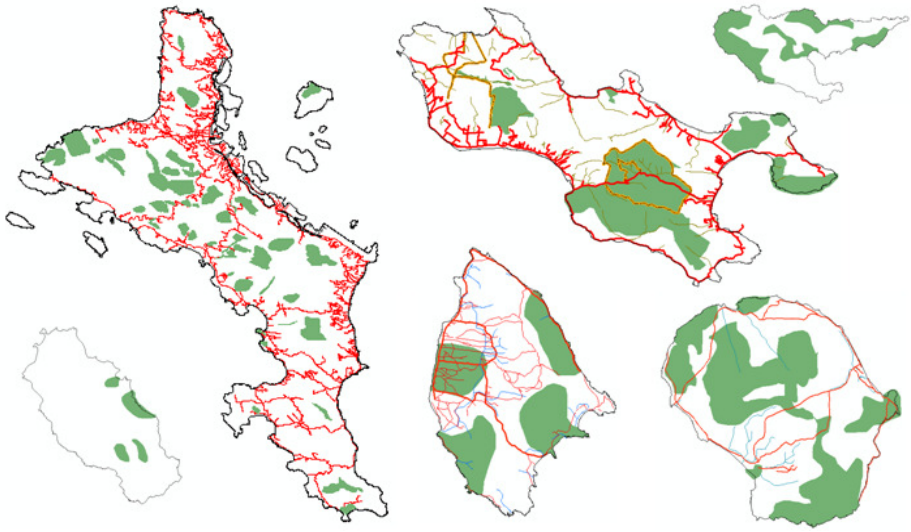
GOS- UNDP-GEF

Mainstreaming Biodiversity Management into Production Sector Activities

SEYCHELLES KEY BIODIVERSITY AREAS



Output 6: Patterns of conservation value in the inner islands

by

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(Final report of consultancy)

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CONTENT

EXECUTIVE SUMMARY

The Seychelles archipelago includes about 155 islands and has a land area of 45,538 ha. Conservation priorities have been studied mostly since the 1960s and resulted in a system of protected areas which represents 46.6 % of the land area. Nevertheless, if we consider the inner islands (24,406 ha), there are 22.3 % of terrestrial areas with a protection status. Therefore, the government of Seychelles has decided to further investigate the patterns of conservation value for the inner islands which are more concerned with human development.

We selected a list of 776 species of special concern (152 vascular plants, 14 amphibians, 21 birds, 5 freshwater fishes, 2 mammals, 19 reptiles, 563 terrestrial and freshwater invertebrates) which are considered as well inventoried and have an important conservation value. For these species, we compiled 5493 records of plants and 2672 records of animals, using literature, existing specimens, and new field inventories. In order to analyze the patterns of exploration, we used plants species records for species of special concern plus all other vascular plants (21,068 records). The patterns of conservation value are calculated using weighted endemism with a 500 x 500 m grid, i.e. the sum for each grid cell of the range-size rarity of all species of special concern present in that grid cell (where range-size rarity for a given species = 1 / number of grid cells of occurrence of that species).

For vascular plants, most of the existing knowledge is compiled and the contribution from our new field inventories represents 19 % of all records, up to 33 % if we consider only data with accurate geographical precision. The other most important contribution comes from a project led by Plant Conservation Action group (PCA) and the Natural History Museum, in 2011-2012, corresponding to 29 % of all records and 50 % of the data with accurate geographical precision.

Within 18,835 ha of land area without protection status in the inner islands, we identified 2,169 ha as being priority for extension of the current system of protected areas: Montagne Planneau range (Mahé), Southern slopes of Fond Azore (Praslin), Montagne Corail-Collines du Sud (Mahé) and Montagne Brûlée-Piton de l'Eboulis (Mahé). Geographic data used to assess conservation values are also made available to the government of Seychelles, including a grid of conservation values, species distribution maps, a prioritized system of protected areas and other key biodiversity areas, and a database containing the raw data. Recommendations are proposed for the ongoing development of these tools and of the research on taxonomy and on the patterns of biodiversity-conservation.

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I INTRODUCTION

I.1 Background

The "**Mainstreaming Biodiversity Management into Production Sector Activities**" (or "Mainstreaming Biodiversity") Full sized Project was signed in October 2007 between the Government of Seychelles (GOS) and the United Nations Development Programme (UNDP), and is funded by a Global Environment Facility (GEF) grant of US$3,600,000. The project is part of the UNDP-GEF portfolio in Seychelles and is implemented under a Programme Coordination Unit (PCU). The objective of the project is to integrate biodiversity conservation into key production sectors of the economy. One of the means of achieving this objective is to seek integration of biodiversity conservation in land use planning and management.

The Programme Coordination Unit (PCU) has contracted the present group of consultants to undertake the following medium-term (18 months), part-time assignment: "**Assessment of areas of high biodiversity for informed decision-making in future land use planning and management**". This study represents a total of 750 days of consultancy (see Appendix 7) distributed among the following team of consultants: Bruno Senterre, Elvina Henriette, Justin Gerlach, Terence Vel, Victorin Laboudallon, Gérard Rocamora, Lindsay Chong-Seng, James Mougal, Perley Constance, André Labiche, Roland Nolin, Katy Beaver. In addition, the study received the participation of several contributors: Wilna Accouche, Gilberte Gendron, Nicole Labiche-Barreau, Charles Morel, Elke Talma, Andre Dufrene, Marc Jean-Baptiste and Josianna Rose. Other participants to the project were Jelle Perrine, Rachel Kwok and Ben Thompson of ICS-Silhouette, and Steve Hill of Félicité Island.

The overall **objective of the consultancy** is **to identify terrestrial sites of biodiversity priority** (national areas of biodiversity importance for conservation action) on the **granitic islands** of Seychelles with the aim **of conducting new inventories** and evaluating the conservation priorities of these areas and to provide **recommendations for** gap identification for **future research**.

The **outputs** of this consultancy are:

A detailed work plan describing how the consultancy will be undertaken

1. A stakeholder-endorsed list of species on which the initial collation of spatial data will be based (Senterre et al. 2011)
2. A report summarizing all the collected data on species occurrences (Senterre et al. 2012a)
3. Present in a workshop the collected data on the distribution for the selected species and select areas for the implementation of the new inventories
4. A report on the stakeholder-endorsed selection of sites of biodiversity importance in Seychelles as well as a methodology for implementation of the new inventories (Senterre et al. 2012b)
5. Completion of new field inventories
6. An approved final report defining the selected sites of biodiversity priority, with recommendations for future research (current report)
7. A validation report detailing the deliberations in the workshop and the recommendations made by stakeholders

I.2 Aim of the current report

The aim of the study is to identify areas with high conservation value based on quantitative raw data on the distribution of rare plant and animal species.

Based on our ToR, we are asked to

-"select sites of biodiversity priority" (based on KBA data compiled so far) (activity 8),

-"explain why these sites are priorities" (activity 9),

-"provide recommendations on future research in these priority areas" (activity 10),

-"validate the findings in a workshop" (activity 11).

An approved final report defining the selected sites of biodiversity priority, supporting the selection of these sites with evidence of each selection based on biodiversity value, **with maps of each granitic island's sites of biodiversity priority**, as well as recommendations on future research to be conducted in the different sites and the ranking of the research recommendations on level of importance for each individual site, as well as for the Seychelles. This should include reporting for each site describing the importance of the site in terms of biodiversity value, the threats that the site face, the inventory following the agreed methodology and maps defining the boundaries of the site. The maps should also be provided in the preferred MLUH/DoE format/system.

II METHODOLOGY

In this chapter, we describe the methodology used for data analyses. Data collection methodology is already described in a previous report (output 4). We present also below an overview of the dataset used for these analyses. Throughout this study, plants and animals are treated separately due to the contrasting nature of these sub-datasets. Later, both botanical and zoological components are integrated for the final prioritization of sites, thus using any biological indicator available.

-The first step of the consultancy was the selection of a list of species of special concern (December 2011, output 1: Senterre et al. 2011).
-Secondly, a team of 4 consultants compiled historical records for the listed species of special concern (May 2012, output 2: Senterre et al. 2012a).
-Thirdly, a description of the detailed methodology for implementation of new field inventories was defined with stakeholders (Aug. 2012, output 3 & 4: Senterre et al. 2012b).
-The new field inventories were initiated on 15th June 2012 (preliminary testing of methodologies for the preparation of the workshop with stakeholders) and implementation lasted until April 2013.
-Finally, the data are analyzed in order to quantify conservation priorities (current report).

II.1 Amount and types of data compiled

II.1.1 PLANTS

Overall dataset

The overall dataset used for this study covers all data compiled during the KBA study itself plus the data synthesized and collected during another project based on the Seychelles National Herbarium (PCA-SGP), and referred to as "the herbarium project". In total, 21068 plant records have been compiled and this number keeps growing regularly with the ongoing activities of the Seychelles National Herbarium in collaboration with PCA.

Historical records have been extensively digitized. All the major historical contributions have been entered, especially Robertson (1989) and Carlström (1996) which are entirely covered (Table 1). For other sources (e.g. Friedmann 1994), we focussed on the entry of records for species of special concern only and within our study area.

Specimens of vascular plants are exhaustively captured in the database. All the material existing at the Seychelles National Herbarium (SEY) has been integrated (i.e. 4630 specimens, representing about 1078 species). All the specimens available on the online databases for the herbaria of Paris (http://coldb.mnhn.fr/) and Kew (http://apps.kew.org/) have also been integrated. For Paris, the Seychelles collections are still poorly databased, but for Kew we have captured probably most of the existing specimens since Robertson (1989) herself visited Kew gardens and listed exhaustively all the Kew specimens. The total number of plant specimens collected in Seychelles is ca. 5930 (although non-vascular plants specimens remain poorly recorded in our database).

In terms of quantity, the compiled database provides therefore a very accurate view of the effort of botanical exploration in the Seychelles. This is the first time that such a compilation has been done. In addition, the current study on KBAs provides a major contribution of newly recorded data (302 + 3794 = 4096 records, i.e. 19.4 % of the compiled knowledge).

Table 1. Overall dataset existing on plants (and fungi) of Seychelles: 21068 entries of which 5930 are specimens ("sp") and 15138 are sight records ("obs"). If a specimen is cited in more than one reference, it is counted only once for one of these references.

	Dicots		Monocots		Gymnosp.		Fern		Mosses s.l.		Fungus		Total	
	sp	obs	sp	obs	sp	obs	sp	obs	sp	obs	sp	obs	sp	obs
Awmack 1997							139						139	
Baker 1877 p.p.							2						2	
Bollier & Tanner 2004		23		4										27
Carlström 1996		1297		769				12						2078
Christensen 1912							3						3	
Elzein 2011		1471		528				288						2287
Friedmann 1994	31	22											31	22
Hill 2002 p.p.		169		77			13					1	13	247
Huber & Ismail 2006	3	21											3	21
Jeffrey 1962		11												11
Renguet 2011		327		185				135						647
Robertson 1989	1668	1965	792	768		9	1						2461	2742
Senterre 2009	183	1001	53	332		1	119	67	11				366	1401
Tardieu-Blot 1960							285						285	
KBA 2013	158	1953	34	952		2	68	878	41	7	1	2	302	3794
Others	1368	1333	158	277	0	2	494	241	292	5	13	3	2325	1861
Total	**3411**	**9593**	**1037**	**3892**		**14**	**1124**	**1621**	**344**	**12**	**14**	**6**	**5930**	**15138**

But the most important contribution of the current study is mostly in terms of quality of the data rather than quantity, especially from a conservation perspective. Indeed, most of the historical records compiled from specimens and literature provide only limited details on the geolocation of these records. In the Table 2, we present the number of records in relation to the level of geographic precision, comparing KBA vs. pre-KBA records. The KBA study contributed no less than 23 % of the mapable data (see Table 2: 50 + 15 + 4027 records) and 33 % of the data with a precision to at least coordinates level. Most of the pre-KBA data with sufficient geographic precision is provided only recently by the "herbarium project" initiated by PCA (= 35 % of the mapable records, 50 % of those to coordinates level). Historical pre-KBA contribution represent 41 % of the mapable records, but only 17 % of the records to coordinates level.

Table 2. Number of records per level of geographic precision and per data source. "pays" = to country level, "ile" = island record, "localité" = to locality level (mapable but not precise), "coord." = to coordinates level, "précis" = precision to a few meters.

Projet		pays	ile	localité	coord	précis	Total
KBA contribution	(Senterre)		4	50	15	4027	4096
pre-KBA (PCA herbarium project)			31	126	3625	2434	6216
	Senterre		31	122	2101	1028	3282
	Elzein				884	1403	2287
	Renguet			4	640	3	647
pre-KBA (historical records)		1065	2483	5081	1547	580	10749
	Robertson	23	1614	1623	301		3561
	Carlström		2	1780	297		2079
	Friedmann	2	164	495	187	7	855
	Jeffrey	84	52	253	136		525
	Procter	114	67	237	59		477
	Others	842	584	693	567	573	3252
Total		**1065**	**2518**	**5257**	**5187**	**7041**	**21068**

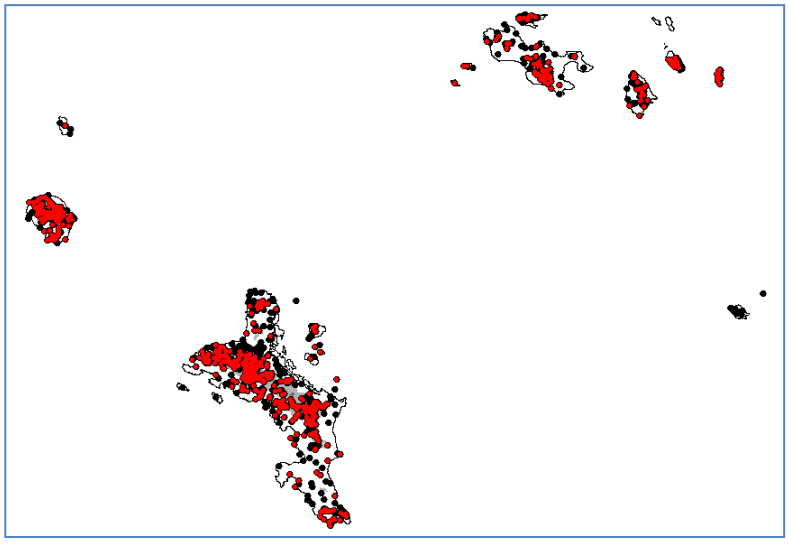
KBA dataset

In the previous section, we present a few statistics on the overall dataset, collected before and during the KBA study, i.e. including all species. But from a conservation perspective, it is most important to compile data on the taxa which are most difficult to observe, the rarest, the most threatened, and least known. The total number of KBA species selected for this study is 152 (70 dicots, 30 monocots, 52 ferns), of which 16 have not been found or recorded from any locality. What is the contribution of the KBA study in terms of inventory of these most interesting taxa? KBA inventories contributed 16.7 % of the existing knowledge on the distribution of the species of special concern, pre-KBA historical inventories contributed 43.5 % and the pre-KBA recent contribution of the "herbarium project" corresponds to 40 % of the existing knowledge (Table 3). If we calculate the sum of all the range size rarity of these records (i.e. weighted endemism, see p.11), it is possible to have a more detailed view of these contributions (i.e. not only considering the number of KBA species records, but considering also the rarity of these KBA species).

Table 3. Number of records for species of special concern (i.e. "KBA species") compared to other species. The weighted endemism (sum of range-size rarities) is calculated for each data source, indicating their contribution in terms of rare species recording.

Projet		KBA species	Other species	All species	wEndi
KBA contribution	(Senterre)	914	3182	4096	140
pre-KBA (PCA herbarium project)		2188	4028	6216	154
	Senterre	844	2438	3282	116
	Elzein	1169	1118	2287	31
	Renguet	175	472	647	7
pre-KBA (historical records)		2391	8365	10756	190
	Robertson	214	3347	3561	9
	Carlström	720	1359	2079	63
	Friedmann	156	699	855	25
	Jeffrey	94	431	525	9
	Procter	107	370	477	13
	Others	1100	2159	3259	71
Total		**5493**	**15575**	**21068**	**484**

Figure 1. Overview of the distribution of the botanical records compiled for this study. Black points = explored locations without KBA species (15763 records); red points = explored locations with KBA species (4862 records).



Out of the 21068 records, 5493 are related to species of special concern. From this we need to filter only the data which can be mapped with sufficient precision and which occurs inside the study area (e.g. excluding outer islands or Denis), which makes 4862 records (mapable KBA records within the study area). For the study of exploration patterns, we use all mapable records within the study area, both KBA species or not, i.e. 15763 records (Figure 1).

II.1.2 ANIMALS

Contrary to the situation for plants, the zoological dataset has been entirely entered during the KBA study. For terrestrial and freshwater invertebrates, all records related to species of special concern, and used for a previous study (Gerlach 2008), have been integrated in our database. In total, 3009 records have been compiled. The specimen currently present in the Seychelles Natural History Museum could not be databased since this collection would first need to improve curation aspects (as has now been done for plants, see "Herbarium project").

The number of zoological species of special concern is 624 and there are 2672 records related to these species (Table 4). Therefore the zoological data concentrates much more on these species of special concern (89 % of all records) compared to the botanical data (records of species of special concern = 26 % of all records).

Table 4. Number of records and number of species for species of special concern (KBA species) compared to other species.

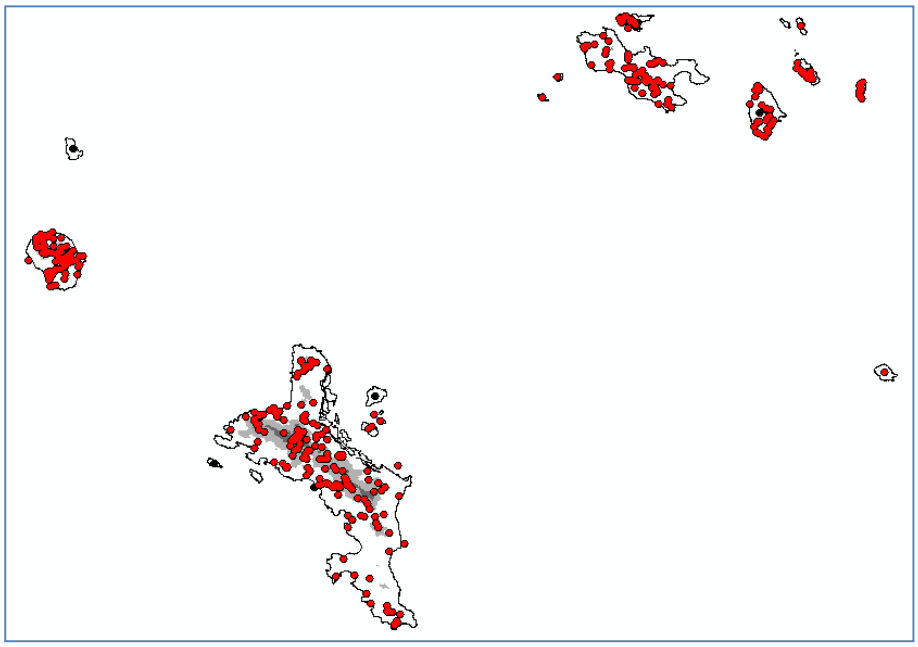
	Number of Species		Number of records	
Group	**KBA species**	**Other species**	**KBA species**	**Other species**
Amphibians	14	0	180	1
Birds	21	8	402	33
Freshwater fishes	5	11	83	58
Mammals	2	3	20	3
Reptiles	22	0	181	2
Terrestrial & fresh. invert.	560	39	1806	240
Total	**624**	**61**	**2672**	**337**

Mapable records (i.e. at least to locality level) correspond to 89 % of all records, and detailed geographic records (at least to coordinate level) represent 49 % of all records (Table 5). This means that there is quite a large proportion of the mapable records which are only accurate to locality level.

Table 5. Number of records per level of geographic precision and per taxonomic group. "pays" = to country level, "ile" = island record, "localité" = to locality level (mapable but not precise), "coord." = to coordinates level, "précis" = precision to a few meters.

Group	**pays**	**ile**	**localité**	**coord_**	**précis**	**Total**
Amphibians		19	40		121	180
Birds		14	59	2	327	402
Freshwater fishes		1			82	83
Mammals		4		4	12	20
Reptiles		56	25	5	95	181
Terrestrial & fresh. invert.	21	176	937	137	535	1806
Total	**21**	**270**	**1061**	**148**	**1172**	**2672**

Figure 2. Overview of the distribution of the animal records compiled for this study. Black points = explored locations without KBA species (2654 records); red points = explored locations with KBA species (2317 records).



Out of the 3009 records, 2671 are related to species of special concern. From this we need to filter only the data which can be mapped with sufficient precision and which occurs inside the study area (e.g. excluding outer islands or Denis), which makes 2317 records and 533 species (mapable KBA records within the study area). For the study of exploration patterns, we use all mapable records within the study area, both KBA species or not, i.e. 2654 records (594 species) (Figure 2).

II.2 Exploration index

The degree of exploration does not depend on the number of species of special concern observed, but on the number of observations of any species. It also depends on the number of distinct visitors responsible for these observations (as more persons will accumulate more taxa of interest) and on the number of visits (as time and seasons might explain observation or non observation of some taxa) (Droissart et al. 2012).

The best data would be from recording every single individual observed during exploration, but this is of course impossible. Therefore we cannot deal with our dataset as we would deal with community inventory datasets, where species records are often considered in relation to the number of observations or individual records (sampling effort).

Here, we are typically dealing with a compilation of very heterogeneous data, both regarding the methodology and the purpose. In a given site, we might have just one single individual observed, but repeatedly by many visitors (e.g. the *Polyscias lionnetii* tree at La Mission). In that case, sampling effort, or better said here "exploration effort", will be overestimated in the database. By contrast, if in a given site the observers make a systematic inventory of all individuals along a transect but record only the rarest species, exploration effort would be under-estimated. The same is true if the observer spends a lot of time trying to make the

observation (e.g. searching for a certain rare species) but does not find anything worth recording. For interpretation of the results, it is important to be aware of these biases, and to use statistics less affected by them.

