable production of valuable plants:</p> <p><b>8a: Sustainable production</b> – produce 80% of plant-based, locally derived products sustainable by 2010.</p> <p><b>8b: Sensitising and helping users</b> – sensitize and provide incentives such as technical support to herbalists and stakeholders, so that poaching and over-exploitation are no longer threats to native plant species.</p> <p><b>8c: Coco-de-Mer use</b> – establish and implement effective mechanisms for the SU of Coco-de-Mer, including consideration of its inclusion in CITES appendices.</p>	<p>Progress has been made on target <b>8a</b> but data on implementation is not available. Extensive work on <b>8b</b> has been undertaken including seminars, training and the establishment of ex-situ medicinal gardens it is believed – though not quantified – that this has served to reduce pressure on wild plant populations. Target <b>8c</b> has been realised and adaptive management of the nut harvest is ongoing (see <b>Case Study 1</b>).</p> <p>Trends in abundance and distribution of certain species are monitored and utilised to adaptively manage fishery activities e.g. lobster fishery (see <b>Section 1.3</b>)</p>
Target 4.2: Unsustainable consumption, of biological resources, or that impact upon biodiversity is reduced.	<p>Fisheries, forestry and biodiversity strategies are all based on the principle of the conservation and sustainable use of biodiversity as a fundamental component of the national pursuit of sustainable development.</p>	<p>All such plans seek to prevent unsustainable consumption and minimise impact upon biodiversity.</p> <p>Overall implementation of the objective is hard to assess there are good model success stories such as management of the Coco-de-Mer nut and Sooty tern egg harvests respectively (<b>Case Studies 1 &amp; 4</b>); but there are also many problematic examples such as the management of various fisheries and their by-catch. In the domain of fisheries capacity to enforce legislation and effectively implement management plans (e.g. the NPOA sharks) are limiting and various stocks are known to be over-exploited both nationally and regionally (see <b>Section 1.3 and Table 3</b>).</p>
Target 4.3: No species of wild flora endangered by international trade.	<p>No national target with specific reference to trade adopted for plants so international target applies.</p>	<p>This target is considered to be currently successfully attained. Seychelles is Party to CITES and has 21 species of plant listed under the Convention – most of which are orchids.</p> <p>The plant species that has been considered at threat from international trade is the Coco-de-Mer (<i>Lodoicea maldivica</i>) due to the curio and supposed medicinal value of its nut in certain markets. This has been addressed by a thorough census of productive trees the legal requirement for the registration and certification of nuts for sale and export. A sustainable harvest and re-planting regime has also been developed and initiated (see <b>Case Study 1</b>).</p>



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<i>Theme: Address threats to biodiversity</i>		
<b>Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced.</b>		
Target 5.1: Rate of loss and degradation of natural habitats decreased.	No national habitat based target developed so international target applies.	Despite ongoing downward trends in many habitat types (see <b>Tables 5 a - c</b> ) the rate of degradation has been dramatically decreased or reversed in all habitats during the 1997- 2010 reporting period except for lowland wetlands and coral reefs – so in general implementation of this target is considered good.
<b>Goal 6. Control threats from invasive alien species.</b>		
Target 6.1: Pathways for major potential alien species controlled.	The National Biosecurity Strategy sets out as its first 2 objectives: 1). The introduction and establishment of IAS is prevented and minimised. 2). The spread and impact of IAS is prevented, minimised and effectively managed.	A full-size GEF project on IAS is ongoing in Seychelles it has included an institutional review of IAS quarantine and control functions (Ikin & Dogley 2009), an introduction threat analysis, the establishment of an IAS baseline (Nevill 2009), the development of a National IAS Strategy (Nevill & Ikin 2010) and the development of a new institutional and legal framework to govern the prevention, control and eradication of IAS in Seychelles. IAS is the key biodiversity issue in the terrestrial domain and these initiatives have sought to identify and address the obstacles in the existing IAS pathway control. Technical capacity remains a limiting factor however.
Target 6.2: Management plans in place for major alien species that threaten ecosystems, habitats or species.	The National Strategy for Plant Conservation sets out target 7a to “Implement efficient management programmes for at least 7 established invasive plant species”. There are no national targets established for animal IAS but several key areas have detailed and effective IAS management plans.	No national plant IAS plans have been developed to date however various site-based IAS management plans are in place and under implementation. Several key areas have detailed and effective IAS management plans some are comprehensive such as for Cousin, Aride and North islands. Others are specific to key IAS species e.g. rodent prevention plans for Denis and Fregate islands. Aldabra has various IAS management measures in place most notably the ongoing eradication programme for Goats which is approaching resolution. Plans are also in development for the eradication of various avian IAS from nearest island of Assumption to prevent their subsequent colonisation of Aldabra. The Vallee-de-Mai has had an effective removal of IAS creeper species and a general IAS prevention plan is in place. The broader Praslin National Park also has a general IAS management plan.
<b>Goal 7. Address challenges to biodiversity from climate change, and pollution.</b>		

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<p>Target 7.1: Maintain and enhance resilience of components of biodiversity to adapt to climate change.</p>	<p>No national target developed so international target applies.</p>	<p>The bulk of research directly linked to the resilience of biodiversity to climate change has focused on coral reef systems (Engelhardt 2004b, Graham et al 2007 etc... see <b>Section 1.3.9</b>). Research has been undertaken into the resilience of Seychelles' endemic palm forests to climate change to enable enhanced management for resilience. Understanding and tools in this regard nationally remain limiting to the development and implementation of mitigatory management regimes.</p>
<p>Target 7.2: Reduce pollution and its impacts on biodiversity.</p>	<p>No national target developed so international target applies.</p>	<p>There is no systematic monitoring of water quality in natural systems so overall trends are not available. Algal growth etc in lower reaches of many water systems on the main three islands suggests considerable enrichment pollution. The Environment Protection Act 1994 covers illegal pollution and point source incidents are followed up on a case-by-case and polluter-pays basis. Despite often very difficult terrain on the main populated islands connection to integrated sewage systems is progressively expanding through population centres. Large tourism developments are required to have their own sewage treatment plants that meet international standards. Industrial discharge is also closely monitored with in particular the discharge from the tuna factory having been greatly improved during the reporting period despite its expanded operations.</p>
<p><i>Theme: Maintain goods and services from biodiversity to support human well-being</i></p>		
<p><b>Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods.</b></p>		
<p>Target 8.1: Capacity of ecosystems to deliver goods and services maintained.</p>	<p>No national target developed so international target applies.</p>	<p>The substantial increase in montane forest cover on the main islands over the last 50 years has without question improved the water cycle capacity and soil cycle status. Various species and multi-species fishery data indicate an overexploitation on the Mahe plateau which implies a reduction in ecosystem capacity. No Marine Trophic Index has been developed however and so overall trends are unknown. Pelagic stocks also face considerable problems (see <b>Table 3</b> and associated text).</p>
<p>Target 8.2: Biological</p>	<p>No national target developed so international target applies.</p>	<p>Trends in the cost of fish on the local market are closely monitored</p>

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<p>resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained.</p>		<p>by the National Statistics Bureau as a prime indicator of the cost of living. This also reflects the productivity of the Mahe Plateau and the sustainability of its exploitation. These indices are utilised to guide management of fisheries and the provision of incentives to the fishing sector to maintain a sustainable supply of quality cheap protein to the populace.</p> <p>Certain Protected Areas successfully serve to provide livelihoods for local communities. Prime examples would be Vallee-de-Mai and Cousin Island Special reserve both of which have undertaken assessments of their financial contribution to local communities through direct and secondary benefits – such as direct employment, boat hire, taxi fees, guide services, related merchandising etc... it is hoped to expand these models to larger areas and to quantify economic benefits from PAs through tourism and related services.</p>
<p><i>Theme: Protect traditional knowledge, innovations and practices</i></p>		
<p><b>Goal 9. Maintain socio-cultural diversity of indigenous and local communities.</b></p>		
<p>Target 9.1: Protect traditional knowledge, innovations and practices.</p>	<p>No national target developed so international target applies.</p>	<p>Effort has been made to record and catalogue traditional knowledge in particular with regard to the applications of medicinal plants. The local patois language (Creole) has been mainstreamed by development into a written language and incorporation into the education syllabus.</p> <p>All awareness campaigns and traditional knowledge initiatives are likewise promoted and presented in Creole to ensure optimum access to communities in general and practitioners in particular.</p>
<p>Target 9.2: Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit-sharing.</p>	<p>No national target developed so international target applies.</p>	<p>Progress has been made nationally in some aspects by Seychelles joining the World Intellectual Property Organisation (WIPO) but this has been focused primarily upon protection of copyright issues pertaining to Arts and literature. No specific measures have been developed to protect aspects of biodiversity related traditional knowledge.</p> <p>An Access and Benefit Sharing Bill has been drafted but this is directed at the protection of national rights when access provided to foreign parties.</p> <p>Domestic access is governed by existing PA and protected species legislation but measures for domestic benefit sharing have not yet been elaborated.</p>
<p><b>Goals and Targets</b></p>	<p><b>Target Integration and Indicators</b></p>	<p><b>Implementation, Obstacles and Notes</b></p>

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<i>Theme: Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources</i>		
<b>Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources.</b>		
Target 10.1: All access to genetic resources is in line with the CBD and its relevant provisions.	No national target developed so international target applies.	An Access and Benefit Sharing Bill (Lewis-Lettington & Dogley 2006) that seeks to protect Seychelles' rights to its genetic diversity has been drafted. This has yet to be promulgated indicating a lack of progress in this domain. In the interim the Nagoya Protocol on Access and Benefit Sharing has been developed under the auspices of the CBD. As such the 2005 Bill will require review in that context before promulgation.
Target 10.2: Benefits arising from the commercial and other utilisation of genetic resources shared in a fair and equitable way with the countries providing such resources.	The CBD developed and finalised the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization and it was opened for signature on the 2 <sup>nd</sup> February 2011.	Signed by Seychelles 15 <sup>th</sup> April 2011.
<i>Theme: Ensure provision of adequate resources</i>		
<b>Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention.</b>		
Target 11.1: New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.	Seychelles has benefited significantly from biodiversity-related international donor funds.	<u>2 full size GEF projects</u> : Mainstreaming Biodiversity & Biosecurity (a 3 <sup>rd</sup> full size project on PAs has been approved for 2011). <u>5 GEF Medium Size projects</u> have been awarded 3 NGO led and 2 to Government led. A FFEM grant (equivalent to a GEF MSP) was awarded to an NGO. The <u>GEF Small Grants Programme</u> , recently launched in Seychelles, with 5 biodiversity projects awarded by the end of 2010. Various grants have been received from other <u>multilateral donor agencies</u> such as ReCoMaP and MFF. <u>Bilateral donors</u> have also been significant – most notable a US \$ 1 Million biodiversity grant from the Dutch Government (1998 – 2001) but also from the Governments of Australia, Sweden, UK and USA.
Target 11.2: Technology is transferred to developing country parties, to allow for the effective implementation of their commitments under the Convention.	No national target developed so international target applies.	Seychelles has received assistance in technological application in particular in the field of satellite tagging and genetic analysis. The very small population of Seychelles (c 85,000) means it is very unlikely that independent capacity for such technologies can be established in-country. Though direct interpretation of satellite data has been realised in some projects.

## **4.2 Progress towards the Goals and Objectives of the Strategic Plan.**

Progress in meeting or contributing to, the relevant goals and objectives of the Strategic Plan is summarised in **Table 11** overleaf – adapted from annex III of the CBD report guidelines.

### **4.2.1 Achievement of Goals and Objectives at the Convention Level.**

Seychelles has to date submitted three national reports for the convention. Since we became a party in 1992, we have been actively running a national program that has set our biodiversity and natural environment as our main priority. National legislations have been set up since then to ensure that we have a framework whereby our policies now allow us to enforce accordingly. Our involvement with the CBD has helped create widespread local awareness between our Environmental NGOs, the general public. The government of the Seychelles has designated over 47% of its total land surface as protected areas and continues to identify areas of significant ecological importance to protect. Seychelles has been one of the countries that have benefited the most with funding of several projects from GEF over the past decade. More recently we have started to mainstream biodiversity into other sectors so that Biodiversity issues become addressed at a more strategic national level.