We propose to define an "Exploration Index" (EI) as follows:

$$EI_i = [a\ (AbNbCelli / AbNbCellmax) + b\ (CollNbCelli / CollNbCellmax) + c\ (VisitNbCelli / VisitNbCellmax)] / [a + b + c]$$

where

EIi = exploration index of the grid cell i
AbNbCelli = number of observations (all taxa) in the cell i
AbNbCellmax = max number of observations in a grid cell
CollNbCelli = number of persons having visited the cell i
CollNbCellmax = max number of persons having visited a grid cell
VisitNbCelli = number of days of observation (visits) in the cell i
VisitNbCellmax = max number of days of observation (visits) in a grid cell
a, b, c = ponderation of the different factors (default value proposed: a=3; b=2; c=1)

II.3 Biodiversity and conservation index

Species richness: This is the total number of taxa (species and infra-specific taxa) within a given area. We calculated values of species richness separately for natives (endemics + indigenous), exotics, endemics, species of special concern (KBA species). These indexes are more or less integrating a conservation dimension and are differently influenced by sampling effort.

RSpNative: Species richness for native taxa. This is a biodiversity index which is largely influenced by sampling effort, i.e. RSpNative will be higher where it has been more sampled and not necessarily where it is indeed more diverse.

RSpExo: Species richness for exotic taxa. This is a threat index, also very much influenced by sampling effort. Species richness for invasive taxa might be less biased since these taxa should attract more the attention of observers (observation bias), at least for well known invasive species.

RSpEnd: Species richness for endemic taxa, or endemism richness. This is a conservation index. Higher values do not necessarily indicate high biodiversity but rather a high conservation value due to abundance of taxa with a globally restricted distribution and for which Seychelles is responsible. This index is less influenced by sampling effort, at least for plants and for some zoological groups like birds, since endemics are not too numerous (so they are relatively well known) and have long attracted the attention of both visiting and local biologists.

RSpKBA: Species richness for species of special concern (KBA species). This is a conservation index giving more weight to locally rare and / or threatened species. The main difference with RSpEnd is that widespread endemics are not included here and rare indigenous species are included. It is much less influenced by sampling effort since KBA

species are generally the first things recorded by visitors and are most often exhaustively recorded.

Weighted endemism (wEnd): This is a conservation index giving more weight to rare species, where "rare" is quantified using range-size rarity. The weighted endemism of a given sampling unit (e.g. grid cell) is the sum of the range-size rarity of all the "n" species present in that sampling unit (Linder 2001; Raes et al. 2009; Williams 2001-2013). Therefore, wEnd gives more weight to rare species, and the rarer the species the higher the wEnd. This index is the least influenced by sampling effort (when based on data similar to our dataset) since the rarest species are clearly the first things recorded during explorations (and for plants at least our dataset is appropriate for this index).

$$wEnd_{(cell\ i)} = \sum rsRar_{(species\ j = 1\ to\ n)}$$

rsRar: Range-size rarity of a given species "$_j$" is calculated as follows

$$rsRar_{(species\ j)} = 1 / CellNbSp_{(species\ j)}$$

where

$CellNbSp_{(species\ j)}$ = the number of grid cells or sampling units where the species "$_j$" does occur

Hence, if a rare species is present in only one grid cell, then its rsRar will be 1/1 = 1, as opposed to another rare species found in 10 cells whereby its rsRar will be 1/10 = 0.1.

Relative Biodiversity Index (RBI): This index is calculated as the value of the biodiversity index calculated for the sampling unit divided by the value of the same biodiversity index for the sampling unit having the highest score. It can be based on any biodiversity or conservation index. This index is independent of the size of the study area.

Corrected Relative Biodiversity Index (cRBI): This index is calculated as the RBI divided by the REI (Relative Exploration Index), where $REI = EI_{cell\ i} / EI_{cell\ max}$

Normalized Relative Biodiversity Index (nRBI): This index uses a variant of the RBI, i.e. calculated with the biodiversity index of the whole study area rather than the biodiversity index of sampling unit with the highest score. RBI is then divided by the RAI (Relative Area Index = area of the sampling unit / area of the whole study area) (Schill & Raber 2009). It is sometimes used to compare biodiversity values of sites of different scales, e.g; Morne Seychellois – Silhouette.

III RESULTS AND DISCUSSION

III.1 Patterns of exploration

III.1.1 PLANTS

Main explorers

The herbarium-KBA database includes 120 contributors, from the mid 18th century to present (Appendix 1). Most specimens from the 18th century still need to be entered but are poorly relevant for the study of spatial patterns (mostly island records, without locality). The main contributors are listed in Table 6: Senterre, Robertson, Elzein, Carlström, Friedmann, Renguet, Jeffrey, and Procter. The number of visited grid cells varies considerably from one contributor to another, but this is at least partly due to differences in the level of precision of the geographic data provided (unfortunately low for the important contributions from Friedmann and Robertson). The number of days spent in the field is another interesting statistic but here again, Friedmann used to note only the month and year of his observations. For Senterre, the number of days in the field is 261, since 2008.

Table 6. Number of records (specimens + sight records) for the main explorers of the Seychelles inner islands. Overall, 493 grid cells (500 x 500 m) have been visited out of 1344 for these inner islands.

Contributor	Nb. records	Geolocalised records	Visited grid cells
Senterre	7278	7201	320
Robertson	3561	454	54
Elzein	2287	2287	7
Carlström	2079	2077	75
Friedmann	855	638	126
Renguet	647	647	19
Jeffrey	525	374	51
Procter	477	258	69
Total	**21068**	**15763**	**493**

Most explored islands and taxonomic groups

Mahé and Silhouette have been far more explored than other islands. Praslin has been explored in only a limited number of sites. Other islands such as Félicité, La Digue, Curieuse and Marianne have been quite well covered but during a limited number of visits, and are therefore to be considered still under-explored. The other islands are also under-explored (Table 7).

Table 7. Number of records for the most explored islands, based on all data (any species + unidentified material) localised at least to island level and within the Inner islands (18189 records). The total size of each island is indicated (Area: expressed in number of 500 x 500 m grid cells) as well as the number of explored grid cells (Explo).

Island	Dicots	Monocots	Gymno.	Ferns	Mosses	Others	Total	Area	Explo	%
Mahé	6396	2355	8	1783	272	13	10827	780	299	38
Silhouette	2125	724	1	531	44	1	3426	102	65	64
Praslin	640	377	2	141	19		1179	207	54	26
Félicité	348	148		43	2	2	543	22	9	41
La Digue	284	105	1	58	6	1	455	61	26	43
Curieuse	207	87		22	7	3	326	27	10	37
Frégate	202	79		9	1		291	17	1	5,9
Ile du Nord	124	44		4	3		175	16	1	6,3
Ile Aride	112	55		2			169	10	1	10
Cousin	101	40		4			145	5	3	60
St.-Anne	103	25		2	1		131	19	5	26
Marianne	86	24		11	1		122	10	7	70
Ile Longue	38	29		1			68	4	1	25
Ile au Cerf	30	8		6			44	13	2	15
Others	197	88		3			288	51	9	18
Total	**10993**	**4188**	**12**	**2620**	**356**	**20**	**18189**	**1344**	**493**	**37**

Within islands patterns of exploration

The patterns of botanical exploration are illustrated in Figure 3. The number of records per grid cell indicates the most inventoried sites, but sometimes just visited once by an intensive observer. Therefore Figure 3b indicates the degree of exploration using the exploration index (EI), i.e. giving more weight to grid cells visited several times by several observers (see section II.2).

Although many areas traditionally considered as key biodiversity areas have been quite well inventoried in terms of number of records, there are still many sites needing more intensive exploration (repeated and diversified exploration):

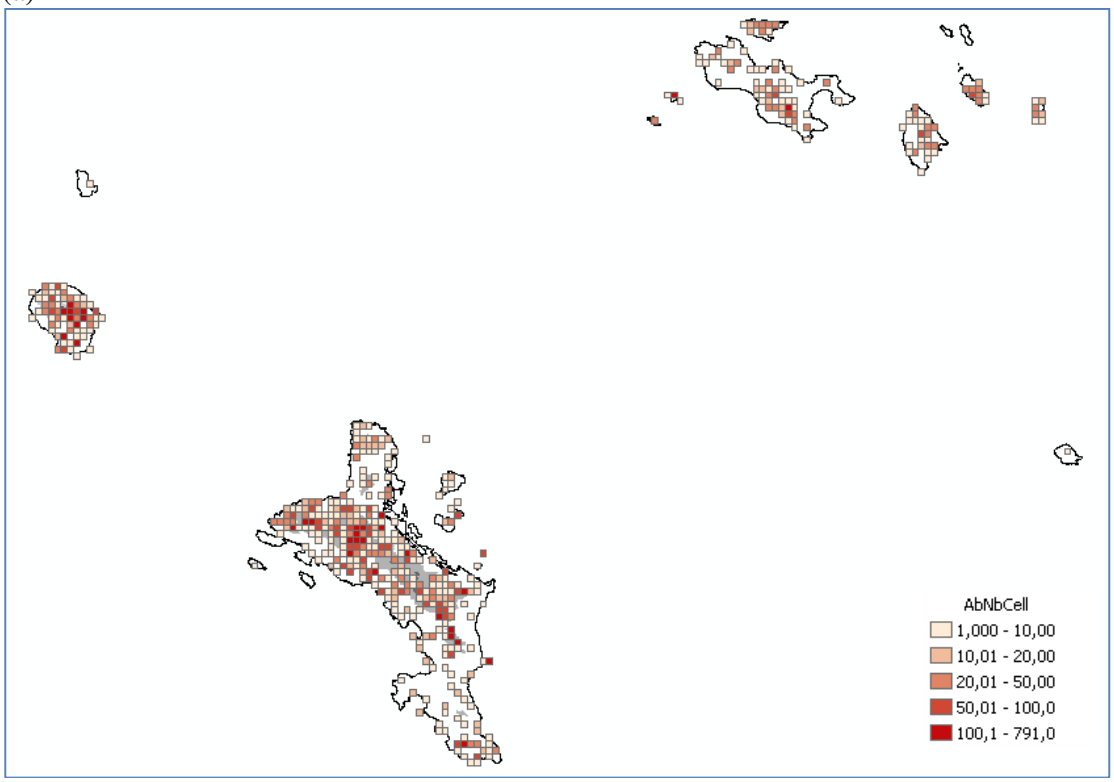
-Montagne Planneau massif: most of the area delimited in chapter III.5 (proposed NP)
-Montagne Brûlée-Castle Peak
-Collines du Sud-Montagne Corail area
-Mont Dauban (the true summit)
-Pointe Civine
-Most of Praslin, La Digue Curieuse, Félicité

Other areas remain mostly unexplored :

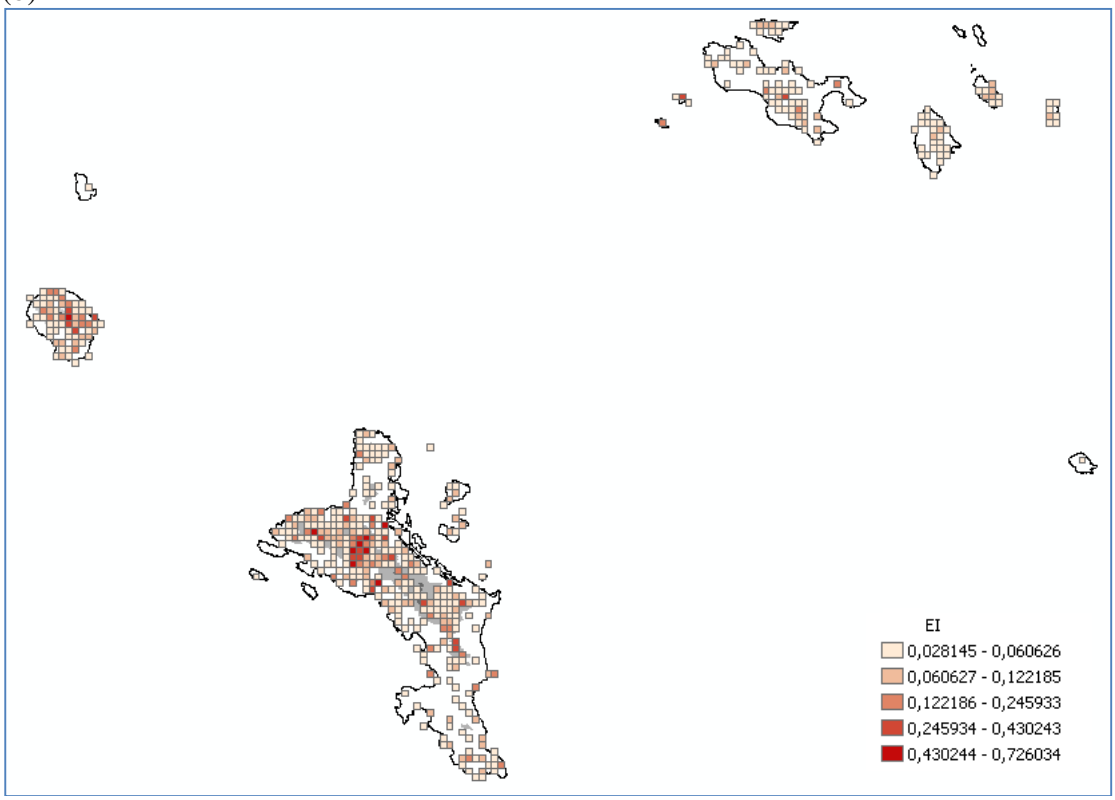
-ridge and slopes from Mont Le Niol to Congo Rouge, via Glacis Sarcelles
-southern slopes of Mont Jasmin and Mare aux Cochons area, towards Port Glaud
-Mont Dauban south-western slopes towards Grand Barbe
-Pointe Civine-Cocos dans trou
-L'Amitié to Grand Anse forests on Praslin southern slopes

Figure 3. Degree of exploration within the main granitic islands, using (a) the number of records (AbNbCell, both specimens and sight records) for the complete dataset (all species and unidentified taxa) and (b) the exploration index (EI).

(a)



(b)



III.1.2 ANIMALS

Main explorers

The number of explorers for the fauna is much smaller compared to plants simply because most records are from literature and observers might not be known. The remaining records are those collected during our new field inventories (Henriette, Rocamora, Accouche, Chong-Seng, Gendron, etc.: Table 8). Specimens are rarely entered in the database.

Table 8. Main explorers for the zoological dataset. RSp = number of species recorded, Ab = number of records made, Cells = number of grid cells (500 x 500 m) visited.

Observer	RSp	Ab	Cells	Observer	RSp	Ab	Cells
Henriette	134	1040	121	Fisher	6	7	7
Scott	235	520	62	Brauer	7	7	7
Unknown	168	434	112	Morel	4	4	1
Gerlach	161	312	59	Nolin	4	4	1
Rocamora	28	129	21	Laboudallon	1	3	3
Gardiner	55	87	35	Mougal	1	3	3
Accouche	14	38	4	Constance	1	2	1
Chong-Seng	9	20	10	Schauneberg	1	1	1
Keith	6	14	10	Commerson	1	1	1
Gendron	7	14	4	ARDA	1	1	1
Senterre	9	12	8	Stoddart	1	1	1

Most explored islands and taxonomic groups

Table 9. Number of zoological records made for the most explored islands.

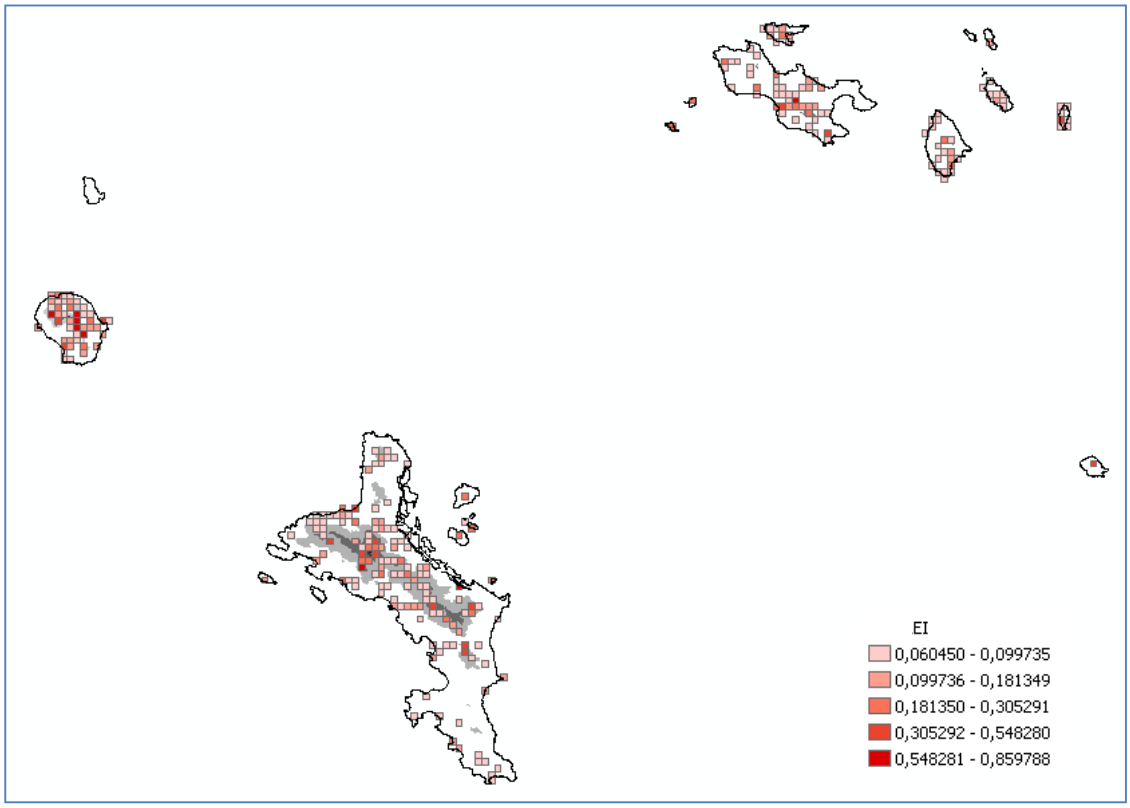
Island	Amphi.	Birds	Fresh. fishes	Mammals	Reptiles	Invertebrates	Total
Mahé	106	145	15	9	35	760	1070
Silhouette	40	81	22	3	28	658	832
Praslin	11	47	83	1	9	224	375
La Digue		63	9		9	35	116
Curieuse		27	11	2	13	44	97
Félicité		19			7	13	39
Marianne		13		1	7	13	34
Frégate	2	5			5	13	25
Ile au Cerf	2	2			4	7	15
Cousine		3			2	9	14
Ile Longue						13	13
Cousin		4			2	3	9
Anonyme						5	5
Sainte-Anne	1					3	4
Grande Soeur					1	2	3
Conception		1			1		2
Ile Ronde						1	1
Total	**162**	**410**	**140**	**16**	**123**	**1803**	**2654**

Table 9 does not really give a good idea of exploration effort from one island to another because more species and locality data need to be entered, but it at least complements the tables presented earlier (describing the dataset) and shows the islands with relatively few data.

Within islands patterns of exploration

Since the zoological dataset focuses much more on the species of special concern, and is in general less exhaustive than the botanical dataset, the pattern of exploration within islands using the relative exploration index (Figure 4) is not very meaningful. The higher values correspond to sites where more species of special concern have been recorded but not necessarily to where exploration has been more intense. Nevertheless, we provide the figure here just for the record.

Figure 4. Within island patterns of zoological exploration using the Exploration Index (EI).



III.2 Taxonomic (re)discoveries

III.2.1 PLANTS

The present study has contributed about 20 % of the compiled knowledge on species distribution in the Seychelles (4096 records, see Table 2) and it has been developed in collaboration with another project known as the herbarium project (6216 records, ca. 30 % of compiled knowledge). Among these records, some needed more taxonomic attention and specimens have been collected and deposited at the Seychelles National Herbarium.

During these two projects, and in previous years (since March 2008), one of us (B. Senterre) has contributed ca. 1600 specimens to the Seychelles National Herbarium, representing 425 species of which ca. 100 were not represented yet in the Seychelles national collection. Recent collections have also been deposited in SEY by several visiting botanists, e.g. G. Rouhan, T. Janssen, C. Awmack (to cite only the most important ones). As part of the herbarium project, we initiated the taxonomic study of the recently collected materials. We found 17 new records for the native flora of Seychelles, including one new species to science. We also found 15 species not seen for about a century or more. These discoveries are being published progressively, in collaboration with colleagues mostly from Paris herbarium (Dubuisson et al. 2013; Senterre et al. 2013). More intense taxonomic study of collected specimens is needed in future as it offers the opportunity to discover new species or to make re-discoveries.

In addition to taxonomic discoveries and rediscoveries, several species previously known from only a few locations have been discovered in new locations, e.g. *Pisonia sechellarum*, *Pseuderanthemum subviscosum*, *Angraecum maheense*, *Achyrospermum sechellarum.* Finally, it is worth mentioning that our taxonomic studies not only concentrate on native species but also include exotic species, for which there have been even more new records for the flora of Seychelles (ca. 40), including some newly identified invasive species (e.g. *Lygodium japonicum*).

17 native species newly recorded for the flora of Seychelles

In **bold**, the new records made during the KBA explorations (the others are new records made since 2008 and during the "herbarium project").