Despite the many achievements Seychelles has had some difficulties in establishing major protection for our marine areas, as well as with reporting especially with this fourth national report. Our participation in global meetings, forums, discussions have not been as exemplary as we would have hoped and these are the main areas that we will be working towards in the coming years.

### **4.2.2 National implementation of the Cartagena Protocol.**

As reported in Seychelles 1<sup>st</sup> National Report to the Cartagena Protocol (2007) a National Biosafety Framework has been established (**GoS 2005c**) and legislation drafted. Unfortunately there has been no further progress since that time, in part due to a change in key staff and a subsequent major Governmental restructuring. The implementation of the framework and finalisation and promulgation of the legislation must be considered a priority under the second NBSAP.



**Table 11: Assessment of Progress towards the Goals and Objectives of the Strategic Plan**

<b>Table 11: Assessment of Progress towards the Goals and Objectives of the Strategic Plan</b>		
<b>Strategic Goals</b>	<b>National goals and Indicators</b>	<b>Implementation progress and obstacles</b>
<i>Goal 1: The Convention is fulfilling its leadership role in international biodiversity issues.</i>		
1.1 The Convention is setting the global biodiversity agenda	N/A	See <b>Section 4.2.1</b>
1.2 The Convention is promoting cooperation between all relevant instruments and processes to enhance policy coherence		
1.3 Other international processes actively support implementation of CBD consistent with their respective frameworks.		
1.4 The Cartagena Protocol on Biosafety is widely implemented.		See <b>Section 4.2.2</b>
<b>Strategic Goals</b>	<b>National goals and Indicators</b>	<b>Implementation progress and obstacles</b>
1.5 Biodiversity concerns are being integrated into relevant (cross-)sectoral plans, programmes and policies at the regional and global levels.	Seychelles places a very high importance on the integration of biodiversity concerns into its international diplomacy.	Seychelles was a lead country in the formation of the Indian Ocean Whale Sanctuary, the Nairobi Convention and the CMS Migratory Sharks agreement.
1.6 Parties are collaborating at the regional and sub-regional levels to implement the CBD.	Seychelles is very active at regional and sub-regional levels of cooperation to implement the CBD.	Seychelles is active within diverse regional initiatives <i>inter alia</i> the Indian Ocean Commission, SADC – e.g. the SADC Wildlife Protocol, the Nairobi Convention, the Indian Ocean South East Asia Sea Turtle Agreement, the MoU on the Conservation of Dugongs, the Indian Ocean Whale Sanctuary, the Indian Ocean Tuna Commission etc...
<i>Goal 2: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention.</i>		
2.1 All Parties have adequate capacity for implementation of priority actions in NBSAPs.	As a SIDS Seychelles faces the capacity and resource limitations typical of such countries.	Of the 8 NBSAP projects identified as addressing priority issues of “high biodiversity significance” 5 were successfully implemented, 2 partially implemented and 1 not implemented. Review of the implementation of strategic objectives ( <b>Table 9</b> ) also shows broad and extensive progress. Capacity is however limiting in certain key areas e.g. management of IAS in intermediate forest, effective management of fishery resources and certain key skills areas e.g. in the fields of taxonomy and environmental economics.
2.2 Developing country Parties, in particular LDCs and SIDS, have sufficient resources available to implement the three objectives of the CBD.	As a SIDS Seychelles faces the capacity and resource limitations typical of such countries.	Resources and capacity remain limiting to the effective implementation CBD objectives. Seychelles is a typical SIDS in respect of its small population, geographic isolation and related logistical constraints, high per capita infrastructure and skills requirement etc... This holds true for biodiversity management: an EEZ of 1.4 million km <sup>2</sup> means that effective implementation and enforcement of marine management plans and laws is in many cases beyond national capacity. The Seychelles is also behind on developing the appropriate mechanisms to enable the 3 <sup>rd</sup> objective of the Convention (see <b>Table 10</b> goal

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		10).
<b>Strategic Goals</b>	<b>National goals and Indicators</b>	<b>Implementation progress and obstacles</b>
2.3 Developing country Parties, in particular LDCs and SIDS, have increased resources and technology transfer available to implement the Cartagena Protocol.		See <b>Section 4.2.2</b>
2.4 All Parties have adequate capacity to implement the Cartagena Protocol.		See <b>Section 4.2.2</b>
2.5 Technical and scientific cooperation is making a significant contribution to building capacity.		Technical capacity has developed significantly on a national basis in part due to technical and scientific cooperation in the field of environmental management. The French Government in particular has provided significant technical support. Capacity has notably been built in fisheries management, marine conservation, Protected Area management etc...
<i>Goal 3: NBSAPs and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention.</i>		
3.1 Every Party has effective national strategies, plans and programmes in place to provide a national framework for implementing the 3 objectives of the CBD and to set clear national priorities.	The Seychelles NBSAP is reviewed in <b>Chapter 2</b> .	Seychelles has developed excellent strategies and plans for the conservation of biodiversity. Good plans and monitoring regimes are likewise in place for a broad range of sustainable use plans e.g. Coco-de-mer and various fisheries. Capacity to implement some of these plans can however be limiting. The 3 <sup>rd</sup> objective of the Convention has not received the same attention as the first two to date though an Access and Benefit sharing bill has been drafted (see <b>Table 10</b> goal 10).
3.2 Every Party to the Cartagena Protocol has a regulatory framework in place and functioning to implement the Protocol.		See <b>Section 4.2.2</b>
3.3 Biodiversity concerns are being integrated into relevant national (cross-)sectoral plans, programmes and policies.	Seychelles has been very successful at integrating biodiversity into sectoral and cross-sectoral plans.	Biodiversity is one of ten thematic areas in the primary national strategic environmental management document the EMPS 2000-2010. The Vision 21: Tourism development strategy, the Agricultural strategy, various fisheries management strategies. Biodiversity is integrated into the development management cycle through means of the 1994 Environment Protection Act and its 1996 EIA regulations.
3.4 The priorities in NBSAPs are being actively implemented, as a means to achieve national implementation of the CBD, and as a significant contribution towards the	Chapter 2 of this document analyses how the NBSAP addresses the active articles of the Convention and the extent to which specific projects and the broader strategic objectives of the NBSAP have been implemented.	The NBSAP has served effectively to harness and focus national capacity in the domain of C&SU of BD (see <b>Chapter 2</b> ). This in turn has furthered the global biodiversity agenda as extensive advances have been made in the understanding and effective conservation of species endemic to Seychelles (e.g. <b>Case Studies 1, 2 &amp; 6</b> ) and its unique biodiversity assemblages.