Family	Species name
Orchidaceae	**Cynorkis sp.1**
Aspleniaceae	**Asplenium inequilaterale Bory ex Willd.**
Aspleniaceae	Asplenium obscurum Bl. **
Aspleniaceae	**Asplenium paucijugum F.Ballard**
Aspleniaceae	Asplenium petiolulatum Mett. ex Kuhn
Hymenophyllaceae	**Abrodictyum parviflorum (Poir.) Ebihara & K.Iwats.** **
Hymenophyllaceae	Crepidomanes bipunctatum (Poir.) Copel.
Hymenophyllaceae	Crepidomanes minutum var. mascarenensis Pynee & Dubuisson
Hymenophyllaceae	Didymoglossum motleyi (Bosch) Ebihara & K.Iwats.
Hymenophyllaceae	Didymoglossum rotundifolium (Bonap.) J.P.Roux
Hymenophyllaceae	Hymenophyllum digitatum (Sw.) Fosberg
Hymenophyllaceae	Hymenophyllum polyanthos var. blumeanum (Spreng.) Krug
Marattiaceae	Angiopteris sp.nov.1 Senterre & Fabre
Polypodiaceae	Grammitis pygmaea (Mett. ex Kuhn) Copel.
Pteridaceae	**Antrophyum boryanum (Willd.) Spreng.**
Pteridaceae	**Pteris atrovirens Willd. fo. laevicosta Verdc.**
Tectariaceae	Tectaria waterlotii (Tardieu) J.P.Roux
Lycopodiaceae	Huperzia ophioglossoides (Lam.) Rothm.

(** : doubtful identification)

15 Species not seen for a long time (rediscovered)

In **bold**, the species rediscovered during the KBA explorations (the others were rediscovered earlier following the same methodology)

Family	Species name
Araliaceae	Schefflera procumbens (Hemsl.) F.Friedmann (rediscovered on Mahé)
Lamiaceae	Achyrospermum sechellarum Baker (rediscovered on Mahé)
Aspleniaceae	Asplenium aethiopicum (Burm.f.) Bech.
Aspleniaceae	Asplenium affine Sw.
Aspleniaceae	Asplenium complanatum C.Chr.
Aspleniaceae	Asplenium pellucidum Lam.
Aspleniaceae	Asplenium tenerum Forst.
Aspleniaceae	Asplenium unilaterale Lam.
Dryopteridaceae	Lastreopsis hornei (Bak.) Tindale
Lomariopsidaceae	Lomariopsis pervillei (Mett.) Kuhn (rediscovered on Mahé)
Marattiaceae	Ptisana sp.nov. aff. fraxinea (Sm.) Murdock
Pteridaceae	**Antrophyum callifolium Blume**
Pteridaceae	Antrophyum immersum (Bory ex Willd.) Mett.
Pteridaceae	**Haplopteris zosterifolia (Willd.) E.H.Crane**
Pteridaceae	**Pteris pseudolonchitis Bory**

27 Species not seen for a long time and still possibly to be rediscovered

Species that need to be rediscovered only on some islands are in **bold**. Several of these records might be erroneous historical records (e.g. *Abrodictyum tamarisciforme*?).

Family	Species name
Acanthaceae	Justicia gardineri Turrill
Acanthaceae	**Pseuderanthemum subviscosum (C.B.Clarke) Stapf**
Apocynaceae	**Carissa spinarum L.**
Apocynaceae	**Secamone schimperiana (Hemsl.) Klack.**
Asteraceae	Vernonia sechellensis Baker
Euphorbiaceae	Orfilea neraudiana (Baill.) G.L.Webster
Loranthaceae	Bakerella clavata (Desrouss.) S.Balle subsp. sechellensis (Baker) S.Balle
Moraceae	**Trilepisium madagascariense DC.**
Onagraceae	Ludwigia jussiaeoides Desr.
Rhamnaceae	Smythea lanceata (Tul.) Summerhayes
Rubiaceae	**Amaracarpus pubescens Bl. subsp. sechellarum F.Friedmann**
Santalaceae	Korthalsella opuntia (Thunb.)Merr.
Orchidaceae	Oeceoclades seychellarum (Rolfe ex Summerhayes) Garay & Taylor
Aspleniaceae	Asplenium daucifolium var. inaequale (Bory ex Willd.) C.V.Morton
Aspleniaceae	Asplenium erectum Bory ex Willd.
Aspleniaceae	Asplenium lunulatum Sw.
Blechnaceae	Blechnum attenuatum (Sw.) Mett. var. attenuatum
Hymenophyllaceae	Abrodictyum tamarisciforme (Jacq.) Ebihara & Dubuisson

Hymenophyllaceae	Hymenophyllum fumarioides Willd.
Hymenophyllaceae	Hymenophyllum hirsutum (L.) Sw.
Lindsaeaceae	Sphenomeris chinensis (L.) Maxon
Lonchitidaceae	Lonchitis pubescens Willd. ex Klf.
Polypodiaceae	Platycerium alcicorne (Willem.) Tard.
Pteridaceae	Actiniopteris australis (L.f.) Link
Pteridaceae	Monogramma graminea (Poir.) Schkuhr
Pteridaceae	Pellaea goudotii (Kze.) C.Chr.
Pteridaceae	Vittaria isoetifolia Bory

III.2.2 ANIMALS

New records of native species for the fauna of Seychelles

The new records were made during the KBA explorations. In **bold**, species new to science (Philippe Keith, pers. comm.).

Family	Species name
Kuhliidae	Kuhlia rupestris
Anguillidae	Anguilla marmorata (Quoy & Gaimard, 1824)
Palaemonidae	Palaemon debilis (Dana, 1852)
Palaemonidae	Palaemon concinnus (Dana, 1852)
Palaemonidae	Palaemon sp.
Palaemonidae	Macrobrachium australe (Guérin-Ménenville, 1838)
Eleotridae	Eleotris fusca (Schneider & Foster, 1801)
Sooglossidae	Sooglossus sp. (probably Sechellophryne sp.)
Sesarmidae	**Scandarma sp**
Poeciliidae	Gambusia affinis

Species previously recorded, but for which new localities were discovered

Family	Species name
Ptereleotridae	Parioglossus multiradiatus n.sp.
Scutigeridae	Seychellonema gerlachi Butler, Edgecombe, Ball & Giribert, 2010

Species previously recorded, but with genetic / morphologic differences in populations

Family	Species name
Atyidae	Caridina cf serratirostris
Aplocheilidae	Pachypanchax cf playfairii
Gekkonidae	Urocotyledon cf inexpectata
Gobiidae	Redigobius bikolanus (Bleeker, 1867)

Species with restricted range, but discovered in distinct habitats

These two species are restricted to high forest. However, they were discovered in a low altitude cave where the habitat is distinctively different from the high forest. Specimens were collected and the species where initially identified as *Hyperothris orophura* and *Seychellonema gerlachi*. These are not considered to be species with a wide ecological plasticity (J.Gerlach, pers. comm.) hence casting a doubt over the true identity of the species.

Family	Species name
??	Hyperothris orophura?
Scutigeridae	Seychellonema gerlachi?

III.3 Patterns of biodiversity

III.3.1 PLANTS

As part of the herbarium project (PCA-Museum), an updated list has been compiled on all plant species occurring in the Seychelles, along with synonymies. This is the first time that such a list has been compiled for all plants, covering vascular and non-vascular groups. It integrates the main synthetic documents available (e.g. Friedmann 1994, Robertson 1989) plus the recent additions from the Seychelles National Herbarium (see Section III.2). The flora of Seychelles includes ca. 1700 taxa, of which at least 707 are natives. If we focus on the inner islands (current study), the flora is made up of 790 exotics and 376 natives. The outer islands have a native flora half as diverse as the inner islands, while outer islands' exotic flora is one third less diverse (Table 10).

The most diverse islands in terms of native flora are Mahé, Silhouette, Praslin, Félicité and Curieuse (Table 11). The most interesting sites of biodiversity are, on Mahé, Morne Seychellois-Pérard-Congo Rouge, Morne Blanc, Mont Jasmin, South Planneau-Varigault, Mt. Brûlée, Mt. Corail, on Silhouette, Mt. Plaisir-Jardin Marron, on Praslin, Fond Azore (Figure 5). This is of course nothing new, but this time it is supported by quantitative data with higher geographic precision.

Nevertheless, some of these areas are also the most explored ones (see Figure 4), and therefore they may appear more diverse in native species simply because we have been searching more intensively in these areas. Indeed, all other factors kept constant, we know that species richness increases with sampling effort. In order to account for sampling effort bias, several statistics have been developed in the literature, but mostly based on data with individual counts, which are not available with our dataset. Therefore, with our dataset it is not easy to assess the impact of exploration effort on biodiversity values. Note also that if it is true that better explored sites will appear more diverse in species simply because they are better explored, the reverse statement is also true, i.e. more diverse sites are better explored precisely because they are more diverse. Statistics tend to forget that (when trying to take into consideration the sampling effort bias), but experimented field explorers know where they explore, i.e. they concentrate their exploration effort where they know that they are likely to discover more species. Criteria used to orient exploration and observation effort include mostly habitat-type and vegetation maturity stage, as well as preliminary exploration patterns.

In Figure 6, we present the patterns of species richness using an index which intends to take into consideration the exploration effort bias (cRBI). Although this is very simple (simplistic) statistics, the patterns emphasize sites which are interesting in terms of biodiversity although quite under-explored:

-Montagne Planneau range,
-Western slopes of Pérard towards Glacis Sarcelle,
-an unnamed mountain south-east of Anse Major,
-most of Silhouette island but especially Mont Dauban-Mare aux Cochons area,
-Mt. Takamaka-Fond Azore-Anse Bois de Rose area on Praslin,
-La Digue Eastern slopes,
-Curieuse and Félicité.

The main summits of Morne Seychellois have relatively lower values, which indicate that these summits have been extensively explored. Nevertheless, even well explored sites might deserve further exploration if they fall within areas of outstanding conservation and biodiversity value, which is clearly the case of the Morne Seychellois area.

Table 10. Updated statistics on the flora of Seychelles: (a) overall, (b) inner islands, (c) outer islands.

(a) Flora of the Seychelles (overall)

Plant group	unknown	endemic	indigenous	exotic	Total (natives)	Total
Dicotyledon	2	71	166	731	237	970
Monocotyledon	75	35	96	159	131	365
Gymnosperm				9		9
Fern	2	16	94	14	110	126
Anthocerotophyta			1		1	1
Bryophyta		4	108		112	112
Marchantiophyta		10	106		116	116
Total	**79**	**136**	**571**	**913**	**707**	**1699**

(b) Vascular flora of the Inner Islands

Plant group	unknown	endemic	indigenous	exotic	Total (natives)	Total
Dicotyledon	1	52	106	633	158	792
Monocotyledon	46	25	85	135	110	291
Gymnosperm				8		8
Fern		16	92	14	108	122
Total	**47**	**91**	**283**	**790**	**376**	**1213**

(c) Vascular flora of the Outer Islands

Plant group	unknown	endemic	indigenous	exotic	Total (natives)	Total
Dicotyledon		22	114	151	136	287
Monocotyledon	27	11	37	36	48	111
Gymnosperm				2		2
Fern			6		6	6
Total	**27**	**33**	**157**	**189**	**190**	**406**

Table 11. Number of endemic (End), indigenous (Ind) and Exotic (Exo) species found on the main granitic islands. Total values consider only vascular plants and only the inner islands (since unvascular plants are too poorly recorded even at island level). Islands are ordered by decreasing values of native species richness.

Island	unknown	endemic	indigenous	exotic	Total (natives)	Total
Mahé	46	88	259	710	347	1103
Silhouette	16	80	174	143	254	413
Praslin	21	54	135	134	189	344
Félicité	6	27	83	82	110	198
Curieuse	3	23	67	58	90	151
Frégate	16	10	66	144	76	236
La Digue	3	18	55	86	73	162
Cousin	8	2	48	67	50	125
Ile Aride	11	3	45	59	48	118
Ile du Nord	10	2	45	84	47	141
Sainte-Anne	3	10	37	56	47	106
Marianne		7	27	15	34	49

Figure 5. Within island patterns of biodiversity based on native species richness (RSpNatif).

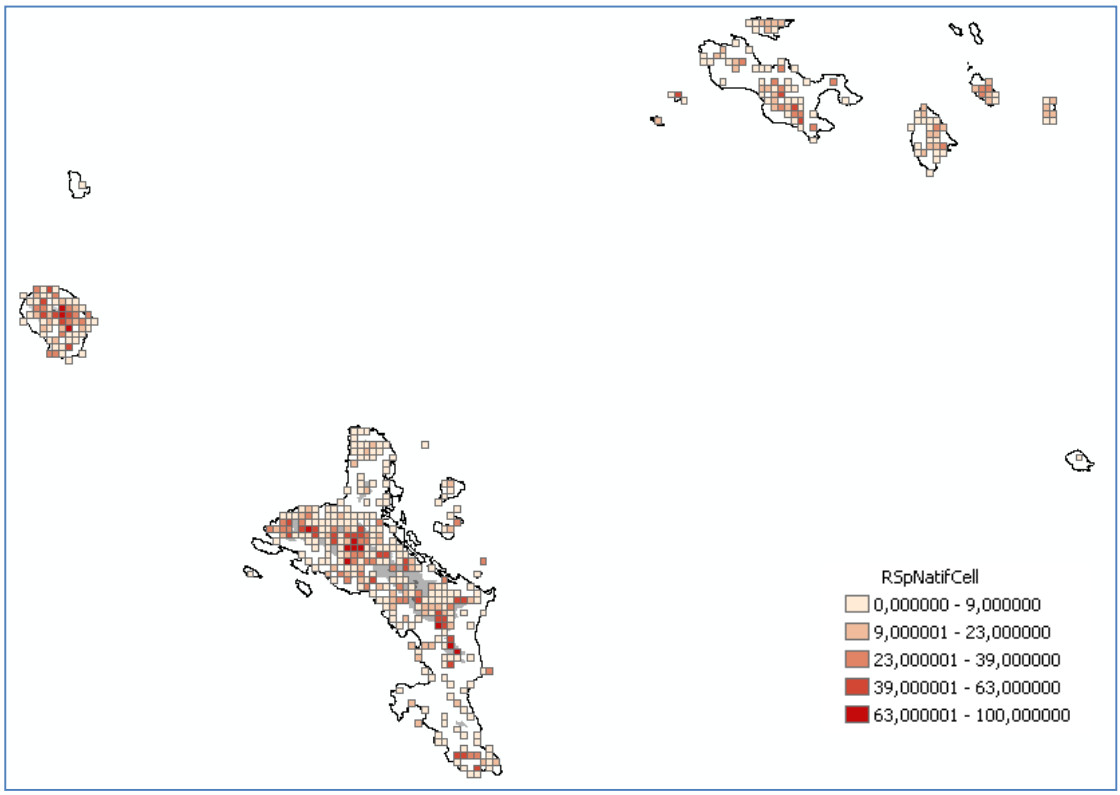
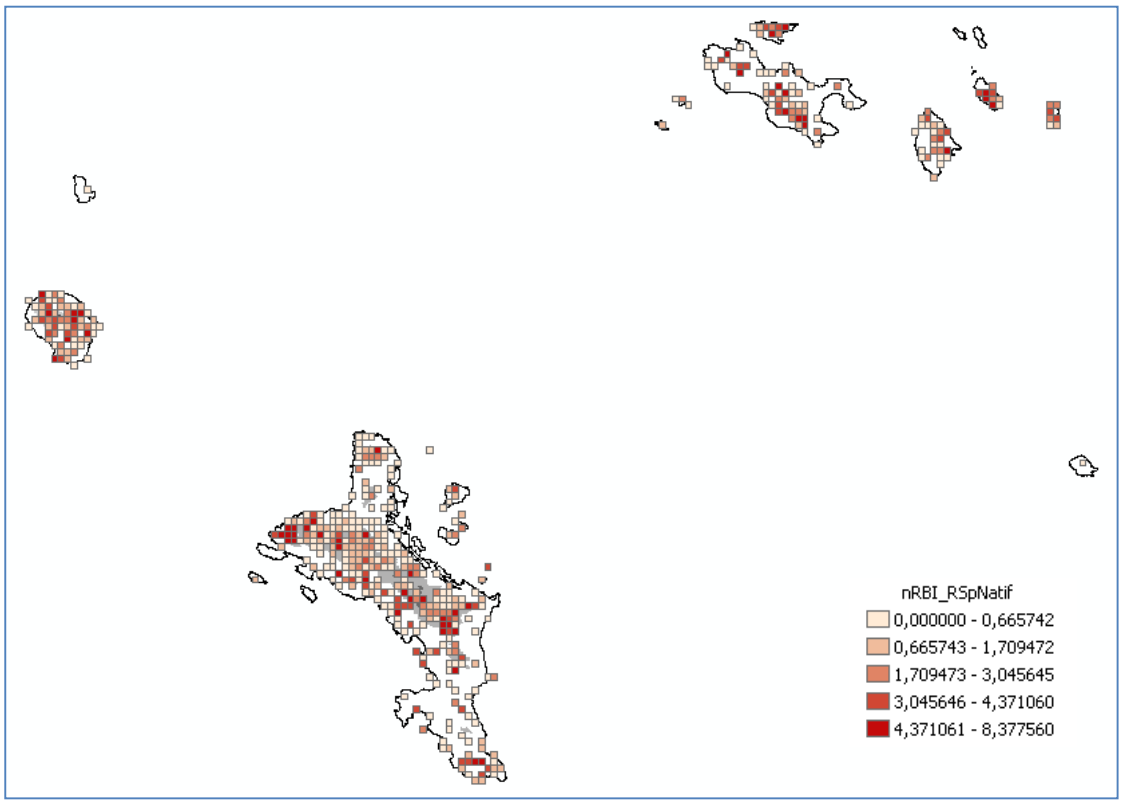


Figure 6. Corrected Relative Biodiversity Index (cRBI) based on native species richness. The red areas are the most interesting under-explored sites, i.e. exploration priorities.



III.3.2 ANIMALS

Since the zoological dataset focused mostly on conservation units (i.e. species of special concern) rather than biodiversity units, we will develop only the patterns of conservation value (Section III.4.2), and we will use the zoological dataset to complement the botanical one.

III.4 Patterns of conservation value

III.4.1 PLANTS

The first statistics that we can use is the endemism richness. Which are the sites with the highest numbers of endemic species? Based on the taxonomic database compiled during the "Herbarium project", the updated list of endemics for the Seychelles is 136 taxa (including 14 non-vascular taxa, i.e. poorly recorded for distribution). If we consider only vascular plants in the inner islands, 91 endemic taxa are recorded (Table 10). The key islands for endemism richness are as expected the three main islands, but we can note that Félicité and Curieuse have higher values than La Digue.

The pattern of endemism richness within islands is presented in Figure 8 and mostly confirms previous knowledge on key biodiversity areas (e.g. Carlström 1996a; Senterre 2009). Nevertheless, several key areas do not appear strongly in that analysis, e.g. Bernica or most of Montagne Planneau area, simply because the analysis only accounts for numbers of endemic species. If we take into consideration the relative rarity of the species occurring (using wEnd), then these areas appear with a higher conservation value (see Figure 9). In Figure 10, we modified slightly the calculation for the weighted endemism in order to give disproportionate values for sites with extremely rare species, i.e. species known from only 1 site, which can therefore be considered as an irreplaceable site. The combination of figures 8, 9 and 10 (but mostly Figure 9) provides a good quantitative description of conservation priority areas in the main Seychelles granitic islands.

In addition to the previous analyses, we calculated a "corrected relative biodiversity index" (cRBI) based on the weighted endemism values (Figure 11) and considering the relative exploration index (REI). This analysis emphasizes the same most interesting under-explored sites as in Figure 6 (based on RSpNatif). Nevertheless, weighted endemism is an index much less influenced by sampling effort compared to native species richness (Figure 7).

Figure 7. Relation between sampling effort (measured as the number of records per grid cell) and native species richness and weighted endemism, indicating that wEnd is less influenced by sampling effort.

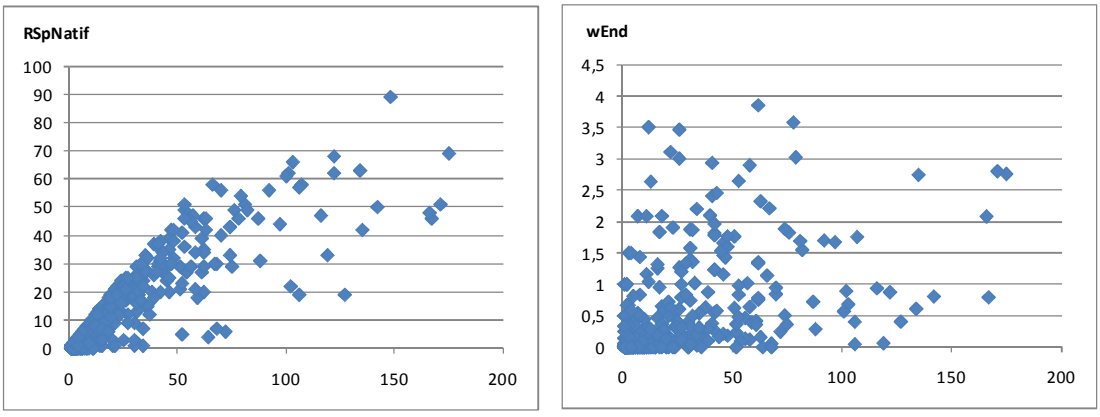


Figure 8. Patterns of conservation values measured with endemism richness (RSpEnd).

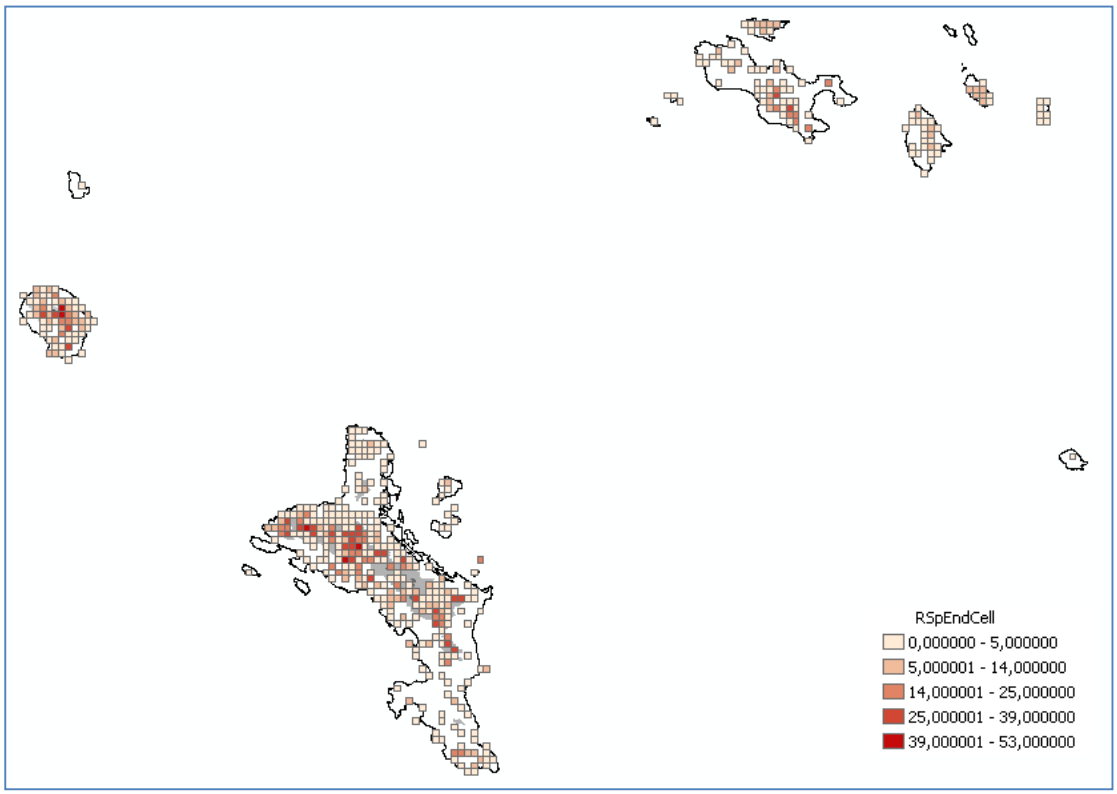


Figure 9. Patterns of conservation value based on weighted endemism (wEnd, less biased by sampling effort). N.B. The index used takes into consideration the species rarity on each island (wEndSynth) and needs to be interpreted at island scale. For prioritization at the scale of all inner islands, refer to the Section III.5.

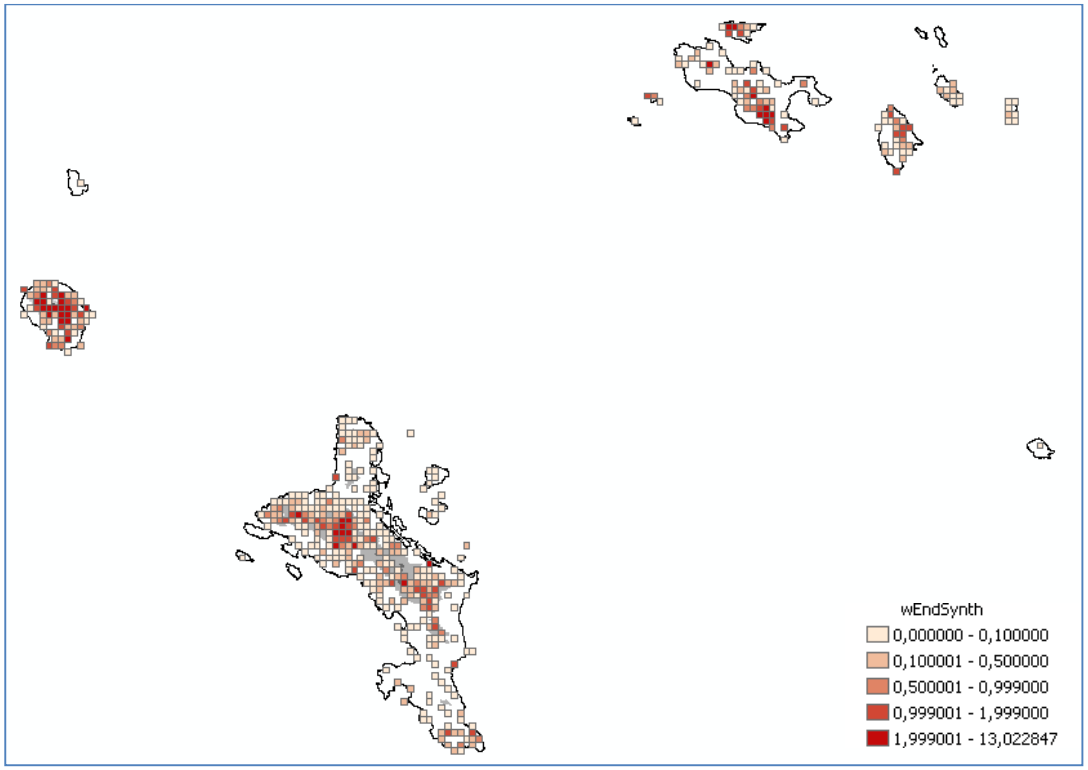


Figure 10. Patterns of conservation value based on a variant of the wEnd index giving much higher values to sites with species known from less than 3 grid cells, i.e. irreplaceable sites.

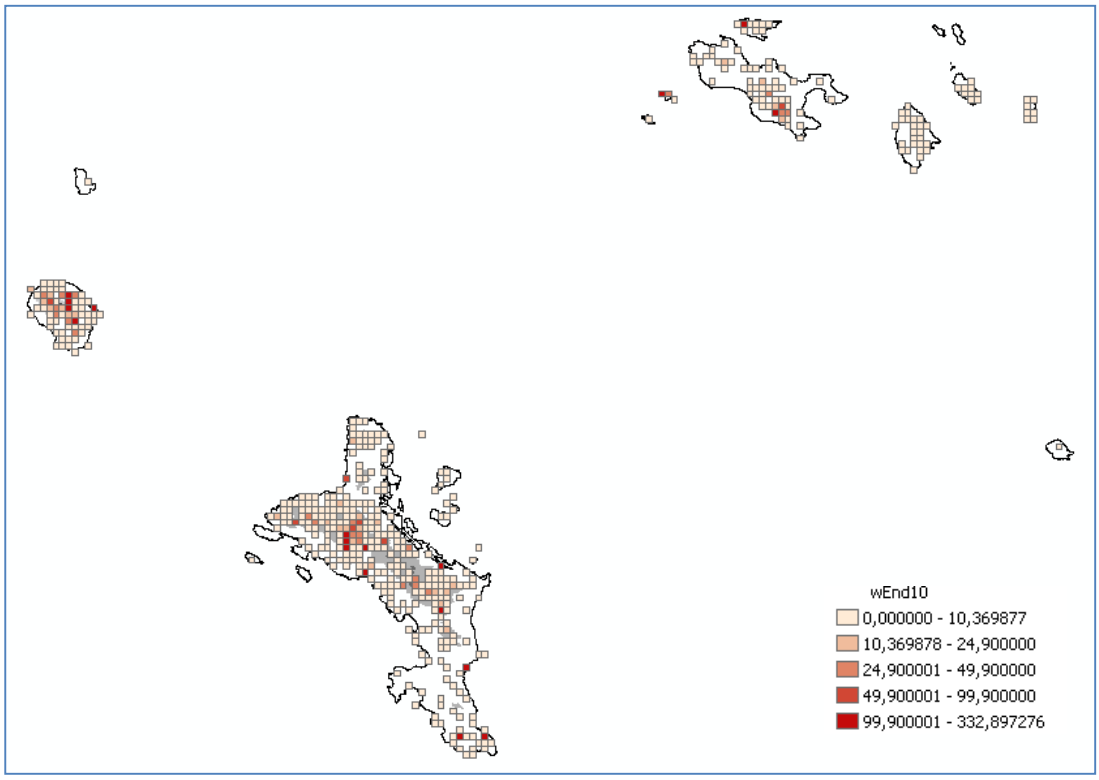
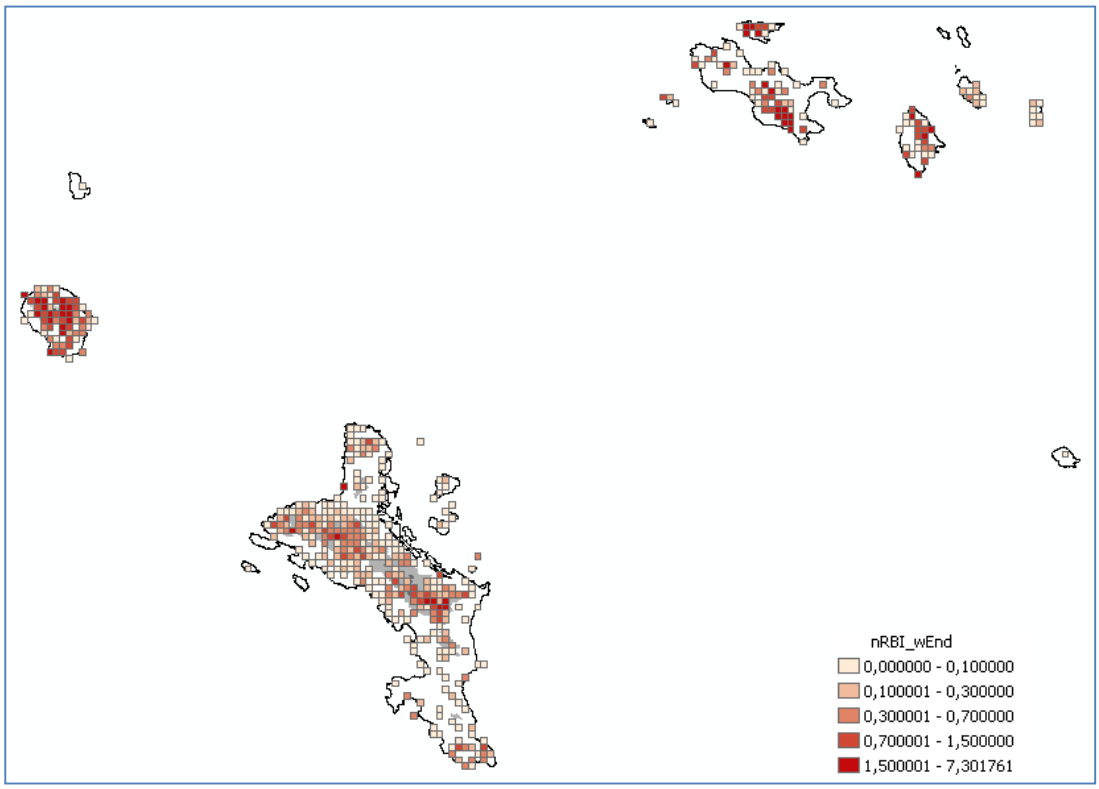


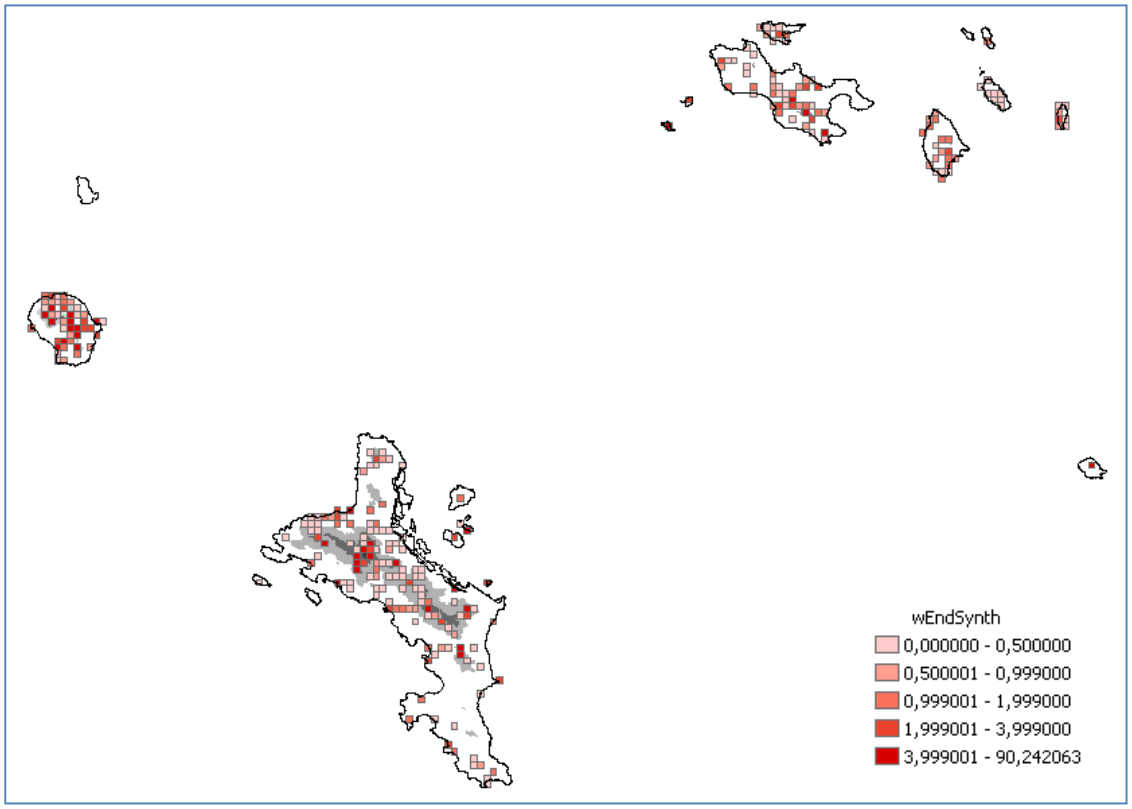
Figure 11. Corrected Relative Biodiversity Index (cRBI), showing the most interesting under-explored sites, i.e. exploration priorities.



III.4.2 ANIMALS

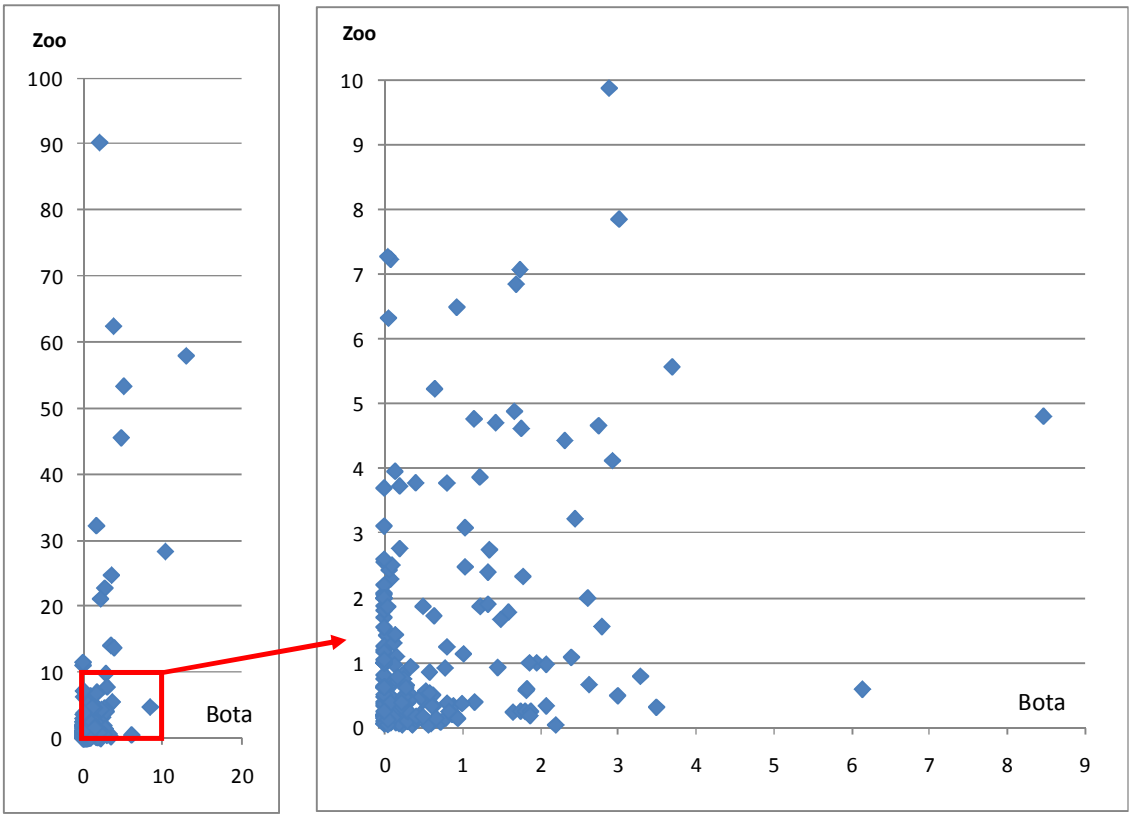
The sites with the highest zoological conservation value tend to be the same as for plants, but there are also some sites with relatively low botanical conservation value and very high zoological conservation value. These sites are mostly at lower elevation, e.g. in wetlands and rivers, or are on smaller islands (Figure 12). Regarding higher zoological conservation value of smaller islands, Hill (2002) had already made the same observation and this can be explained by the more frequent absence of rats on these smaller islands.

Figure 12. Patterns of zoological conservation value based on weighted endemism (wEnd, less biased by sampling effort). N.B. The index used takes into consideration the species rarity on each island (wEndSynth) and needs to be interpreted at island scale. For prioritization at the scale of all inner islands, refer to the Section III.5.



Values of weighted endemism calculated per grid cell are generally much higher based on zoological data compared to botanical data (Figure 13), i.e. up to 90 for animals at Mare aux Cochons (= Scott's Valley, Silhouette) vs. up to 13 for plants at Mont Pot à Eau. This is due to more numerous invertebrates known from just 1 or 2 localities, which most probably results from a more important sampling biais (i.e. fewer invertebrates specialists). Among the 533 zoological species of special concern known from at least one grid cell (i.e. not considering data with reduced geographic precision), 194 are known from 1 cell only and 114 are know from 2 cells. This means that 58 % of all animal species of special concern are known from less than 3 grid cells. For plants, only 19 % of all species of special concern are known from less than 3 grid cells. High values of zoological weighted endemism indicate accumulation of several very rare species.

Figure 13. Comparison of botanical and zoological weighted endemism calculated for each 500 x 500 m grid cell.



III.5 Reviewing and updating the system of KBAs

The first detailed document discussing the areas with conservation interest was by JEFFREY (1962), who proposed 12 reserve areas within 5 granite islands. Later, in 1970, SWABEY and especially PROCTER discussed the conservation status recommended for areas mostly corresponding to those defined by Jeffrey. These observations and recommendations were mostly based on plant diversity through qualitative observations of these experienced botanists. These authors did not define precise criteria for conservation value but described the proposed areas, emphasizing their special characteristics.

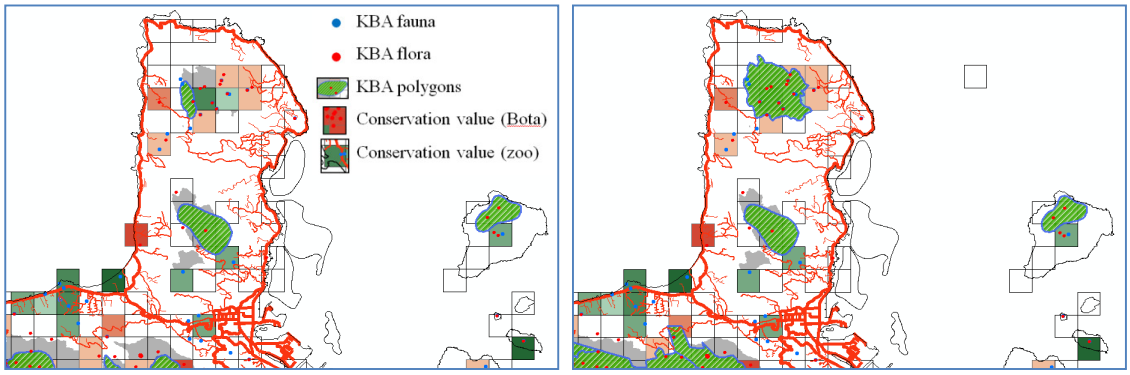
In the 1990s, many "areas of special conservation value" were added by Carlström (Carlström 1996a, b) based on traditional knowledge of local botanists and new field inventories focusing on endemics and threatened plants. From the late 1990s to recently, Justin Gerlach produced also several very useful studies or reviews on the key biodiversity areas (Gerlach 1993a, b, 2003, 2008; Gerlach et al. 1997). Here again, these studies included new field surveys focusing on a great diversity of taxonomic groups. These studies mostly occurred from 2000 to 2005 in relation to the "Indian Ocean Biodiversity Assessment" (IOBA). The results provided in the 2008 paper, provide the first quantitative ranking of these key biodiversity areas, including most of the areas already distinguished by previous authors but also missing some. It was based on 500 x 500 m grid squares and used mostly species and endemism richness. Two important studies are also to be mentioned which focused mostly on animals: Hill 2002; Rocamora & Skerrett 2001.

Finally, Senterre (2009) proposed a semi-quantitative synthesis of the literature above (among others), focusing on inner islands and integrating also personal field exploration experience. The author produced a GIS layer representing these areas, with the biodiversity priority rank assessed semi-quantitatively. This layer has been used recently by the Ministry of Land Use and Habitat (MLUH) to integrate key biodiversity areas into land-use planning revisions. For the inner Seychelles, 88 key biodiversity areas are listed from 7 of the main islands: Mahé, Praslin, Silhouette, La Digue, Curieuse, Félicité and Sainte Anne (see Appendix 2).

Below, we discuss and review the synthesized system of key biodiversity areas using the results of analyses on weighted endemism patterns, the distribution of species of special concern and the current state of habitat degradation or human development possibilities. Some areas are modified (regazetted), some are added. Data-deficient areas are cited at the end of this section (see III.5.5). The new version has been discussed during the final workshop and should be endorsed by MLUH as their new KBA map.