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global biodiversity agenda.		
<i>Goal 4: There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.</i>		
4.1 All Parties are implementing a communication, education and public awareness strategy and promoting public participation in support of the Convention.	Seychelles has no overarching national Public Education and Awareness (PE&A) strategy. Various agencies are however very active in this domain.	The Department of Environment has a division dedicated to PE&A and the Department of Education incorporates environmental education as a cross cutting component of the syllabus. The Wildlife Clubs of Seychelles is an NGO dedicated to the education of children in matters of biodiversity. Most environmental NGOs have active PE&A campaigns utilising the media, posters, booklets, websites etc... The national television broadcaster has a weekly environmental programme. The various national newspapers have environmental pages.
4.2 Every Party to the Cartagena Protocol is promoting and facilitating public awareness, education and participation in support of the Protocol.	<b>See Section 4.2.2</b>	
4.3 Local communities are effectively involved in implementation and in the processes of the Convention, at national, regional and International levels.	No national target established – but active drive to expand societal activity in the implementation of the CBD at the national level.	Various small grant programmes aimed at assisting small environmental groups and local area associations have been active in country – e.g. E.U., GEF SGP, MFF and ReCoMaP. The EMPS (2000-2010) steering committee has broad civil society representation.
4.4 Key actors and stakeholders, including the private sector, are engaged in partnership to implement the Convention and are integrating biodiversity concerns into their relevant (cross)sectoral plans, programmes and policies.	The EMPS 2000-2010 was structured to integrate biodiversity concerns across development sectors.	The mainstreaming of biodiversity into tourism, a key economic sector in Seychelles, has been particularly successful from hotels supporting turtle beach rookery management and wetlands conservation to financing the rehabilitation of complete island ecosystems (see <b>Case Study 6</b> ).

## 4.3 Conclusions

### 4.3.1 Implementation of the Convention and its Objectives in Seychelles.

The Seychelles when considered in its context has made broad progress in the implementation of the CBD and its objectives at the National level. Enormous political emphasis has been placed in the conservation and sustainable use of biodiversity by the designation of Protected Areas to 47% of the country's total terrestrial surface area – plans to declare further areas to take the total to over 50% have been announced. This action has served to set aside natural capital that will enable the future enhanced conservation and rehabilitation of Seychelles unique natural heritage; and the development and elaboration of non-consumptive sustainable use regimes particularly in the development of eco- and nature-based tourism.

4.3.1.1 The Mainstreaming of Biodiversity into the two main pillars of the economy has yielded great benefits both directly in terms of the harnessing of new and additional resources to the benefit of C&SU of BD but also in the localisation of capacity to develop and refine such management mechanisms in the future.

The mainstreaming of biodiversity into the tourism sector has been one of the key areas of progress during the reporting period driven by the expanding importance of ecotourism in the global tourism market; and a growing partnership between private sector resources, the drive and expertise of the environmental NGO sector and the enabling activities of Government. This integration of biodiversity into the tourism sector has yielded enormous benefit (see **Case study 6**) and offers much more potential in the future.

Great effort and resources have been put into the sustainable utilisation of marine biological resources with conservation and sustainable being the founding principle behind all management approaches. Though success in this domain has been less pronounced the national capacity to develop, monitor and adaptively manage such approaches continues to expand.

4.3.1.2 Biodiversity Conservation in the context of the CBD is broken down into three components namely the levels of ecosystem, species and genetic diversity within species.

Ecosystem level – **Tables 5a-c** in chapter 1 summarise the status of ecosystem conservation. Decline in biodiversity status in forest ecosystems has been significantly reduced in various habitat types with several habitats considered relatively stable and the case of lowland forest on small islands showing a positive trend following successful rehabilitation projects (see **Case Study 6**). Inland water ecosystems also show improvement in the isolated highland wetlands and stability in the higher reaches of water courses. Lowland wetlands however continue a worrying negative trend and these habitats can be considered perhaps the most threatened terrestrial habitat type. Marine and coastal ecosystems (**Table 5c**) show a general ongoing downward trend but in many cases the rates of decline have been significantly reduced and in others concerted national efforts are underway to better manage biological resources in general. Coral reefs remain an area of key concern with ongoing decline following the severe bleaching event of 1998 – in this case however global climate change is considered to be the primary underlying cause of declining coral cover, though greater effort could be devoted on the national level to improve reef resilience in certain key areas. Information is also lacking for proper understanding of certain marine habitats e.g. sea grass beds.

Species level - Excellent progress has been made on several apex/keystone species e.g. various endemic land birds, coco-de-mer and sea bird colonies etc... The understanding of species management has and nationally capacity in this regard has greatly improved. These areas of success need to be further expanded however to cover more keystone species such as sharks on the Mahe Plateau and terrapins for lowland wetlands. In general the understanding of endemic invertebrate species and populations is limiting to their effective conservation and that of their habitats. Some very high profile endemic species continue to decline and require urgent and substantive conservation initiatives e.g. the Sheath-tailed bat (*Coleura seychellensis*).

Genetic level - genetic work has only been applied to certain selected species – e.g. warblers, white-eyes, turtles, whale sharks, Jelly fish tree (*Medusagyne oppositifolia*) – to guide species conservation and management initiatives.

In all aspects of biodiversity conservation enhanced monitoring and assessment of key components of biodiversity is required to enable and facilitate effective management regimes.