III.5.1 MAHÉ & SATELLITE ISLANDS

Figure 14. North Mahé; left figure = Carlström 1996-Senterre 2009 KBAs; right figure = current proposition.



Montagne Glacis (Wensikom): ID 1; Senterre 2009: CV 2 (Conservation Value = low); Gerlach 2008: rank 40

	Native	End	Exo	KBA	wEnd	Rank
Plants	42	14	15	11	0,27	36
Animals	11	10	0	10	1,60	25

This area was first proposed by Carlström. It could clearly be broadened in order to include some interesting biodiversity areas discovered close to Wensikom. We used the 200 m contour line to enlarge that polygon, which covers those interesting sites and does not interfere with areas of human development. Although biodiversity targets are not outstanding in that area, a forest reserve on the mountain is useful for preserving water catchment services.

Mont Signal: ID 2; Senterre 2009: CV 1 (Conservation Value = very low)

	Native	End	Exo	KBA	wEnd	Rank
Plants	13	7	12	2	0,02	53

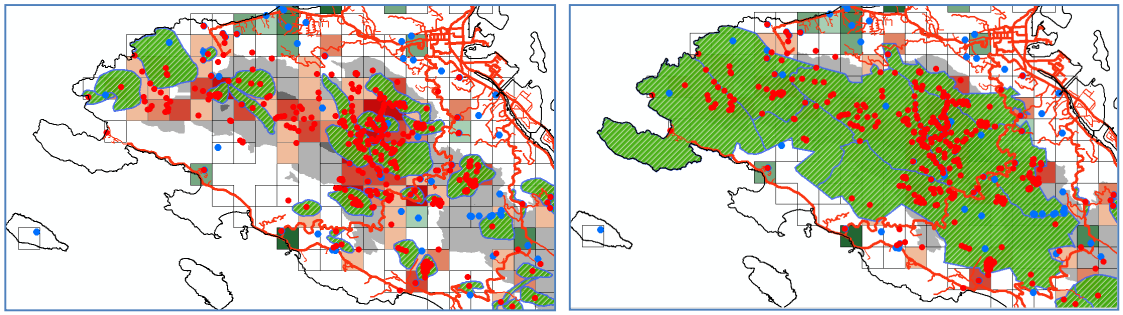
This area (listed by Carlström) is underexplored but has probably a very low biodiversity value. Nevertheless, it is a good site to preserve for water catchments services.

Sainte Anne: ID 23; Senterre 2009: CV 3 (Conservation Value = medium) ; Gerlach 2008: rank 12

	Native	End	Exo	KBA	wEnd	Rank
Plants	17	7	5	3	0,07	45

There are very few data with good geolocalisation quality for St. Anne, and few data in general. The KBA proposed by Carlström needs to be reviewed.

Figure 15. Morne Seychellois National Park; left figure = Carlström 1996-Senterre 2009 KBAs; right figure = currently protected area, subdivided in a way to reassess Carlström's KBAs.



Morne Seychellois National Park : ID 3 to 11 (several polygons included)

	Native	End	Exo	KBA	wEnd	Rank
Plants	227	75	122	92	13,28	2-25
Animals	206	191	1	210	76,77	4-44

All the areas shown on the left of Figure 16 are the areas defined by Carlström (1996). These polygons are often vaguely delimited and sometimes overlap partly, so that there was quite a lot of cleaning to do on that shapefile. In addition, we need here to integrate the polygon corresponding to the Morne Seychellois National Park itself (which is currently under revision by government). Therefore, we re-delimited Carlström's areas considering the limits of the National Park and natural geomorphological limits. Among the 9 areas subdivided within the Morne Seychellois National Park, the 2 most important ones for conservation are Morne Seychellois-Pérard and Mont Cotton-Glacis Sarcelles-Mont Le Niol (see Appendix 3), although for the latter area the most important sites are found on the ridges. The polygon corresponding to Glacis D'Antin, Mt Jasmin and Jasmin estate has most probably a high conservation value as well, but is still under explored (see section III.1). It includes interesting species such as Bwa mediz and Bwa marmay and possibly the lowest range limit for sooglossids frogs.

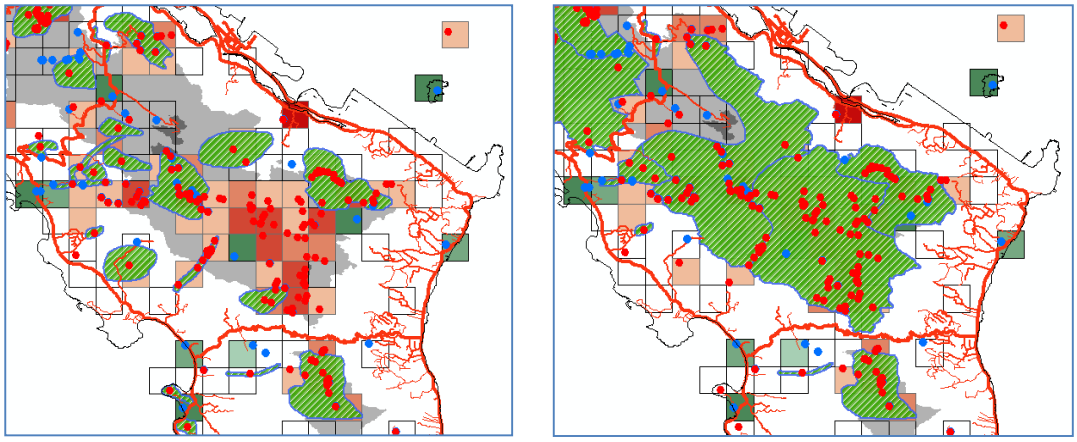
Montagne Planneau proposed NP: ID 13-16 (several polygons included); Senterre 2009: CV 5 (Conservation Value = very high) ; Gerlach 2008: rank 9

	Native	End	Exo	KBA	wEnd	Rank
Plants	175	70	55	75	6,54	6-14
Animals	63	62	3	65	16,14	12-22

Carlström did delimit several polygons within Planneau mountain range, but most of the central and southern parts are not covered although having outstanding conservation values

(as shown with the wEnd grid cells). We propose to regroup most of these areas into one, using the 250 m contour line, eliminating a few areas already affected by human development (e.g. tracking station) and adding a polygon to cover the areas identified by Carlström in the south-western limit (close to Barbarons). In addition to the obvious conservation value, the water catchment argument is also very important to support the proposition of protected status for that area. The most important area seems to be the central and southern parts, but most of the south-western slopes remain unexplored.

Figure 16. Montagne Planneau-Montagne Brûlée area; left figure = Carlström 1996-Senterre 2009 KBAs; right figure = current proposition.

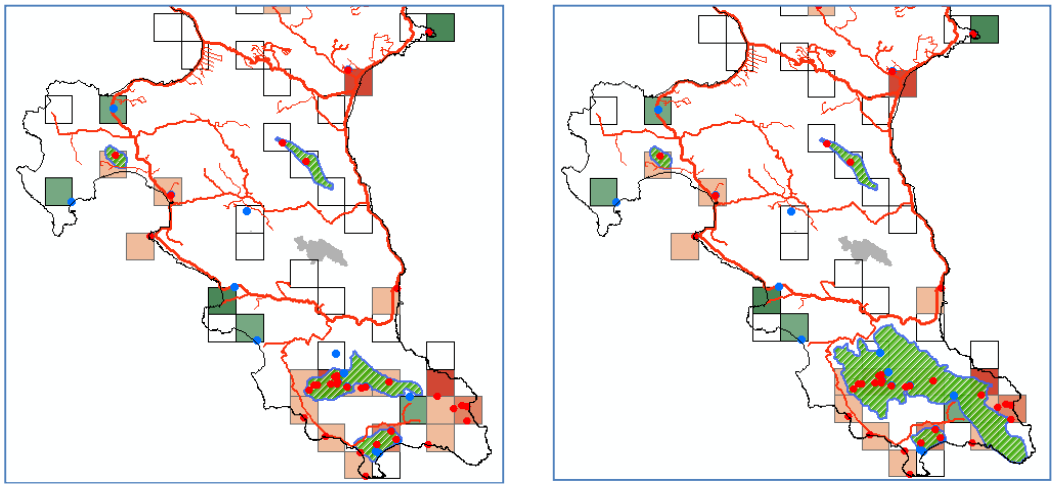


Montagne Brûlée-Piton de l'Eboulis: ID 19; Senterre 2009: CV 4 (Conservation Value = high) ; Gerlach 2008: rank 11

	Native	End	Exo	KBA	wEnd	Rank
Plants	102	42	17	31	1,21	21
Animals	22	21	0	22	4,19	18

This area is one of the best sites on Mahé with remains of lowland palm forests and the transition to submontane forests. It needs more exploring and deserves a protection status.

Figure 17. Montagne Corail-Collines du Sud area; left figure = Carlström 1996-Senterre 2009 KBAs; right figure = current proposition.



Val d'Endor: ID 21; Senterre 2009: CV 2 (Conservation Value = low)

	Native	End	Exo	KBA	wEnd	Rank
Plants	24	14	2	5	0,08	44

This area remains very poorly explored and needs more investigation. Nevertheless, it is also an area with important agricultural development, and it is worth mentioning that conservation targets might mostly remain on the less accessible rocky ridges.

Montagne Corail-Collines du Sud: ID 22; Senterre 2009: CV 4 (Conservation Value = high)

	Native	End	Exo	KBA	wEnd	Rank
Plants	73	26	15	16	2,40	12
Animals	8	8	5	10	1,07	31

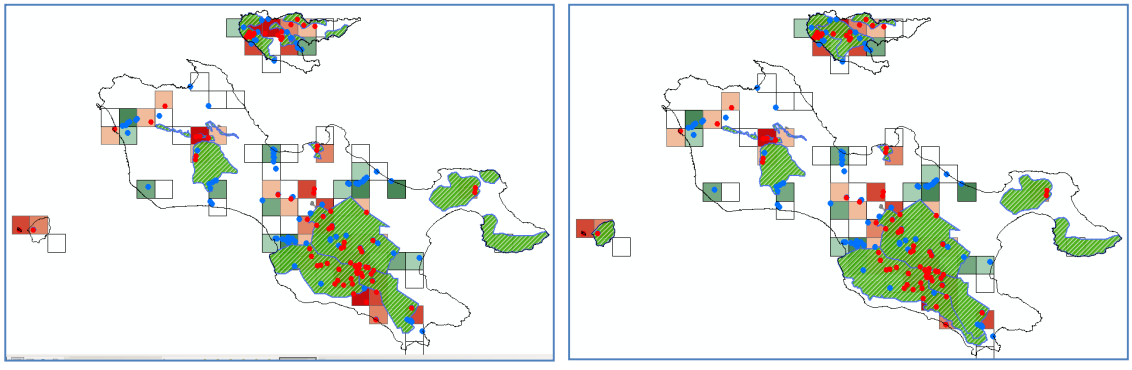
The polygon compiled from the literature is based on Carlström's study (1996) and is here modified to follow the 100 m contour line, which includes the most interesting biodiversity targets, leaves some areas for water catchment services and still enough space for potential human development. For the Police Bay wetland, we restricted the polygon to the main marsh environment and the steep slopes on the eastern side.

Grande Police wetlands: ID 45; Senterre 2009: CV 3 (Conservation Value = medium) ; Gerlach 2008: rank 37

	Native	End	Exo	KBA	wEnd	Rank
Plants	43	7	15	4	0,20	38
Animals	7	2	0	3	0,26	39

III.5.2 PRASLIN, CURIEUSE, COUSIN & ARIDE

Figure 18. Praslin, Curieuse & Cousin islands; left figure = Carlström 1996-Senterre 2009 KBAs; right figure = current proposition.



Praslin National Park: ID 30; Senterre 2009: CV 5 (Conservation Value = very high) ; Gerlach 2008: rank 10

	Native	End	Exo	KBA	wEnd	Rank
Plants	76	37	15	26	1,9	17
Animals	68	57	3	67	26,1	6

The Praslin National Park has actually a lower conservation value compared to the slopes south of Fond Azore. Nevertheless, it is also the most important site for the Seychelles emblematic Koko-d-mer, which justifies the very high conservation value of that area.

Fond Azore Southern slopes to Anse Bois de Rose: ID 31; Senterre 2009: CV 4 (Conservation Value = high)

	Native	End	Exo	KBA	wEnd	Rank
Plants	84	39	19	31	2,8	10
Animals	7	7	0	7	0,7	36

On Praslin, we kept most of the polygons unchanged, except for the southern slopes of Fond Azore (an area identified by Senterre 2009). This area was extended using the 50 m contour line, connecting to the coast line towards Montagne Cabris slopes, and connecting to Fond Ferdinand in the eastern side.

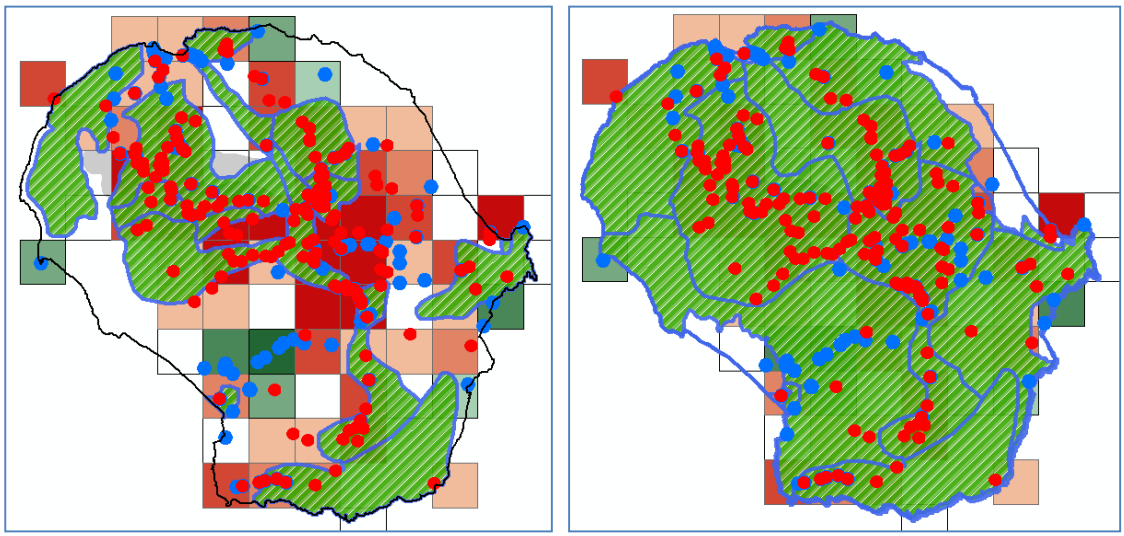
Praslin & Curieuse other KBAs + Aride and Cousin: several polygons

(for plants only)	Native	End	Exo	KBA	wEnd	Rank
Anse Petite Cours boulders	26	13	3	5	0,2	39
Fond Diable	30	15	6	4	0,2	41
Fond Ferdinand	62	30	15	22	1,4	20
L'Amitié forest	20	9	1	4	0,0	50
Rivière Kerlan	37	12	6	10	0,4	33
Rivière Zimbabwe-Rivière Anse Boudin	4	0	0	0	0,0	54
Curieuse Central ridges to Baie La Raie	35	15	9	6	0,2	37
Curieuse Northern slopes to Fond Blanc	19	9	5	2	0,1	46
Curieuse Western coast	12	6	2	6	1,5	18
Aride island Special Reserve	48	3	59	5	2,1	15
Cousin island Special Reserve	50	2	65	4	0,8	24

For Curieuse we regrouped the polygons of the western and central parts in order to cover several sites which are very interesting to preserve. All other areas have been kept unchanged. Conservation values are given for plants only.

III.5.3 SILHOUETTE

Figure 19. Silhouette island; left figure = Carlström 1996-Senterre 2009 KBAs; right figure = currently protected.



	Native	End	Exo	KBA	wEnd	Rank
Plants	221	75	97	94	15,1	1-42
Animals	331	288	3	322	153,9	2-38

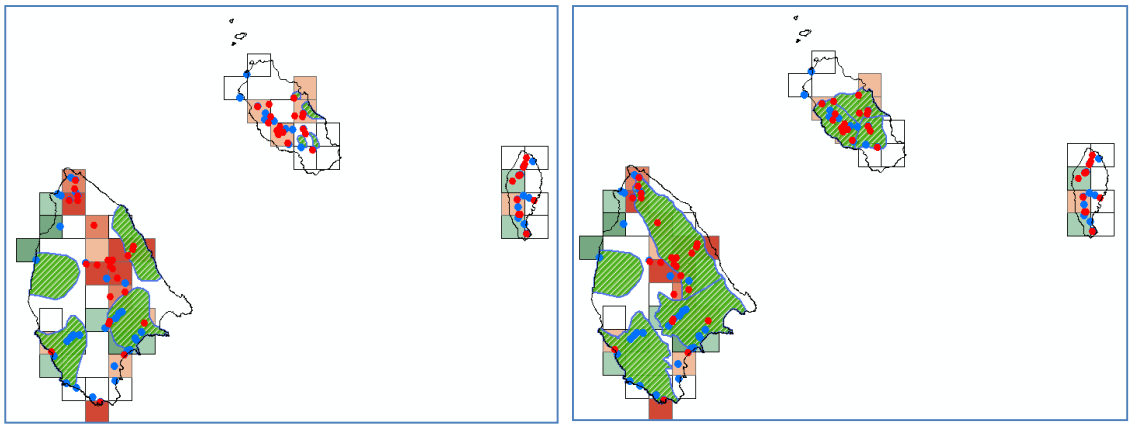
Similarly as for the Morne Seychellois National Park, we extended the previously identified areas (based on Senterre 2009 and Jeffrey 1962) in order to cover the limits of the national park. Some polygons were merged together for simplicity (e.g. Mont Plaisir-Jardin Marron-Grande Rivière).

(for plants only)	**Native**	**End**	**Exo**	**KBA**	**wEnd**	**Rank**
Mt Pot à Eau-Vallée de l'Anse Mondon-Gd. Congoman	120	57	16	62	9,9	1
Mont Dauban	134	55	14	64	5,7	4
Mont Plaisir-Jardin Marron-Grande Rivière	132	49	21	56	4,8	5
La Passe	66	33	39	23	1,9	16
Mont Cocos Marrons-Rende d'Avance	55	29	6	24	1,4	19
Anse Lascars slopes	52	20	10	17	0,7	26
Casse Tonnère-Mare aux Cochons	44	17	18	13	0,6	27
Pointe Civine	41	14	5	13	0,5	29
Grand Barbe slopes	44	20	11	14	0,4	30
La Réserve (Silhouette)	40	9	14	8	0,3	34
Grand Barbe mangrove	6	2	6	3	0,2	42

III.5.4 La Digue, Félicité & Marianne

Most of the biodiversity targets present on La Digue and Félicité were missed by the previously delimited polygons. Therefore, we updated the system of areas using the 50 m contour line on La Digue in order to enlarge the polygon on the hills above Anse Source d'Argent, the one above the slopes of Grand Anse and the ridge plus eastern slopes, and then removing areas already affected by human development (e.g. Nid d'Aigle). On Félicité we merged the previously defined polygons to create a continuous area of conservation value in the center of the island. Marianne is not further discussed since we have not found outstanding sites for conservation value. Nevertheless, the forests on the northern part of the central ridge and northern slopes contain some very interesting populations for Bwa-d-nat (*Mimusops sechellarum*) and Bwa papay (*Polyscias sechellarum subsp. sechellarum*).

Figure 20. La Digue, Marianne, Félicité; left figure = Carlström 1996-Senterre 2009 KBAs; right figure = current proposition.



La Digue KBAs : several polygons

(for plants only)	Native	End	Exo	KBA	wEnd	Rank
Anse Source d'Argent-Anse Marron	20	6	7	3	0,3	35
Gd Anse-Petite Anse-Fond Piment	36	8	15	2	0,0	51
Nid d'Aigle ridge & Eastern slopes	46	16	19	**10**	0,4	31
La Veuve Special Reserve			1		0	55

The most interesting area on La Digue is the central ridge and the Eastern slopes. Nevill (2010) suggested the designation of a National Park for that area, "to be established as rapidly as circumstances allow".

Félicité KBAs : several polygons

(for plants only)	Native	End	Exo	KBA	wEnd	Rank
Anse Songe-Baie Chagrin	34	10	4	6	0,4	32
Fond Fidèle South-W slopes	47	19	7	**12**	0,6	28
Fond Malgache-Fond Fidèle	31	10	2	4	0,1	43

For Félicité, the only author having discussed KBAs was Jeffrey (1962), who proposed 4 areas approximately gazetted. Based on our observations, although the areas identified by Jeffrey are interesting, the most valuable area on that island is the ridge near Fond Fidèle and the western slopes. This area needs more exploration.

III.5.5 OTHER KBAS (TO BE FURTHER STUDIED FOR CONSERVATION VALUE)

In this section, we mention the KBAs cited in other reports but not further discussed here because of the lack of data, low conservation value, small size, or because they are outside the geographical scope of our study (outer islands and northern inner islands). For more details, see the references mentioned next to the listed areas or see Appendix 3 & 4.