4.3.1.3 Sustainable Use of Biodiversity. Good capacity has been built nationally for the conceptualization, development and adaptive management of management plans for sustainable use of biological resources. This is particularly the case for fishery management and ecotourism management plans. Implementation however has sometimes proved difficult and enforcement is often beyond national capacity in the very large area of sea that falls under Seychelles' purview. The enhanced development, implementation and adaptive management of marine resource management plans is required.

4.3.1.4 Equitable Sharing of Benefits. Seychelles has drafted an Access and Benefit Sharing Bill and signed the Nagoya Protocol. The Bill requires finalization and promulgation in line with the protocol to enable ratification. The internal scenario in Seychelles as it pertains to benefit sharing amongst stakeholders and civil society needs study, elaboration and understanding before further measures, if required, can be developed and implemented.

#### **4.3.2 Lessons Learned.**

4.3.2.1 Administration. Previous reviews (e.g. GoS 2005a & Nevill 2004b) and the process of compilation of this report have highlighted the need for regular updating of national biodiversity plans and strategies in line with the evolving international commitments off Seychelles. To enable this, the proposed second NBSAP should be operated distinct from the SSDS with its own stakeholder steering committee. It must incorporate a mechanism for the periodic update of programmes and national targets in line with COP decisions, the Aichi Biodiversity targets and the 2011-20 Strategic Plan. The independent operation of the NBSAP will provide a platform for the implementation of the Convention and provide a direct forum for the primary biodiversity stakeholders. The NBSAP steering committee should liaise and coordinate effectively with the SSDS 2011 -2020 steering mechanism.

4.3.2.2 Protected Areas. Seychelles has placed great emphasis on the designation of PAs as a means to conserve and sustainably use biodiversity; including the declaration of 47% of its land mass protected and the creation of the first network of MPAs in East Africa. The PA network however was not developed strategically and hence is not representative of all biodiversity. The

proportion of terrestrial PAs effectively managed for espoused objectives is relatively low – in particular with regard to the key areas of endemic biodiversity situated in mid-altitude and mountain forest on the granite islands of Mahe and Silhouette. The marine area protected falls far below the international target of 10%. Financial sustainability is also a key area requiring improvement; some smaller PAs have proven very effective and financially self-sufficient but the broader national network requires considerable further work in this regard.

4.3.2.3 Invasive Alien Species. Major advances have been made in IAS eradication and control in particular in small island ecosystems. IAS in mid-altitude forest remains major threat to endemic biodiversity however and refined field techniques and pilot projects for IAS eradication/control and habitat rehabilitation are required.

4.3.2.4 Climate Change. Research is needed into the likely impacts of climate change on biodiversity, in particular because of the fragmented nature of many terrestrial habitats and the low lying topography of the coralline islands.

### **4.3.3 Future Priorities for Further Implementation of the Convention.**

The following priorities were identified through the report development process and refined and approved by stakeholders during the second national workshop in bullet point form so as to facilitate the subsequent process to develop the second Seychelles NBSAP.

#### 4.3.3.1 Forest Biodiversity:

- IAS remains the major threat to forest biodiversity. It is important therefore to develop and refine more effective field-based approaches including pilot-projects to re-habilitate mid-altitude forest habitats.
- Establish key indicator species for the main granite islands and develop related species action plans (e.g. Sheath-tailed bat) as a means of advancing forest conservation.
- Reinvigorate/establish broader monitoring of indicator species to assist in ecosystem approach and management – including plant disease/forest health issues.
- Address fire threat by implementation of forest fire prevention and management plan.
- Investigate scope for enhanced forestry sustainable use including agro forestry and Non-Timber Forest Products.

#### 4.3.3.2 Inland Waters Biodiversity:

- Development of specific wetland site management plans for highland wetland sites, within the context of broader PA plans where appropriate.
- Lowland wetlands are perhaps the most threatened habitat type and hence require concerted and integrated effort:
  - Conservation of representative sites on three main islands required.
  - Develop integrated approach to broader lowland wetland management.
  - Develop wetland strategy in line with international commitments.
- Additional research required on more watercourses and their higher reaches including structured invertebrate research.
- Establish a system of water quality monitoring and related database incorporating indicator species.

#### 4.3.3.3 Marine and Coastal Biodiversity:

- Improve understanding of Mahé Plateau ecosystem including development of a Marine Trophic Index.
- Refine fishery management models; develop enhanced tools and capacity for fisheries planning, management and enforcement.
- Investigate sea grass ecosystems status and establish monitoring to assess trends.
- Reef resilience and recovery mechanisms:
  - Investigate scope for reef recovery and prevention of phase shift.
  - Monitor and increase reef resilience.
- Implement IAS monitoring in key areas.
- Develop national turtle policy to allow effective implementation of turtle protection laws including EIA regulations.
- Develop/expand and implement structured marine mammal research programme in the EEZ and if possible within the wider Indian Ocean Whale Sanctuary.
- Work towards greater understanding, management and control of industrial fishery activities and their by-catch issues.

#### 4.3.3.4 Island Biodiversity:

- Elaborate fully the CBD Island Biodiversity programme in the Seychelles context and develop related project proposals to enable its structured implementation in Seychelles.
- In developing the NBSAP 2 consideration should be given to the feasibility of designing it entirely in the context of the CBD Island Biodiversity Programme of Work.
- A full National biodiversity policy should be elaborated to set the context and framework for all activities and implementation of laws in that domain.

#### 4.3.3.5 Protected Areas:

- Undertake gap analysis of the Protected Area Network and identify priority areas for incorporation.
- Increase areas of MPA to meet international targets on the basis of gap analysis and feasibility.
- Enhance PA management and capacity in particular with regard to sustainability including – financing, IAS and research and monitoring.

#### 4.3.3.6 Climate Change and Biodiversity:

Undertake research into the likely impacts of climate change on biodiversity and develop and implement priority biodiversity adaptation measures.

#### 4.3.3.7 Protocols:

- Implementation of Cartagena Protocol
  - Review and promulgate Biosafety Bill
  - Implement National Biosafety Framework
- Review and promulgate Access and Benefit Sharing Bill in line with the Nagoya Protocol and FAO International Treaty on Plant Genetic Resources for food and Agriculture.
- Adopt and implement Nagoya protocol.

#### **4.3.4 Suggestions for actions to improve national implementation of the CBD at Convention, Regional and International level.**

Seychelles has done a tremendous amount of effort to ensure that it meets the obligations of the convention. To ensure that we remain in the forefront of global biodiversity the following will need to be improved:

- Review of current environmental legislation to keep them up to date with the current status of biodiversity in the country
- Increase efforts to protect more of the Seychelles marine environment
- Establish better internal coordination in the Department of environment by National Focal Point to ensure that Seychelles has timely reports and response to CBD obligations
- Participate more actively in international meetings, online forums and other such ventures that will allow us to learn more on best practises and other country experiences on the implementation of the convention.
- Continued public awareness on biodiversity and the importance on the Environment
- Increase capacity building in Environmental field

**Appendix I - Information concerning reporting Party and preparation of national report**

**A. Reporting Party**

Contracting Party	Republic of Seychelles
<b>NATIONAL FOCAL POINT</b>	
Full name of the institution	Environment Department Ministry of Home Affairs, Environment, Transport and Energy.
Name and title of contact officer	Ms. Marie-May Jeremie Acting Director of Environment Assessment and Permit.
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<b>SUBMISSION</b>	
Signature of officer responsible for submitting national report	<b>M.Jeremie</b>
Date of submission	<b>09<sup>th</sup> March 2012</b>

**B. Process of preparation of national report**

The Steering Committee for the Seychelles Environmental Management Plan (EMPS SC) is the primary and most inclusive environmental forum in the country. This Committee was therefore chosen as the best means of national stakeholder consultation for the preparation of the 4<sup>th</sup> National Report to the CBD. An initial presentation was made to the EMPS SC (4<sup>th</sup> February 2011) to introduce the report format, proposed process and an introduction to an internet workspace that would be used for iterative draft circulation and comments by stakeholders.

The workspace was operationalised and preliminary chapter outlines and subsequently progressive chapter drafts were presented for comment there. Information used was drawn from all pertinent and accessible publications and grey literature (see **Appendix II** for bibliography).

The first national stakeholder workshop was held 29<sup>th</sup> April 2011 and served to finalise the parameters of content for the first three chapters of the report and identify suitable case studies. This was followed by interviews with all the key national biodiversity stakeholders (government, NGO and parastatal agencies)

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to gain specific information input. Successive drafts of the report were placed on the workspace and case studies developed.

The first three chapters were then submitted to the Department of Environment for review, which the DoE undertook by circulation to selected national biodiversity specialists and its own technical staff. Comments were then incorporated and the first 3 chapters finalized. This enabled the drafting of Chapter 4 which was submitted to stakeholders for amendment and approval in the second national workshop on Friday 14<sup>th</sup> October 2011. Chapter 4 was then finalized, the Executive Summary composed and the full report document including Appendices submitted to the DoE for final approval and submission to the Secretariat of the Convention.



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**Appendix III – Progress towards Targets of the Global Strategy for Plant Conservation and the Programme of Work on Protected Areas**

**A. Progress towards Targets of the Global Strategy for Plant Conservation**

Seychelles developed a National Strategy for Plant Conservation (2005-2010) (PCA 2005) to address the global strategy in the national context. The numbered national targets in the table below are derived from the Seychelles strategy.

<b>Global Strategy for Plant Conservation Implementation – Evaluation Matrix</b>		
<b>GSPC Targets</b>	<b>National Targets</b>	<b>Progress</b>
1). A widely accessible working list of known plant species, as a step towards a complete world flora	<p><b>1).</b> Establish a widely accessible and comprehensive information resource on the Seychelles plant diversity focusing on dicotyledons, monocotyledons and ferns.</p> <p>1a). National database for flowering plants.</p> <p>1b). National Fern database.</p> <p>1c). Illustrated guide to native plants.</p> <p>1d). Atlas of important plant areas.</p>	<p>Various works are already in existence e.g. Baker 1877, Friedmann 1986 &amp; 1994, Sachet 1983, Stoddart 1984 etc...</p> <p>1a). Database not implemented but knowledge of dicotyledons considered complete – see references above. A model database has however been developed for rare plants and requires expansion and data population for all flowering plants (Burger &amp; Stampfli 2005).</p> <p>1b). Most comprehensive work to date Awmack 1997.</p> <p>1c). Basic checklist and field guide re-printed – Beaver 2008.</p> <p>1d). Most comprehensive work to date Carlstrom 1996.</p> <p>The focus was placed on flowering plants and ferns because the national capacity is currently lacking to develop databases for mosses, lichens and marine algae – checklists for these plant groups was identified as a subject for later attention.</p>
2). A preliminary assessment of the conservation status of all known plant species, at national, regional and international levels	<p><b>2).</b> Establish and implement a monitoring and evaluation framework for native species.</p> <p>2a). Quantitative assessment of native plants.</p> <p>2b). Red Data List published.</p> <p>2c). Assessing threats from IAS.</p> <p>2d). Monitoring ecosystem changes.</p>	<p>2a &amp; b). A threat assessment of the very rare plant taxa of Seychelles has been undertaken. A list of very rare, rare and common endemic woody plant species has been compiled (Burger &amp; Stampfli 2005).</p> <p>2c). A national IAS risk and threat analysis and IAS baseline has been established under the Full size GEF IAS project.</p> <p>2d). Effective ecosystem monitoring protocols have yet to be established.</p>
3). Development of models with protocols for plant conservation and sustainable use, based on research and practical experience	<p><b>3).</b> Enhancing plant research in Seychelles.</p> <p>3a). National research agenda for plants.</p> <p>3b). Research on threatened species.</p> <p>3c). Protocols for habitat restoration.</p>	<p>3a). A national Plant Conservation Research Agenda (2008 – 2015) has been developed (MENRT/PCA 2007).</p> <p>3b) A threat assessment of rare woody plants has been undertaken to date.</p> <p>3c). Methodologies and protocols for the rehabilitation/restoration of small island ecosystems have been developed and replicated. Small pilot projects for the restoration of montane forest habitat on Mahe and extensive palm forest work and replanting has been undertaken on Praslin and Curieuse.</p>