Mahé & Satellites
-Riviere Bamboo : proposed by Carlström (1996)
-Rivière Mamelles : proposed by Carlström (1996)
-Rivière Désert / Rivière Mont Posée : proposed by Carlström (1996)
-Rivière Désert : proposed by Carlström (1996)
-La Misère-Dauban area: La Misère: proposed by Carlström (1996)
-Barbarons Ridges: proposed by Carlström (1996)
-Barbarons : proposed by Carlström (1996)
-Rivière Souvenir : proposed by Carlström (1996)
-Val Mer : proposed by Carlström (1996)
-Louis : proposed by Carlström (1996)
-Anse Louis : proposed by Carlström (1996)
-Conception island: see Rocamora & Skerrett (2001)
-Ile aux Vaches Marines (West coast islands): see Gerlach (2008) (not gazetted)
-Moyenne: see Nevill (2010)

Praslin
-Pointe Josephine: proposed by Senterre (2009)
-Au Morne Southern slopes : proposed by Senterre (2009)

Curieuse
-Anse Papai - Grand Anse : proposed by Senterre (2009)

Other inner islands sites
-Ile aux Vaches (= Bird Island): see Rocamora & Skerrett (2001), Gerlach (2008)
-Ile Denis: see Gerlach (2008)
-Ile du Nord (= North): see Gerlach (2008)
-Cousine island: see Rocamora & Skerrett (2001), Gerlach (2008)
-Booby: see Gerlach (2008) (not gazetted)
-Frégate: see Rocamora & Skerrett (2001), Gerlach (2008)
-Récifs & Ilot Frégates : see Gerlach (2008) (not gazetted)
-Sèche island: (East coast islands): see Gerlach (2008), Nevill (2010) (not gazetted)
-Les Mammelles: (East coast islands): see Nevill (2010) (not gazetted)

Outer islands sites (see Rocamora & Skerrett 2001; Gerlach 2008)
-Alphonse & St. Francois atoll
-Providence & Farquhar : Providence, Bancs de Providence, St. Pierre
-Cosmoledo atoll
-Astove
-Assumption
-Aldabra atoll : Aldabra Special Reserve
-African Banks (North Amirantes)
-D'Arros island (North Amirantes)
-Etoile island (North Amirantes)
-Boudeuse island (South Amirantes)
-Marie-Louise island (South Amirantes)
-Desnoeufs island (South Amirantes)

III.6 Assessing the system of protected areas and prioritizing KBAs

In the previous section, we updated the complete list of KBAs, we added some areas based on the data collected during this study (using both plant and animal data), we reviewed the delimitation of some areas and we discussed the most important KBAs.

Here we are assessing the system of KBAs defined in the previous section, i.e. we intend to rank KBAs for their conservation value (prioritization) and we calculate more synthetic statistics on these areas, considering their current or proposed protection status.

Considering that animal data are suffering more gaps and biases compared to plant data (see II.1.2), we will use mostly plant data for prioritizing conservation values. Nevertheless, small islands which are mostly important for birds and invertebrates need to be considered separately; but since the focus is more in relation to land use planning, we concentrate on large islands.

Note that quantitative ranking based on species rarity is very useful but it does not include conservation value at ecosystem scale (e.g. habitat-type rarity). Another consultancy by UNDP is expected to be developed in 2013 which will produce new vegetation maps for the main inner islands, and this will provide the missing information to further detail the

quantitative analyses of the patterns of conservation values. In the meantime the semi-quantitative ranking proposed by Senterre (2009) can still be considered to complement the KBA new ranking proposed here.

Assessing Carlström 1996-Senterre 2009 synthesis

With the newly compiled data on species distribution within islands, it is now possible to assess quantitatively the levels of priorities for the KBAs synthesized in Senterre 2009). The sites with the highest value of weighted endemism are, in order of decreasing values of wEnd: Anse Mondon upper valley (Pisonia), Morne Seychellois (MSNP), Mont Dauban, Jardin Marron, Congo Rouge (MSNP), Morne Blanc (MSNP), Montagne Planneau (Mont Harrison), Perard (MSNP), Praslin National Park, Bernica (Montagne Palmiste), Mont Sebert, Gratte Fesse, Belle Vue - Grand Congomann, Mont Jasmin (MSNP), Abondance / Bon Espoir (Grand Bois) (see Appendix 2 for more details on values and other KBAs).

These results mostly confirm the assessment done by Senterre (2009) on a semi-quantitative basis. Nevertheless, some areas have an underestimated conservation value, based on quantitative species rarity data, because of missing ecosystem rarity criteria.

Assessing the current system of protected areas & Prioritizing non protected KBAs

The Seychelles terrestrial area is approximately 45,538 ha: 24,406 ha for the inner islands and 21,131 ha for the outer islands (based on GIS layer from MLUH, see also Skerrett 1991). About 47 % of the total land area is protected as National Parks or Special Reserves. But this is largely influenced by the Aldabra atoll special reserve and if we consider only the inner islands, 22.3 % of the land area is protected (Table 12).

Table 12. Seychelles land area and extent of protected areas and other KBAs in the inner and outer islands.

		Inner islands	Outer islands	Total
Protected KBAs	National Park	5248		5248
	Special Reserve	184	15772	15955
	Total protected	5432	15772	21204
	protected % of KBAs	54	81	72
	protected % of land area	22.3	74.6	46.6
Unprotected KBAs	Bird Reserve		260	260
	Proposed extension	2169		2169
	Other KBAs	2405	3386	5791
Total KBA area		10006	19418	29423
Total land area		24406	21131	45538

Only 4 endemic species found in the inner islands are not represented within the current system of protected areas: *Bakerella clavata subsp. sechellensis* (not seen recently, 1904), *Cynorkis seychellarum* (doubtful species), *Oeceoclades seychellarum* (not seen recently, 1902), *Polyscias sechellarum var. curiosae* (recently rediscovered, March 2013, as previously known trees could not be localized anymore).

In terms of indigenous species, the most important ones (the rarest) not represented within the current system of protected areas are: *Antrophyum boryanum* (recently discovered, 12/2012), *Asplenium petiolulatum* (recently discovered, 4/2011), *Orfilea neraudiana* (not seen recently, 1875), *Pellaea goudotii* (not seen recently, 1900s), and *Potamogeton richardi* (not seen recently, 1962).

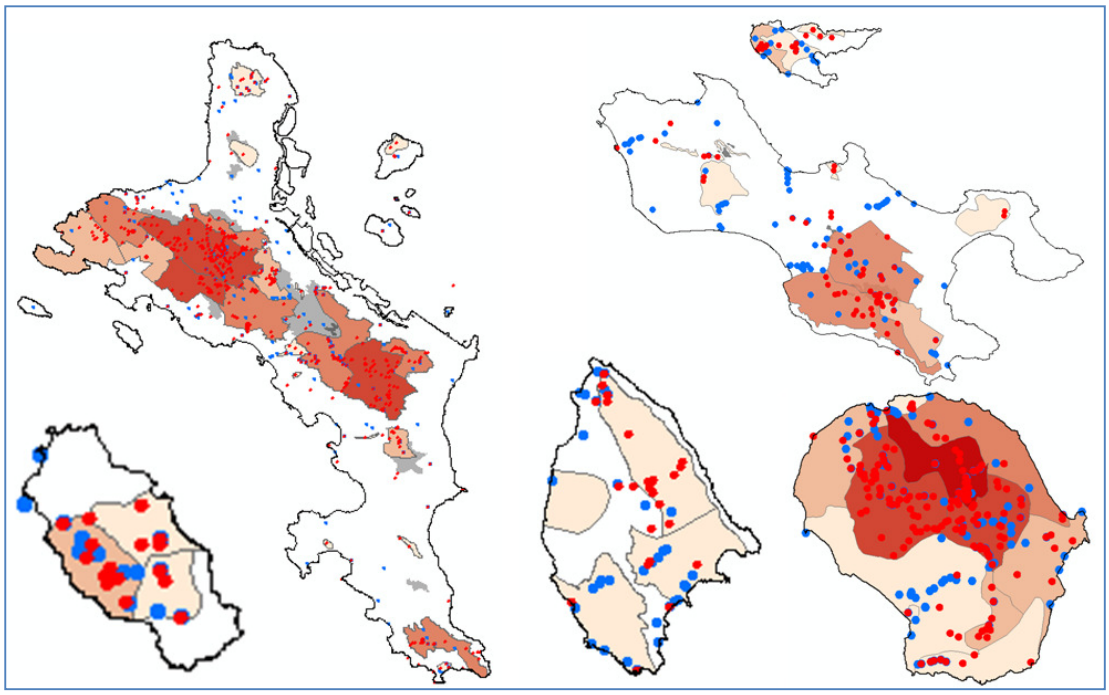
In Table 13, we provide updated statistics on the flora of the currently protected areas and other KBAs, based on the exhaustive dataset for plants. The remaining imprecision or errors can be attributed to a lack of entry of records for the species not listed as species of special concern. These calculations suggest that the two most important protected areas from the current system are indeed the most important ones for conservation. It emphasizes also the good decision made recently by the Seychelles Government when classifying Silhouette as a National Park.

Four areas are proposed as extensions of the current system of protected areas. Three of these areas have outstanding conservation value and are ranked at a higher position compared to e.g. Praslin National Park (see also Appendix 3). These areas cover 2169 ha and correspond to 8.9 % of the inner islands land area. This would bring the percentage of protected area for the inner islands to 31 %.

Table 13. Conservation values and flora for the main categories of KBAs, using weighted endemism based on overall range-size rarity (not island-based range-size rarity as opposed to within islands analysis, see III.4). The detailed statistics calculated for each KBA individually are presented in Appendix 3.

Conservation areas	Native	End	Exo	KBA	wEnd	Rank
National Parks	**281**	**86**	**179**	**120**	**23,43**	
Silhouette National Park	221	75	97	94	15,09	1
Morne Seychellois National Park	227	75	122	92	13,28	2
Praslin National Park	76	37	15	26	1,86	7
Special Reserve	**62**	**3**	**93**	**6**	**2,14**	
Aride island Special Reserve	48	3	59	5	2,08	6
Cousin island Special Reserve	50	2	65	4	0,81	11
La Veuve Special Reserve	0	0	1	0	0,00	16
Proposed extension	**211**	**76**	**71**	**90**	**11,07**	
Montagne Planneau proposed NP	175	70	55	75	6,54	3
Praslin NP proposed extension	84	39	19	31	2,80	4
Montagne Corail-Collines du Sud dry forests	73	26	15	16	2,40	5
Montagne Brûlée-Piton de l'Eboulis	102	42	17	31	1,21	10
Other KBA	**147**	**45**	**64**	**43**	**4,01**	
Curieuse KBA	46	18	12	11	1,71	8
Praslin KBA	79	34	20	25	1,62	9
Félicité KBA	52	19	8	13	0,66	12
La Digue KBA	59	18	29	12	0,63	13
Mahé KBA	87	24	35	17	0,51	14
Sainte Anne KBA	17	7	5	3	0,07	15
Unprotected-non KBA	245	59	498	62	9,99	
Total Inner Islands (Full Dataset)	**368**	**91**	**577**	**137**	**990**	

Figure 21. General overview of the inner islands KBAs and their conservation value.



IV CONCLUSION AND RECOMMENDATIONS

IV.1 KBAs prioritized

KBAs prioritized and 4 areas to become new protected areas

KBAs have been prioritized (III.6, Appendix 3). Within 18,835 ha of land area without protection status in the inner islands, we identified 2,169 ha as being priority for extension of the current system of protected areas (see p.38). Among these, the most important area for conservation at a national scale is without any contest the Montagne Planneau range (1,435 ha), as already demonstrated in previous studies. We propose here new limits for that area so that the most important conservation targets are included. The three other KBAs proposed for revision of protection status are (a) the slopes south of Fond Azore (320 ha, Praslin National Park), (b) Montagne Corail-Collines du Sud dry forests (299 ha) and (c) Montagne Brûlée-Piton de l'Eboulis areas (114 ha). All these areas have an important value not only for biodiversity but also for water catchment.

IV.2 Main outputs and tools produced

Powerful tools available for land-use planning

The conservation value calculated per grid cell of 500 x 500 m is provided in a geodatabase, along with occurrences of species of special concern and other synthetic outputs (e.g. species lists). These numerical tools should be used for decision making process and made available to key stakeholders such EIA section, DoE and Planning Authority (see Appendix 6).

Detailed species distribution maps for species-centred conservation actions
Detailed species distribution maps are available for all species of special concern (see III.7). These data should be used strictly for conservation actions and made available typically for the Department of Environment (e.g. Conservation section), Seychelles National Parks Authority and other ENGOs with species-centred action plans. In addition, the data collected on specific taxa can contribute in a revision of the IUCN endangered species list for Seychelles.

Multipurpose and flexible database integrating species and ecosystems levels
For the first time, a complete database has been compiled for at least all plant collections in Seychelles (herbarium database). It includes also a zoological component covering the species of special concern and integrates the ecosystem components. This database is a powerful tool for the development and curation of national specimen collections (referenced and verifiable species records), and it should greatly improve data collection with very high quality in future.

A major contribution to exploration of biodiversity and taxonomic knowledge
During the KBA study and the closely linked Herbarium project (PCA-Museum), 320 grid cells (500 x 500 m) have been explored out of 493 grid cells explored in total, 261 days have been spent in the field, involving about 23 local researchers from government and different NGOs. About 20 native species are reported here for the first time in Seychelles, including several species new to science and new endemics (see III.2).

IV.3 Recommendations on future research in priority areas

1. Ensure long-term management and development of the Herbarium-KBA database
The new species records and other rediscoveries made during the present study could not have been done without dedicating a large amount of time to the study of the specimens available in Seychelles and developing collaborations with specialists overseas. This emphasizes the critical role of the Natural History Museum for Seychelles biodiversity studies. In order to ensure a long-term development of the KBA-Herbarium database, the following is required:

a) 1 Seychelles National Herbarium curator: this function is already under the responsibility of Charles Morel. This position involves the physical management of the collections, the responsibility for their use and also participation to the taxonomic revisions.

b) 1 Herbarium-KBA database manager: this position needs to be attributed to a senior taxonomist who will contribute to training, develop taxonomic research and who will be responsible for developing international collaborations and writing project proposals for international funding. This position could be attributed part time for an amount of at least 3 days per month at local consultancy rates.

c) 1 Natural History Museum zoological curator and database assistant manager: this position needs to be attributed, preferably to a young Seychellois naturalist full time, to be trained by Charles Morel and the taxonomist (see position b). This position is stipulated as an important acquisition in the following documents: Seychelles Sustainable Development Strategy 2010-2020 (page 44, e.g. activity 4), Seychelles National Strategy for Plant Conservation 2005-2010, target 12. In the short term, it is not indispensable to have a graduate student (since it is not currently available) but someone with the interest in natural sciences.

We recommend that PCU-UNDP (i.e. National Coordinator, Andrew Grieser Johns) explores the possibility to fund the above through a GEF project, especially position (b) which could be implemented immediately. He should also channel the above recommendation through the Minister for Environment and Energy and NHRDC to consider the creation and funding of the above positions, particularly position (c).

2. Continue field exploration combined with taxonomic studies

The most interesting under-explored sites have been identified and prioritized for the inner islands (Figures 6 & 11). Exploration effort should be continued on a regular basis, in part to train more local researchers in the methodology developed here and in the KBA database. In addition, several under-studied taxa or ecosystems need more attention in future, e.g. freshwater systems where most of the zoological discoveries were made, ferns, mosses, fungi and many animal groups. A similar KBA study would also be welcome for outer islands.

We recommend that local ENGOs take part to the development of taxonomic research in collaboration with the Natural History Museum (see recommendation 1). This could be done by dedicating one of their staff to participate to taxonomic revisions, on a part time basis (e.g. several days per month, preferably long term). This will benefit the ENGOs in terms of training and publications. It will also benefit to the development of floras for the groups not yet treated, i.e. monocots, ferns and mosses. Such collaborations should not be limited to plants, and the taxonomist adviser should be able to support the development of tools for identification of known animal species, e.g. through numerical taxonomy and interactive keys of identification, depending on interest or needs of ENGOs.

Funding of the exploration work should be raised through e.g. UNDP-GEF, ETF (Environmental Trust Fund) or international sources of funding (Darwin Initiative, National Geographic Society, Sud Expert Plantes, etc.). Initially, exploration can be focused on Mahé (at lower costs) and more time can be dedicated to indoor study of the existing specimens.

3. Diffuse the database and outputs to the local scientific community, as users

Although we recommended above to centralize the Herbarium-KBA database management within the Seychelles Natural History Museum, we also recommend distribution to the local scientific community of user versions of the database, and to provide support to users.

4. Develop the ecosystem approach

For all areas, there is a need to integrate ecosystem criteria more precisely. Which are the rarest ecosystems? What is the diversity of ecosystems for the different KBAs? These questions cannot be assessed with precision at this stage due to lack of data, i.e. detailed land cover maps developed with remote sensing imagery and defined using conservation / biodiversity–oriented criteria. Further progress on that aspect is expected in 2013, with another UNDP consultancy, but focusing only on 5 inner islands. Vegetation maps exist for several small inner islands and some outer islands (e.g. Hill 2002; Piggott 1969; Spencer et al. 2009), but these should be combined together.

This recommendation should be developed once recommendation 1 has been successfully implemented. It will require another GEF funding for about 4 to 6 months in order to integrate the land cover maps into the analyses of KBAs. In addition, the integration of outer islands into KBA prioritization would represent another study, probably also to be funded by GEF and for a duration of 6 to 12 months.

5. Assess more detailed and less biased biodiversity indexes
A priority for the most important conservation areas (highest scores of weighted endemism) is to set up long-term biodiversity-oriented field inventories, i.e. considering not only KBA species but all native species and based on individual counts or measured sampling effort. Such data will allow the calculation of biodiversity indexes accounting for sampling bias, species evenness, etc.

We recommend to implement such studies through international funding (e.g. Darwin Initiative) and / or in association with universities (e.g. master students) and other international partners.

6. Integrate threats criteria
A priority for already protected areas is to set up permanent plots and transects in order to quantitatively monitor exotic species invasion process, and to monitor indicators of climate change (e.g. species with restricted altitudinal range). Long-term monitoring of key taxa or ecosystems could be an important tool for measuring the effectiveness of conservation actions/efforts within protected areas. In addition, human threats within protected areas also need to be considered, e.g. eco-tourism, agro-forestry.

7. Conservation actions for species of special concern not included in the system of KBAs
A relatively reduced number of species of special concern is found in mostly anthropic habitat-types, e.g. typically freshwater fauna near the coast, or Zwazo linet in several areas. In such areas, not covered by the system of KBAs, it is necessary to set up species-centered conservation actions (Fourmy 1999; Procter 1973; Renguet 2011). This should be in line with the newly proposed protected area classification system which makes reference to Ecological Reserve category.

V BIBLIOGRAPHY

Awmack, C.S. (1997): The Fern Flora of Seychelles - Report of visit to Seychelles, January-February 1997. IACR Rothamsted, Harpenden, Herts, UK, 16 pp.

Baker, J.G. (1877): Flora of Mauritius and the Seychelles - A description of the flowering plants and ferns of those islands. Reeve & Co., London, 557 pp.

Bollier, R. & Tanner, I. (2004): Priority ranking for habitat protection of important biodiversity sites on Mahé and Praslin, Seychelles. Report on the internship for the studies in environmental sciences, Geobotanical Institute (ETH), Zuerich, 67 pp.

Carlström, A. (1996a): Areas of Special Conservation Value for the Plants of the Granitic Islands of Seychelles. Consultancy Report, Seychelles Government. Ministry of Foreign Affairs, Planning and Environment. Conservation & National Parks Section, Victoria, Seychelles.

Carlström, A. (1996b): Endemic and Threatened Plant Species on the Granitic Seychelles. Consultancy Report, Ministry of Foreign Affairs, Division of Environment, Victoria.

Christensen, C. (1912): On the ferns of the Seychelles and the Aldabra group. - Trans. Linn. Soc. Lond. 2nd Ser. Zool. **15**: 407-422.

Droissart, V., Hardy, O.J., Sonké, B., Dahdouh-Guebas, F. & Stévart, T. (2012): Subsampling Herbarium Collections to Assess Geographic Diversity Gradients: A Case Study with Endemic Orchidaceae and Rubiaceae in Cameroon. - Biotropica **44** (1): 44-52.

Dubuisson, J.Y., Rouhan, G., Gralla, A., Hennequin, S., Senterre, B., Pynee, K. & Ebihara, A. (2013): New insights into the systematics and evolution of the filmy fern genus Crepidomanes (Hymenophyllaceae) in the Mascarene Archipelago with a focus on dwarf species. - Acta Bot. Gall.: submitted.

Elzein, H. (2011): Caractérisation des types de forêts montagnardes sur l'île de Mahé (Seychelles). - Master Thesis, Université Libre de Bruxelles, Service Eco-Ethologie Evolutive, Bruxelles, 93 pp.

Fourmy, J. (1999): Plan de gestion et d'aménagement du Parc National du Morne Seychellois. Ministry of Environment and Transports, Division of Environment, Government of Seychelles, Victoria, Seychelles.

Gerlach, J. (1993a): The conservation of Silhouette island, Seychelles. I. Plants. - Phelsuma **1**: 18-29.

Gerlach, J. (1993b): Patterns of species diversity among the Seychelles islands. - Phelsuma **2**: 48.

Gerlach, J. (2003): The biodiversity of the granitic islands of Seychelles. - Phelsuma **11** (B): 1-47.

Gerlach, J. (2008): Setting Conservation Priorities - A Key Biodiversity Areas Analysis for the Seychelles Islands. - The Open Conservation Biology Journal **2**: 44-53.

Gerlach, J., Matyot, P. & Saaristo, M.I. (1997): The ecology and conservation of Silhouette island. - Phelsuma **5**: 27-38.

Hill, M.J. (2002): Biodiversity surveys and conservation potential of inner Seychelles islands. - Atoll Research Bulletin **495**: 1-272.

Huber, M. & Ismail, S. (2006): Suggested IUCN Red List Status of the Endemic Woody Plants of the Inner Seychelles. - Master Thesis, Eidgenössische Technische Hochschule Zürich (ETH), Institute if Integrative Biology Zurich (ibz), Zürich, 142 pp.

Jeffrey, C. (1962): The Botany of the Seychelles (Report by the visiting botanist of the Department of Technical Cooperation Seychelles Botanical Survey, 1961-62). London, 37 pp.

Linder, H.P. (2001): Plant diversity and endemism in sub-Saharan tropical Africa. - Journal of Biogeography **28**: 169-182.

Nevill, J. (2010): Strengthening Seychelles' Protected Area System through NGO Management Modalities. Consultancy Report, GOS, UNDP, GEF, PPG Project, Victoria, Mahé, 65 pp.
Piggott, C.J. (1969): A report on a visit to the Outer Islands of Seychelles between October and November 1960. Report of Expedition, Victoria, Mahé.
Procter, J. (1970): Conservation in the Seychelles. Report of the Conservation Adviser 1970, Government of Seychelles, Victoria, Mahé, Seychelles, 35 pp.
Procter, J. (1973): National parks in the Seychelles. - Biol. Conserv. **5**: 153-155.
Raes, N., Roos, M.C., Slik, J.W.F., van Loon, E.E. & ter Steege, H. (2009): Botanical richness and endemicity patterns of Borneo derived from species distribution models. - Ecography **32**: 180-192.
Renguet, L. (2011): Patrons de diversité végétale dans l'île de Mahé (Seychelles) et implications pour le système d'aires protégées. - Master Thesis, Université Libre de Bruxelles, Service Eco-Ethologie Evolutive, Bruxelles, 116 pp.
Rocamora, G. & Skerrett, A. (2001): Seychelles. - In: L.D.C. Fishpool & M.I. Evans (eds.): Important Bird Areas in Africa and associated islands: Priority sites for conservation. BirdLife Conservation Series, Vol. 11, Pp. 751-768. - Pisces Publications and BirdLife International, Newbury and Cambridge, UK.
Schill, S. & Raber, G. (2009): Protected Area Tools (PAT) for ArcGIS 9.3TM Version 3.0 - User manual and tutorial. The Nature Conservancy, 75 pp.
Senterre, B. (2009): Forest fire risk assessment on Seychelles main granitic islands. Consultancy report, Ministry of Environment-UNDP-GEF project, Mahé, Seychelles, 61 pp.
Senterre, B., Fabre, I., Morel, C., Rouhan, G. & Christenhusz, M.J.M. (2013): Revision of Marattiaceae (Pteridophyta) of the Seychelles with a new species of Angiopteris. - Phytotaxa: in prep.
Senterre, B., Henriette, E., Chong-Seng, L., Beaver, K., Mougal, J., Vel, T. & Gerlach, J. (2011): Seychelles Key Biodiversity Areas - Output 1: List of species of special concern. Consultancy Report, Ministry of Environment-UNDP-GEF project, Victoria, Seychelles.
Senterre, B., Henriette, E., Vel, T. & Gerlach, J. (2012a): Seychelles Key Biodiversity Areas - Output 2: Species distribution data. Consultancy Report, Ministry of Environment-UNDP-GEF project, Victoria, Seychelles.
Senterre, B., Henriette, E., Vel, T. & Gerlach, J. (2012b): Seychelles Key Biodiversity Areas - Output 4: Site selection and methodology for inventories. Consultancy Report, Ministry of Environment-UNDP-GEF project, Victoria, Seychelles.
Skerrett, A. (1991): List of Seychelles islands. Unpublished Report, 4 pp.
Spencer, T., Hagan, A.B. & Hamylton, S. (2009): Atlas of the Amirantes. University of Cambridge, Department of Geography, Cambridge, 66 pp.
Swabey, C. (1970): The endemic flora of the Seychelles islands and its conservation. - Biol. Conserv. **2** (4): 171-177.
Tardieu-Blot, G. (1960): Les fougères des Mascareignes et des Seychelles. - Notulae Systematicae **16**: 151-201.
Williams, P.H. (2001-2013): Biodiversity and WorldMap. The Natural History Museum. URL http://www.nhm.ac.uk/research-curation/research/projects/worldmap

VI ANNEXES

Appendix 1. Complete list of contributors for the Herbarium – KBA database
Appendix 2. Reassessment of the KBAs synthesized by Senterre (2009).
Appendix 3. Assessment of the newly proposed system of KBAs for the inner islands.
Appendix 4. Complete list of all synthesized KBAs in the Seychelles.
Appendix 5. Example of output from the KBA database and geodatabase.
Appendix 6. Main outputs of this consultancy.
Appendix 7. Terms of reference

Appendix 1. Complete list of contributors to the botanical records of the Herbarium – KBA database, classified by decreasing number of contributions ("obs" = observations; "spe" = specimens). This table not only acknowledges contributors but also emphasizes gaps in the database, e.g. Friedmann's monocots have not yet been digitized, as well as Beaver's mosses, etc.

	Dicots		**Monocots**		**Gymno.**	**Fern**		**Mosses s.l.**		**Fungus**		**Total**		
	obs	spe	obs	spe	obs	obs	spe	obs	spe	obs	spe	obs	spe	All
Total	**9592**	**3412**	**3892**	**1037**	**14**	**1620**	**1125**	**11**	**345**	**2**	**14**	**15131**	**5933**	**21068**
Senterre	3208	632	1397	159	5	1027	484	9	341	1	14	5647	1630	7278
Robertson	1964	531	768	263	9		25		1			2741	820	3561
Elzein	1471		528			288						2287	0	2287
Carlström	1298		769			12						2079	0	2079
Friedmann	26	821	3	1		4						33	822	855
Renguet	327		185			135						647	0	647
Jeffrey	14	323	5	142			41					19	506	525
Procter	4	277		161		1	34					5	472	477
Finger	436											436	0	436
Kaiser-Bunbury	292		62									354	0	354
Hill	168		77			13				1		259	0	259
Fosberg	1	115	1	49								2	164	175
Awmack							173					0	173	173
Vesey-Fitzgerald		116		34			4					0	154	154
Labiche	9	75	3	27		1	20		1			13	123	139
Horne	38	15	7	5		6	58					51	78	129
Brunet		73		35			2					0	110	110
Frazier		71		25								0	96	96
Schlieben		73		22		1						1	95	96
Morel	32	3	11	1		4	29					47	33	80
Gardiner	9	8	2	7		4	47	2				17	62	79
Thomasset	18	12	8	6		3	30					29	48	77
Dupont	2	40	1	21								3	61	64
Pervillé	15	3	1			5	37					21	40	61
Janssen						48						48	0	48
Renvoize	33		14									47	0	47
Boivin	10		1			2	23					13	23	36
Todd		26		8			2					0	36	36
Archer		19		15								0	34	34
Bernardi		29		4		1						1	33	34
Rocamora	16		12									28	0	28
Bollier	23		4									27	0	27
Rouhan						23	4					23	4	27
Wright	12	1				2	11					14	12	26
de l'Isle	1		1			1	22					3	22	25
Wood	23		2									25	0	25
Evrard		18		3			3					0	24	24
Dunford	21		2									23	0	23
Unknown	5	1	3			13						21	1	22
Bremer	21											21	0	21
Huber	21											21	0	21
Piggott		15		5								0	20	20
Squibbs				19								0	19	19
Beaver	5	3	1				7		2			6	12	18
Kingsland		16										0	16	16

	Dicots		Monocots		Gymno.	Fern		Mosses s.l.		Fungus		Total		
	obs	spe	obs	spe	obs	obs	spe	obs	spe	obs	spe	obs	spe	All
Henriette	7		2			6						15	0	15
Lambert		13		2								0	15	15
Bouton	1		1			1	10					3	10	13
Warman		10		3								0	13	13
Gwynne		2		10								0	12	12
Chong-Seng	9	1	1									10	1	11
Hopkins		11										0	11	11
Barkly	1						9					1	9	10
Rawson						2	8					2	8	10
Schmid-Hollinger		10										0	10	10
Jacquemin	8		1									9	0	9
Kirk		1				2	6					2	7	9
Ward							9					0	9	9
Neville	1	3	2				2					3	5	8
Stoddart	2	4		2								2	6	8
Takayama	7					1						8	0	8
Fryer	2	5										2	5	7
Lowry II		7										0	7	7
Uranie	7											7	0	7
(vide)		5		2								0	7	7
Mériau						1	5					1	5	6
Cusset	1		1	3								2	3	5
Fabre						5						5	0	5
Whitehead	1		2			2						5	0	5
Dufrene	2		2									4	0	4
Jolliffe	1		3									4	0	4
Alluaud	2	1										2	1	3
Blackburn	2		1									3	0	3
Bogner			1	2								1	2	3
Commerson	1											1	0	3
Feare		3										0	3	3
Matyot			3									3	0	3
Milne		3										0	3	3
Brauer							2					0	2	2
Calabrese		2										0	2	2
Coppinger		2										0	2	2
Desv.							2					0	2	2
Griffith	2											2	0	2
Humblot						2						2	0	2
Lionnet		1		1								0	2	2
Sieber							2					0	2	2
Thiébaut						2						2	0	2
Abbott	1											1	0	1
Aké Assi		1										0	1	1
Averyanov		1										0	1	1
Baron	1											1	0	1
Bijoux							1					0	1	1
Blayney			1									1	0	1
Bojer	1											1	0	1
Boulon	1											1	0	1
Burton						1						1	0	1

	Dicots		Monocots		Gymno.	Fern		Mosses s.l.		Fungus		Total		
	obs	spe	obs	spe	obs	obs	spe	obs	spe	obs	spe	obs	spe	All
Button	1											1	0	1
Chang Tave		1										0	1	1
de Retz							1					0	1	1
Dine		1										0	1	1
Dransfield			1									1	0	1
Estridge	1											1	0	1
Eydoux	1											1	0	1
Gibson	1											1	0	1
Gordon	1											1	0	1
Habayeb			1									1	0	1
Hactink	1											1	0	1
Hnatiuk		1										0	1	1
Hook		1										0	1	1
Hutchinson						1						1	0	1
Kersten							1					0	1	1
LaBuschagne	1											1	0	1
Matatiken			1									1	0	1
Nichols		1										0	1	1
Osborne-Day		1										0	1	1
Penville	1											1	0	1
Perrier		1										0	1	1
Sham-Laye		1										0	1	1
Veevers Carter		1										0	1	1
Wilson		1										0	1	1

Appendix 2. Reassessment of the KBAs synthesized by Senterre (2009). ID = reference id used in Senterre (2009) report; Native = native species richness; End = endemism richness; Exo = exotic species richness; KBA = KBA species richness; wEnd = weighted endemism; CV = Conservation Value in Senterre (2009), where 1 is very low, 2 is low, 3 is moderate, 4 is high and 5 is very high conservation value; Rank = rank on scores of wEnd; PAID = reference id in the newly proposed/synthesized system of KBAs (current report, see Appendix 3).

ID	KBA NAME	Native	End	Exo	KBA	wEnd	CV	Rank	PAID
1	Montagne Glacis	24	6	16	4	0,14	2	54	1
2	Mont Signal	14	8	13	3	0,07	1	66	2
4	Riviere Bamboo	1	1	0	0	0	1	76	60
66	Trois Freres - Morne Pilot (MSNP)	61	39	15	29	1,31	4	23	9
7	West Sans Souci (MSNP)						3	80	8
8	Perard (MSNP)	80	43	23	38	3,02	5	8	8
9	Morne Seychellois (MSNP)	134	62	21	63	5,77	5	3	8
10	Congo Rouge (MSNP)	93	47	19	46	4,73	5	5	6
11	Mont Coton (MSNP)	59	35	20	24	0,76	3	30	6
12	Casse Dent (MSNP)	37	32	1	19	0,60	3	35	7
13	Morne Blanc (MSNP)	90	52	13	47	3,51	5	6	7
14	River Antat / L'Oiseau (MSNP)	23	16	0	8	0,14	2	52	7
15	Mare aux Cochons (MSNP)	53	32	10	26	0,91	4	28	5
16	Mont Simpson (Mt. Bernard, Mt. Le Niol) (MSNP)	55	38	8	26	0,71	3	34	6
17	Mont Jasmin (MSNP)	84	43	8	35	2,05	5	14	4
18	River Moustache (MSNP)	47	20	19	10	0,25	1	43	4
19	Anse Jasmin Estate (MSNP)	101	49	17	37	1,52	4	20	4
20	Cap Ternay Estate (MSNP)	48	23	11	12	0,22	3	44	3
21	Anse du Riz	39	16	4	7	0,14	1	53	3
23	Copolia	69	42	8	27	0,85	4	29	10
24	Salazie Tea plantations	29	25	8	15	1,80	1	16	11
25	Mission lodge	5	4	2	4	0,13	1	55	8
26	Josephine	79	33	25	23	1,06	3	27	14
27	Riviere Mamelles						1	83	12
28	Rosebelle	29	19	16	10	0,20	2	46	11
29	Bernica (Montagne Palmiste)	68	28	43	18	2,35	5	10	11
30	Cephale	39	22	7	8	0,17	4	49	11
31	Riviere Desert / Riviere Mont Posee	31	6	46	3	0,28	4	41	59
32	Riviere Desert	30	19	7	5	0,06	1	69	63
33	Mont Sebert	114	51	34	43	2,34	5	11	16
34	Cascade	20	11	20	7	0,13	2	56	14
35	Montagne Planneau (Mont Harrison)	93	44	11	47	3,12	5	7	14
36	La Misere-Dauban area: La Misere	5	4	0	4	0,12	2	57	64
37	La Misere-Dauban area: whernside	33	22	2	10	0,29	3	40	14
38	La Misere-Dauban area: R Dauban Barbarons	0	0	1	0	0	2	77	14
39	La Misere-Dauban area: bardeau						2	84	14
40	La Misere-Dauban area: Riviere Dauban	40	20	20	9	0,19	2	47	14
41	La Misere-Dauban area: Above Grand Anse	21	12	0	5	0,08	2	63	11
42	Abondance / Bon Espoir (Grand Bois)	101	46	16	32	2,01	4	15	15
43	Riv Caiman	19	9	4	7	0,27	1	42	14

ID	KBA NAME	Native	End	Exo	KBA	wEnd	CV	Rank	PAID
44	Barbarons	15	8	0	2	0,06	1	70	65
45	Barbarons Ridge	19	10	0	5	0,06	2	67	17
46	Brulee-Castle Peak-La Reserve	108	43	23	31	1,21	4	24	19
47	Riv Souvenir	26	12	11	5	0,09	1	59	18
48	Louis	14	6	2	1	0,01	1	73	61
49	Anse Louis	14	5	0	1	0,01	2	72	62
50	Val d'Endor	24	14	3	5	0,08	2	64	21
51	Val Mer	12	8	0	2	0,06	3	68	20
52	Montagne Corail - Cauvin - South hills - Beau Sejour	68	26	13	15	1,40	4	21	22
53	Police Bay	45	7	15	4	0,20	3	45	45
54	Casse Tonnere - Scott Valley (Mare aux Cochons)	30	10	8	6	0,42	4	36	46
55	La Reserve	42	10	19	9	0,37	3	37	49
56	Mont Dauban	438	183	63	195	17,04	5	1	47
57	Anse Mondon upper valley (Pisonia)	101	53	8	52	6,90	5	2	48
58	Anse Mondon lower valley						3	78	48
59	Belle Vue - Grand Congomann	20	11	1	15	2,32	5	13	48
60	Mont Pot a Eau	54	25	5	25	1,14	5	25	48
61	Jardin Marron	104	46	13	51	5,43	5	4	53
62	Gratte Fesse	84	38	9	30	2,34	3	12	53
63	Mont Corgat - Mont Coco Maron	13	8	2	8	0,75	4	33	55
64	Pointe Civine (South coast)	72	34	8	27	1,12	4	26	56
65	Grande Barbe	6	2	6	3	0,15	4	51	52
66	La Passe						3	82	50
67	South eastern glacis	58	21	38	17	1,72	3	17	54
68	Riviere Kerlan	76	26	16	20	0,76	3	32	24
69	Riviere Zimbabwe - Riviere Anse Boudin						3	85	25
70	L'Amitie forest	22	11	1	4	0,05	4	71	26
71	Petite Cours (Northern-eastern rocky coast)	27	13	3	5	0,18	3	48	27
72	Praslin National Park	100	46	27	36	2,87	5	9	30
73	Fond Ferdinand - Marie Louise	64	31	13	23	1,40	4	22	32
74	Fond Azore South slopes	22	9	11	10	1,55	4	19	31
75	Fond Diable	30	15	6	4	0,16	3	50	28
76	Pointe Josephine						3	81	85
77	Au Morne	1	1	1	0	0	3	74	29
78	Anse Grosse Roche - Anse Fourmis hills	40	13	13	8	0,29	4	39	40
79	La Reunion (Mare Soupape)	0	0	1	0	0	4	75	38
80	Fond Piment - Grand Anse slopes	37	8	18	3	0,07	4	65	41
81	Roche Bois hills	17	5	8	1	0,08	3	61	39
82	Western coast	32	18	4	11	1,71	3	18	33
83	Anse Badamien - Baie La Raie	27	12	7	4	0,10	3	58	34
84	North coast - Fond Blanc	31	12	8	3	0,08	3	62	35
85	Anse Papai - Grand Anse						3	79	86
86	Anse Songe - Baie Chagrin	62	20	8	12	0,76	4	31	44
87	Fond Fidele - Fond Malgache	64	20	4	8	0,29	4	38	43
88	Sainte Anne North slopes	22	10	8	4	0,09	3	60	23

Appendix 3. Assessment of the newly proposed system of KBAs for the inner islands. The correspondence with the system synthesized in Senterre (2009) is indicated in the Appendix 2 (column PAID). Outer islands KBAs (see Appendix 4) and a few data deficient KBAs are not included. Classified by decreasing value of weighted endemism based on botanical dataset.

PAID	NAME2	Native	End	Exo	KBA	wEnd	Rank
48	Mont Pot à Eau-Vallée de l'Anse Mondon-Grand Congoman	120	57	16	62	9,94	1
8	Morne Seychellois-Pérard-Sans Soucis	125	63	24	59	6,19	2
6	Mont Le Niol-Glacis Sarcelles-Mont Cotton	139	61	37	64	6,07	3
47	Mont Dauban	134	55	14	64	5,66	4
53	Mont Plaisir-Jardin Marron-Grande Rivière	132	49	21	56	4,80	5
15	Montagne Planneau Centre-Varigault-Cascade	147	60	36	61	4,65	6
7	Morne Blanc	105	59	21	55	3,98	7
14	Montagne Planneau Nord	126	59	32	53	3,07	8
4	Anse Jasmin Estate-Mont Jasmin	125	57	17	49	2,80	9
31	Fond Azore Southern slopes to Anse Bois de Rose	84	39	19	31	2,80	10
9	Trois Frères	108	51	58	44	2,69	11
22	Montagne Corail-Collines du Sud dry forests	73	26	15	16	2,40	12
11	Salazie-Bernica-Mont Céphale	90	44	31	30	2,23	13
16	Mont Sébert	103	49	19	39	2,18	14
37	Aride island Special Reserve	48	3	59	5	2,08	15
50	La Passe	66	33	39	23	1,86	16
30	Praslin National Park	76	37	15	26	1,86	17
33	Curieuse Western coast	12	6	2	6	1,48	18
55	Mont Cocos Marrons-Rende d'Avance	55	29	6	24	1,41	19
32	Fond Ferdinand	62	30	15	22	1,37	20
19	Montagne Brûlée-Piton de l'Eboulis	102	42	17	31	1,21	21
3	Cap Ternay Estate-Cap Matoupa	93	34	17	22	1,03	22
5	Mare aux Cochons (Mahé)	52	32	10	25	0,89	23
36	Cousin island Special Reserve	50	2	65	4	0,81	24
10	Copolia	60	37	7	23	0,74	25
54	Anse Lascars slopes	52	20	10	17	0,73	26
46	Casse Tonnère-Mare aux Cochons	44	17	18	13	0,65	27
42	Fond Fidèle South-Western slopes	47	19	7	12	0,60	28
56	Pointe Civine	41	14	5	13	0,54	29
51	Grand Barbe slopes	44	20	11	14	0,43	30
40	Nid d'Aigle ridge & Eastern slopes	46	16	19	10	0,38	31
44	Anse Songe-Baie Chagrin	34	10	4	6	0,38	32
24	Rivière Kerlan	37	12	6	10	0,38	33
49	La Réserve (Silhouette)	40	9	14	8	0,33	34
39	Anse Source d'Argent-Anse Marron	20	6	7	3	0,33	35
64	La Misère-Dauban area: La Misère	24	18	0	9	0,28	36
1	Montagne Glacis (When she comes)	42	14	15	11	0,27	37
34	Curieuse Central ridges and slopes to Baie La Raie	35	15	9	6	0,24	38
45	Grande Police wetlands	43	7	15	4	0,20	39
27	Anse Petite Cours boulders	26	13	3	5	0,18	40
28	Fond Diable	30	15	6	4	0,16	41

PAID	NAME2	Native	End	Exo	KBA	wEnd	Rank
52	Grand Barbe mangrove	6	2	6	3	0,15	42
43	Fond Malgache-Fond Fidèle South	31	10	2	4	0,15	43
21	Val d'Endor	24	14	2	5	0,08	44
23	Sainte Anne	17	7	5	3	0,07	45
35	Curieuse Northern slopes to Fond Blanc	19	9	5	2	0,07	46
17	Barbarons Ridges	19	10	0	5	0,06	47
20	Val Mer	12	8	0	2	0,06	48
65	Barbarons	15	8	0	2	0,06	49
18	Rivière Souvenir	17	11	1	4	0,05	50
69	Ile du Nord	2	0	0	1	0,05	51
70	Cousine	13	2	1	1	0,05	52
59	Rivière Désert / Rivière Montagne Posée	13	10	0	4	0,05	53
26	L'Amitié forest	20	9	1	4	0,05	54
41	Grand Anse-Petite Anse-Fond Piment	36	8	15	2	0,04	55
12	Rivière Mamelles	2	2	0	2	0,04	56
63	Rivière Désert	15	13	0	3	0,03	57
2	Mont Signal	13	7	12	2	0,02	58
61	Louis	14	6	0	1	0,01	59
62	Anse Louis	14	5	0	1	0,01	60
25	Rivière Zimbabwe-Rivière Anse Boudin	4	0	0	0	0,00	61
38	La Veuve Special Reserve	0	0	1	0	0,00	62
57	Conception	4	0	0	0	0,00	63
58	Ile Moyenne National Park	2	0	0	0	0,00	64
67	Frégate	1	0	0	0	0,00	65

Appendix 4. Complete list of all synthesized KBAs in the Seychelles (including Senterre 2009, Carlström 1996, Rocamora & Skerrett 2001, Gerlach 2008). The system includes 76 KBAs in the inner islands and 14 KBAs in the outer islands (Total = 90 sites).