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4). At least 10% of each of the world's ecological regions effectively conserved	A target to protect more than 50% of terrestrial habitat has been established. The international 10% target for marine habitats applies.	47% of Seychelles landmass is currently protected for environmental reasons. Less than 1% of marine habitats are currently protected.
5). Protection of 50% of the most important areas for plant diversity assured	<b>6).</b> Linking legislation with plant conservation. 6b). New protected areas.	More than 50% of the most important areas for plant conservation in Seychelles are currently protected though attainment of management objectives is very difficult in the key montane forests of Mahé and Silhouette due to the terrain and IAS issues. Target 6b identifies key areas for protection as does the NBSAP – but this has yet to be implemented.
6). At least 30% of production lands managed consistent with conservation of plant diversity	No National target adopted.	The ongoing GEF Full-size mainstreaming biodiversity project is seeking to mainstream biodiversity concerns throughout production landscapes.
7). 60% of threatened species conserved in situ.	<b>4).</b> Conserving threatened plants. 4b). In-situ conservation	A high proportion of threatened plants are viable represented in the existing PA network see GSPC target 5 above for more details.
8). 60% of threatened plant species in <i>ex situ</i> collections, and 10% of them in recovery and restoration programmes	<b>4).</b> Conserving threatened plants. 4a). Ex situ Conservation – 95% of threatened flowering plant taxa <i>ex-situ</i> .	Ex-situ facilities have been established at the Barbarons Biodiversity centre but they are currently restricted to nursery and propagation programmes for relatively few species and a seed bank has yet to be established.
9). 70% of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated indigenous and local knowledge maintained	<b>5).</b> Conserving crop diversity 5a). National database for crop varieties 5b). Conserving rare crop varieties 5c). Local participation in rare crop conservation.	5a: Database of local agricultural varieties established. 5b: 11 hectares have been set aside at the Barbarons Biodiversity Centre for the planting and maintenance of rare of agricultural varieties. 5c: 7,000 homes are known to maintain agricultural gardens and these are believed to maintain important rare varieties – further work is required to catalogue and bring these varieties into <i>ex-situ</i> collections.
10). Management plans in place for at least 100 major alien species that threaten plants, plant communities, habitats and ecosystems	<b>7).</b> Managing IAS. 7a). Management programmes for seven established Invasive plant species 7b). Detecting and acting against new invasive species.	7a) National management programmes of invasive plant species are not in place – various managed areas however have extensive IAS plant species management programmes. A full-size GEF project on IAS is ongoing it has included a review of IAS quarantine and control functions, an introduction threat analysis and the development of a National IAS Strategy. Technical capacity remains a limiting factor however.
11). No species of wild flora endangered by international trade	<b>8).</b> Sustainable production of valuable plants. 8c). Coco-de-Mer use – establish and implement effective mechanisms for the sustainable use of Coco-de-Mer.	This target is considered to be currently successfully attained. Seychelles is Party to CITES and has 21 species of plant listed under the Convention – most of which are orchids. 8c). The Coco-de-Mer is subject to an effective sustainable use management regime including

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		legal requirement for registration and certification of nuts for sale and export. A sustainable harvest and re-planting regime has also been developed and initiated (see Case Study 1).
12). 30% of plant-based products derived from sources that are sustainably managed	<b>8).</b> Sustainable production of plants. <b>8a).</b> Sustainable production – 80% of plant products produced sustainably by 2010.	Not integrated in a coordinated manner and data not available to assess current status.
13). The decline of plant resources, associated knowledge innovations and practices, that support sustainable livelihoods, food security and healthcare, halted.	No National target adopted.	Seychelles has no indigenous people and a very short (240 yr) human history so traditional knowledge issues are not so prominent. Effort has been made to record and catalogue traditional knowledge in particular with regard to the applications of medicinal plants. Certain Protected Areas successfully serve to provide livelihoods for local communities e.g. Vallee-de-Mai and Cousin Island.
14). The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes	<b>9).</b> Increasing public awareness <b>10).</b> Making information more widely available. <b>11).</b> Increasing awareness in the education system.	Various agencies are very active in this domain. The Department of Environment has a division dedicated to PE&A and the Department of Education incorporates environmental education as a cross cutting syllabus component. The NGO Wildlife Clubs of Seychelles is dedicated to the education of children in matters of biodiversity. The national television broadcaster and various national newspapers have weekly environmental coverage.
15). The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this Strategy	<b>12).</b> Improving Local capacity 12a & b). Training Botanists and field practitioners. 12d). Train people in biosecurity. 12e). Train trainers.	Some training of field practitioners has been undertaken but human capacity remains a significant limiting factor. Additional facilities have been developed at the Barbarons Biodiversity Centre but further developments (e.g. creation of seed bank facilities) are required.
16). Networks for plant conservation activities established or strengthened at national, regional and international levels	<b>14).</b> National network strengthened – strengthen a broad-based national network for plant conservation.	The local NGO Plant Conservation Action was a key partner in the development of the National Strategy for Plant Conservation and has been a main driving force behind the implementation of the strategy to date. One key short falling however has been the inability to form and maintain the strategy's proposed formal implementation framework of an active steering committee, a clear and transparent reporting mechanism and an annual evaluation workshop. This has meant overall coordination of national partner agencies and full and targeted harnessing of national capacities and resources in the implementation of the strategy have not been realised.

**B. Progress towards Targets of the Programme of Work on Protected Areas**

<b>Protected Areas Programme of Work Implementation – Evaluation Matrix</b>			
<b>Goal/Target 1</b>	<b>Deadline</b>	<b>Key Evaluation criteria</b>	<b>Main Obstacles and Progress</b>
1.1. Establishment and maintenance by 2010 terrestrially and 2012 in the marine area of a national network of comprehensive, representative and effectively managed national PAs.	2010 2012	<ul style="list-style-type: none"> <li>-Develop national/regional definitions for: “comprehensive”, “ecologically representative” and “effectively managed”.</li> <li>-National gap analysis (2006).</li> <li>-National plan for development of a comprehensive PAN.</li> <li>- Progress report on designation.</li> <li>-Mechanisms for assessing management effectiveness established.</li> </ul>	<ul style="list-style-type: none"> <li>-No policy or standardisation of terms developed beyond the objectives established in the 1969 NPNCA.</li> <li>-PA legislation and policy to be addressed under full-size GEF project commencing 2011.</li> <li>-Various surveys and studies have identified key biodiversity areas that reside outside of PAN (e.g. Rocamora &amp; Skerrett 2001, Carlstrom 1996, Gerlach 2008a) but no formal structured GAP analysis has been undertaken to date.</li> <li>-An assessment of areas of terrestrial BD interest for inclusion in the existing PAN is included in the GEF project commencing 2011.</li> <li>-No plan in place or projected.</li> <li>- A PA policy is proposed for development under the 2011 GEF project.</li> <li>-Seychelles is very lacking in terms of comprehensive and representative MPAs and this requires urgent redress.</li> </ul>
1.2. PAs integrated into the wider land and seascapes utilising the ecosystem approach and taking into account ecological connectivity.	2015	Measures taken on and progress made towards integration into the wider landscape, connectivity and integration with other sectors.	<p>Mainstreaming BD GEF project (commenced 2008) seeks to integrate BD issues in the broader land and seascapes outside of PAs – but buffer zones and corridors not addressed. The Ecosystem approach is not effectively implemented on larger islands.</p> <p>Note: Terrestrial corridors in a small island archipelago are of different relevance than to a continental landmass.</p>
1.3. Establish & strengthen regional networks and transboundary PAs.	2010 2012	Measures taken for the establishment of regional networks and transboundary PAs.	The geographic isolation of Seychelles reduces the relevance of this target. The entire Seychelles EEZ falls within Indian Ocean Whale Sanctuary. Seychelles also contributes to regional protection measures through its membership of the CMS and related agreements and MoUs.
1.4. Effective management of all PAs.	2012	Evaluation criteria (see <b>pt. 1.1</b> above) not established.	<p>There are some very well run PAs including the largest Aldabra Special Reserve otherwise they are typically small in size (e.g. Cousin Island, Aride Island special reserves and Vallee-de-Mai).</p> <p>The main National Parks are largely unmanaged aside from maintenance of trails and/or tourism facilities.</p>

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1.5. Prevent and mitigate key threats.	2008	Effective mechanisms to identify and prevent key threats in place.	Monitoring of indicator species is undertaken in many PAs. There is however no systemic approach to mitigate threats in place. Extensive fire breaks are maintained in and around the Praslin National Park. PA status has been somewhat undermined by the approval of major developments within their boundaries e.g. St Anne and Port Launay PAs.
<b>Goal/Target 2</b>	<b>Deadline</b>	<b>Key Evaluation criteria</b>	<b>Progress and Main Obstacles</b>
2.1. Promote equity and benefit sharing.	2008	Mechanisms for equitable sharing of both costs and benefits arising from the establishment of PAs.	No national mechanisms established, but some smaller NGO-run PAs have good benefit sharing models.
2.2. Enhance and secure involvement of local communities and stakeholders.	2008	Enabling environment (legislation, policies etc) developed ensuring the participation and PIC of local communities. Plans and initiatives developed for participation in decision making in the identification, designation and management phases of PAN.	Current legislation (NPNCA 1971) does not require consultation and recent PA declarations have not involved consultation (e.g. Silhouette NP and Recif SR). Neither are clear criteria for the appropriate designation of PAs in place. These matters are proposed to be addressed under the GEF NGO PA project scheduled to commence in 2011.
<b>Goal/Target 3</b>	<b>Deadline</b>	<b>Key Evaluation criteria</b>	<b>Progress and Main Obstacles</b>
3.1. Review and revise policies to provide an enabling environment for PAs.	2008	Main impediments to effective PA establishment & management identified and measures taken to overcome them.	A review was undertaken in 2010 as part of the formulation of the GEF PA project scheduled for 2011 and recommendations made for the policy development which is a scheduled activity under the project.
3.2. Build capacity for PA planning, establishment and management.	2010	Comprehensive capacity building programmes implemented.	Capacity building in this regard is a key component of the 2011 GEF PA project.
3.3. Develop, apply and transfer appropriate technologies for PAs.	2010	Appropriate technologies and innovated approaches for effective PA management developed, validated and transferred.	This is a target aimed at developed countries.
3.4. Ensure financial stability of PAs and PA networks.	2008	Financial needs identified (2005) and secured. Sustainable financing plans established.	Financing status of state managed PAs is unclear and under review following major administrative restructuring in recent years. Funds are clearly lacking however for the effective management of state PAs to meet objectives. Small NGO-run PAs e.g. Cousin, Aride, Vallee-de-Mai are good models.

<b>Protected Areas Programme of Work Implementation – Evaluation Matrix</b>			
<b>Goal/Target 4</b>	<b>Deadline</b>	<b>Key Evaluation criteria</b>	<b>Progress and Main Obstacles</b>
4.1. Develop and adopt minimum standards and best practice for PAs.	2008	National criteria and best practice for PA selection, establishment, management and governance.	No standards in place and governance not considered transparent. Criteria to be developed through stakeholder consultation by GEF PA project commencing 2011 and hopefully adopted subsequently.
4.2. Evaluate and improve the effectiveness of PA management.	2006 2010	Management evaluation methods, standards, criteria and indicators adopted. Monitoring frameworks for site, national and regional levels implemented.	No national methodologies in place. IMPASP developed and adopted in 2003 for MPAs but never implemented. SIF and some NGO/private PAs undertake independent management effectiveness reviews.
4.3. Assessment and monitoring of PA status and trends.	2010	Systems for enabling effective monitoring of PA coverage, status and trends at national level established.	Various species based monitoring regimes are in place that can be used as indicators of attainment of PA objectives; but no systematic regime in place for State managed PAs.
4.4. Scientific knowledge contributes to the establishment and effectiveness of PAs.	?	Results of scientific research on ecological, social and economic aspects of PAs disseminated and shared e.g. to the clearing-house mechanism.	Research papers on various PAs are periodically released/published, particularly with the aid of foreign collaborators. No national mechanism for or promotion of this however.