(a) Inner islands KBAs

STATUS	NAME1	NAME2	PAID	Area (ha)	%
National Park	Ile Moyenne National Park	Ile Moyenne National Park	58	8,8	0,09
National Park	Morne Seychellois National Park	Anse Jasmin Estate-Mont Jasmin	4	349,7	3,68
National Park	Morne Seychellois National Park	Cap Ternay Estate-Cap Matoupa	3	530,8	5,58
National Park	Morne Seychellois National Park	Copolia	10	182,8	1,92
National Park	Morne Seychellois National Park	Mare aux Cochons (Mahé)	5	228,6	2,40
National Park	Morne Seychellois National Park	Mont Le Niol-Glacis Sarcelles-Mont Cotton	6	456,6	4,80
National Park	Morne Seychellois National Park	Morne Blanc	7	329,0	3,46
National Park	Morne Seychellois National Park	Morne Seychellois-Pérard-Sans Soucis	8	306,6	3,22
National Park	Morne Seychellois National Park	Salazie-Bernica-Mont Céphale	11	494,0	5,19
National Park	Morne Seychellois National Park	Trois Frères	9	188,7	1,98
National Park	Praslin National Park	Praslin National Park	30	323,6	3,40
National Park	Silhouette National Park	Anse Lascars slopes	54	189.9	2,12
National Park	Silhouette National Park	Casse Tonnère-Mare aux Cochons	46	192,6	2,03
National Park	Silhouette National Park	Grand Barbe mangrove	52	4,4	0,07
National Park	Silhouette National Park	Grand Barbe slopes	51	403,3	4,69
National Park	Silhouette National Park	La Passe	50	161,6	2,48
National Park	Silhouette National Park	La Réserve (Silhouette)	49	19,9	0,22
National Park	Silhouette National Park	Mont Cocos Marrons-Rende d'Avance	55	71,2	0,75
National Park	Silhouette National Park	Mont Dauban	47	314,3	3,31
National Park	Silhouette National Park	Mont Plaisir-Jardin Marron-Grande Rivière	53	170,1	1,84
National Park	Silhouette National Park	Mont Pot à Eau-Vallée de l'Anse Mondon-Grand Congoman	48	165,9	1,76
National Park	Silhouette National Park	Pointe Civine	56	155,7	1,64
Special Reserve	Aride island Special Reserve	Aride island Special Reserve	37	70,8	0,74
Special Reserve	Cousin island Special Reserve	Cousin island Special Reserve	36	28,9	0,30
Special Reserve	La Veuve Special Reserve	La Veuve Special Reserve	38	83,9	0,88

STATUS	NAME1	NAME2	PAID	Area (ha)	%
Special Reserve	Booby Special Reserve	Booby Special Reserve (not gazetted)			
Bird Reserve	Ile aux Vaches Marines (West coast islands)	Ile aux Vaches Marines (West coast islands) (not gazetted)			
Bird Reserve	Sèche island (East coast islands)	Sèche island (East coast islands) (not gazetted)			
Bird Reserve	Les Mammelles (East coast islands)	Les Mammelles (East coast islands) (not gazetted)			
Bird Reserve	Recifs & Ilot Fregates	Recifs & Ilot Fregates (not gazetted)			
Proposed extension	Montagne Brûlée-Piton de l'Eboulis	Montagne Brûlée-Piton de l'Eboulis	19	114,2	1,20
Proposed extension	Montagne Corail-Collines du Sud dry forests	Montagne Corail-Collines du Sud dry forests	22	298,9	3,14
Proposed extension	Montagne Planneau proposed NP	Mont Sébert	16	180,6	1,90
Proposed extension	Montagne Planneau proposed NP	Montagne Planneau Centre-Varigault-Cascade	15	625,8	6,58
Proposed extension	Montagne Planneau proposed NP	Montagne Planneau Nord	14	629,1	6,62
Proposed extension	Praslin NP proposed extension	Fond Azore Southern slopes to Anse Bois de Rose	31	320,1	3,37
Other KBA	Curieuse KBA	Anse Papaie - Grand Anse	86	11,4	0,12
Other KBA	Curieuse KBA	Curieuse Central ridges and slopes to Baie La Raie	34	66,7	0,70
Other KBA	Curieuse KBA	Curieuse Northern slopes to Fond Blanc	35	20,6	0,22
Other KBA	Curieuse KBA	Curieuse Western coast	33	54,0	0,57
Other KBA	Félicité KBA	Anse Songe-Baie Chagrin	44	45,4	0,48
Other KBA	Félicité KBA	Fond Fidèle South-Western slopes	42	58,4	0,61
Other KBA	Félicité KBA	Fond Malgache-Fond Fidèle South	43	37,5	0,39
Other KBA	La Digue KBA	Anse Source d'Argent-Anse Marron	39	157,6	1,66
Other KBA	La Digue KBA	Grand Anse-Petite Anse-Fond Piment	41	159,2	1,67
Other KBA	La Digue KBA	Nid d'Aigle ridge & Eastern slopes	40	206,0	2,17
Other KBA	Mahé KBA	Anse Louis	62	9,1	0,10
Other KBA	Mahé KBA	Barbarons	65	56,5	0,59
Other KBA	Mahé KBA	Barbarons Ridges	17	5,3	0,06
Other KBA	Mahé KBA	Conception	57	61,4	0,65
Other KBA	Mahé KBA	Grande Police wetlands	45	18,5	0,19
Other KBA	Mahé KBA	La Misère-Dauban area: La Misère	64	20,0	0,21
Other KBA	Mahé KBA	Louis	61	9,1	0,10
Other KBA	Mahé KBA	Mont Signal	2	75,5	0,79
Other KBA	Mahé KBA	Montagne Glacis (When she comes)	1	140,1	1,47
Other KBA	Mahé KBA	Rivière Bamboo	60	0,6	0,01
Other KBA	Mahé KBA	Rivière Désert	63	4,6	0,05
Other KBA	Mahé KBA	Rivière Désert / Rivière Montagne Posée	59	11,1	0,12
Other KBA	Mahé KBA	Rivière Mamelles	12	6,6	0,07
Other KBA	Mahé KBA	Rivière Souvenir	18	7,3	0,08
Other KBA	Mahé KBA	Val d'Endor	21	22,4	0,24
Other KBA	Mahé KBA	Val Mer	20	10,3	0,11
Other KBA	Praslin KBA	Anse Petite Cours boulders	27	8,3	0,09

STATUS	NAME1	NAME2	PAID	Area (ha)	%
Other KBA	Praslin KBA	Au Morne Southern slopes	29	86,7	0,91
Other KBA	Praslin KBA	Fond Diable	28	92,5	0,97
Other KBA	Praslin KBA	Fond Ferdinand	32	128,9	1,36
Other KBA	Praslin KBA	L'Amitié forest	26	102,4	1,08
Other KBA	Praslin KBA	Pointe Josephine	85	15,4	0,16
Other KBA	Praslin KBA	Rivière Kerlan	24	11,8	0,12
Other KBA	Praslin KBA	Rivière Zimbabwe-Rivière Anse Boudin	25	5,5	0,06
Other KBA	Sainte Anne KBA	Sainte Anne	23	44,4	0,47
Other KBA	Other KBA	Cousine	70	29,2	0,31
Other KBA	Other KBA	Frégate	67	199,0	2,09
Other KBA	Other KBA	Ile aux Vaches (=Bird)	66	75,3	0,79
Other KBA	Other KBA	Ile Denis	68	136,2	1,43
Other KBA	Other KBA	Ile du Nord	69	194,7	2,05

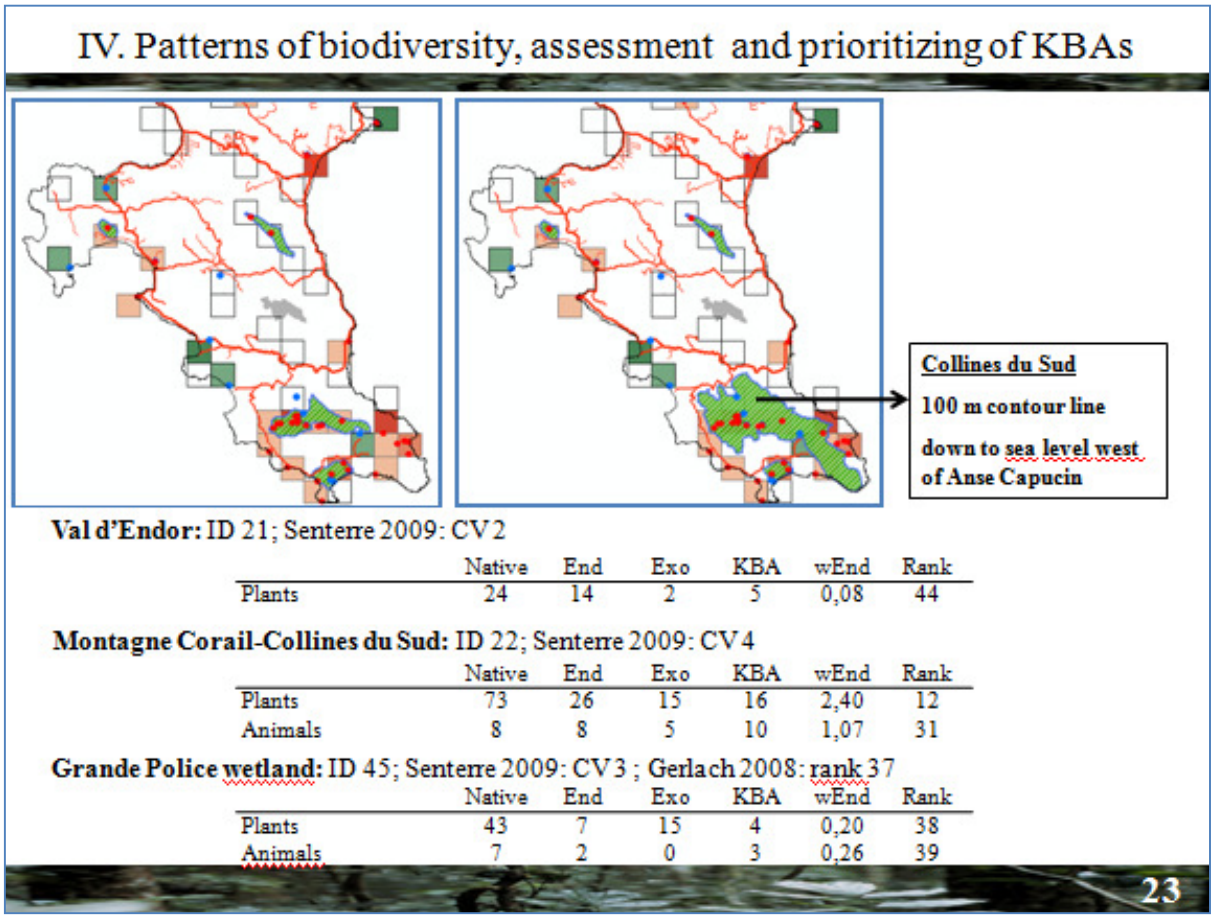
(b) Outer islands KBAs

STATUS	NAME1	NAME2	PAID	Area (ha)	%
Special Reserve	Aldabra Group	Aldabra	84	15771,8	165,83
Bird Reserve	Amirantes Group	Bancs Africains	77	2,0	0,02
Bird Reserve	Amirantes Group	D'Arros	76	160,0	1,68
Bird Reserve	Amirantes Group	Desnoeufs	75	38,6	0,41
Bird Reserve	Amirantes Group	Etoile & Boudeuse	74	1,9	0,02
Bird Reserve	Amirantes Group	Marie-Louise	71	57,1	0,60
Other KBA	Aldabra Group	Assomption	83	1136,9	11,95
Other KBA	Amirantes Group	Alphonse	72	160,8	1,69
Other KBA	Amirantes Group	Saint François	73	32,3	0,34
Other KBA	Cosmoledo Group	Astove	82	532,8	5,60
Other KBA	Cosmoledo Group	Cosmolédo	81	455,5	4,79
Other KBA	Farquhar Group	Farquhar	80	744,5	7,83
Other KBA	Farquhar Group	Providence	78	151,8	1,60
Other KBA	Farquhar Group	Saint Pierre	79	171,4	1,80

Appendix 5. Example of output from the KBA database and geodatabase, here from a concrete case where Government of Seychelles asked for a detailed report, in the area of Grand Police.

Montagne Corail-Collines du Sud dry forests
Extract from the KBA report (in prep.) following a query by UNDP

In total there are about 73 native plant species in the areas defined during KBA studies (see the large polygon in the figure below). That area is ranked at the 12th position in terms of conservation value. This is based on rare species distribution (weighted endemism; see presentation made at workshop).



The main conservation targets recorded for plants are :

Species name	Orig	IUCN	CellNbSp
Oeoniella aphrodite (or polystachys)	ind	CR	1
Orfilea neraudiana (Baill.) G.L.Webster	ind	EX	1
Jasminum fluminense Vell. subsp. mauritianum (Bojer ex DC.) Turrill	ind		6
Nephrolepis acutifolia (Desv.) Christ	ind		11
Seychellaria thomassetii Hemsl.	end	NT	12

ind = indigenous; end = endemic; CellNbSp = range-size estimated by the number of grid cells (500 x 500 m) where the species occurs Mahé

Oeoniella is an orchid (Orkid pti fler payanke) recorded on Mahé only by Carlström (1996), at Montagne Corail. It is still unclear how many Oeoniella species occur in Seychelles (1 or 2), but there is no other published record of the genus on Mahé. It is more easily found on Silhouette (2-3 localities known), and we know 2 localities on Praslin plus 1 on Félicité.

Orfilea neraudiana was recorded only in the old days (Horne 1870s) and has not yet been rediscovered. It was recorded most probably from the area included in the proposed Montagne Corail KBA polygon ("small tree at south end of Mahé"), where the appropriate habitat is still present for that species. The proposed KBA polygon for the mountains above Grand Police is the best site on Mahé for that habitat-type, i.e. lowland dry forests.

Jasminum fluminense subsp. mauritianum is common only on Silhouette (where well preserved dry lowland forests are more common), but it is found on Mahé only in the proposed KBA area, from Montagne Corail to the Takamaka forested slopes above Anse Capusin.

Therefore, in terms of habitat-types, the proposed KBA area includes 2 important conservation targets:

-submontane saxicolous forests: above 250-300 m a.s.l. with interesting species like Seychellaria (Lafisel mov), Northea (Kapisen), Colea seychellarum (Bilenbi maron), and with the only known locality on Mahé for Oeoniella.

-lowland dry forests: these include palm forests and Takamaka-dominated forests; it is where we expect to rediscover Orfilea when more exploration will be done, and it is also where occurs the population of Jasminum.

Our recommendation is to define a protected area above 100 m of altitude, and if possible down to sea level only for the rocky hills found east of Grande Police and West of Anse Capusin. This would be sufficient to include all biodiversity targets present in that area.

Appendix 6. Main outputs of this study (for use by stakeholders)

Main outputs

This report is freely available in pdf and is accompanied by the following material, some of which are with limited access (contact UNDP: Betty. Seraphine, b.seraphine@pcusey.sc):

-intermediate reports: outputs 1, 2 & 4 (in pdf format)

-KBA database : This is a MS Access database. The tables (file "SEYBota3Tab.accdb") are separated from the other database objects (file "SEYBota3.accdb"). It includes only the records of species of special concern, as per the terms of references. Therefore, the KBA database provided with this report is an extract from the overall database which is the database of the Seychelles National Herbarium. For more details on the full database, contact Beryl Ondiek (nathismus@seychelles.sc) or Charles Morel (charles6422@hotmail.com).

-KBA shapefile: This is an ESRI shapefile named "sey_cons_pas2013" and providing the map of all listed KBAs (except for 5 small areas which need to be gazetted).

-KBA species distribution maps: There is one ESRI shapefile for plants ("SpDistribSelect") and one ESRI shapefile for animals ("SpDistribSelectZoo").

-GridKBABota: This is an ESRI shapefile corresponding the 500 x 500 m grid on the inner islands. The main statistics are included in the shapefile for plants.

-GridKBAZoo: This is an ESRI shapefile corresponding the 500 x 500 m grid on the inner islands. The main statistics are included in the shapefile for animals.

-Botanical raw data : The most important raw data and synthetic data are compiled into one Excel file ("KBA2013_BotaStats.xlsx") and are distributed among 6 spreadsheets:

- "Sp_Stat1": provides the main statistics for each KBA species, e.g. rsRar.
- "Grid_Stat": provides the main statistics for each grid cell, e.g. wEnd.
- "Grid_wEnd": provides the species list for every grid cell, along with species stats.
- "SA_StatAll2": provides statistics for the study area in general (inner islands)
- "PA_Stat": provides the main statistics for each KBA, e.g. wEnd
- "PA_SpList": provides the species list for every KBA, along with species stats.

-Zoological raw data : same principle as for plants ("KBA2013_ZooStats.xlsx")

-GeoDatabase: To further help users, we prepared an ArcGIS project (KBA2013GeoDB) where we included the main cartographic outputs used for the maps of the section III.5.

How to use the provided outputs

The databases provided are sensitive to path location of files. Therefore, the user first needs to copy the folder provided here (named "Database") in the directory C:\. Users need a computer with ArcGIS.10 installed in order to be able to open the geodatabase.

KBA database: Open the file SEYBota3 and see the options available in the main menu. A detailed manual of utilization for the database is outside the scope of the present report, but the user will find

most of what he / she is interested in with the queries named “SpDistrib” and “SpDistribZoo”. These two queries provide the detailed raw data on the distribution records for every species, classified by class, family, species, island, locality, collector.

Geo Database: Simply open the ArcMap project named KBA2013GeoDB. The shapefiles explained in the previous section are already displayed with the appropriate legend.

To see the distribution map of plant species, open the attributes table of the shapefile SpDistribSelect. Each line in the table is the distribution map for one species, which are ordered per class, family and species name. Select one to several lines to see the corresponding distribution map (see Figure 22). For animals, do the same with the shapefile SpDistribSelectZoo.

To see the species composition of a given grid cell or of a given KBA, import into ArcGIS the relevant spreadsheet from the Excel files provided (e.g. PA_SpList for the list of species per KBA). Then relate the imported table with the shapefile of all KBAs (sey_cons_pas2013) using the field “PAID” as link (Figure 23). To link the grid cells of the shapefile GridKBA to their species lists, use the spreadsheet “Grid_wEnd” and the field “PAGENUMBER” as link. By using these types of function, it is possible to produce detailed descriptions for all areas (see Appendix 5 for an example).

Ownership and access to data

Data ownership is shared between the authors, the Seychelles Natural History Museum, Plant Conservation Action group, UNDP and the Government of Seychelles. The authors encourage collaborative valorization of the database, and sharing within the local scientific community, but spread of detailed raw data is not recommended at a wider scale and to non scientific community. This is to avoid divulging exact GPS coordinates for some rare plants (e.g. orchids, or medicinal plants) to a wider public. Other outputs will be shared with the wide public as for example the Seychelles Plant Gallery (www.seychellesplantgallery.com).

Figure 22. Print screen of the KBA geodatabase showing how to display the distribution map for any KBA species, here for Achyrospermum sechellarum (Bwa sevret).

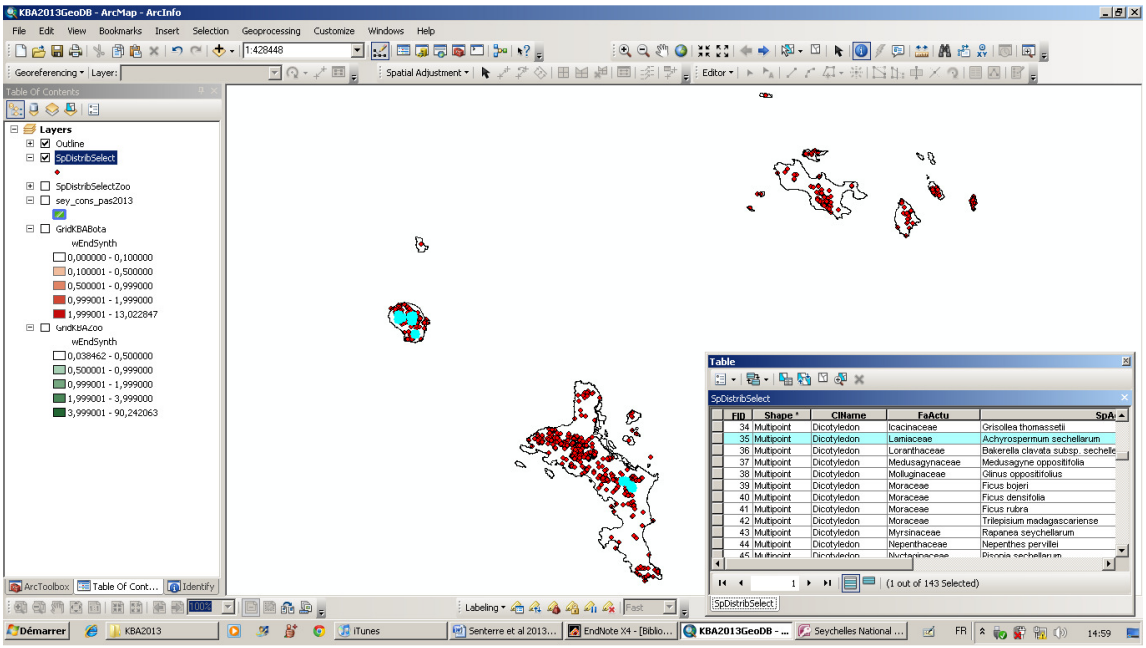
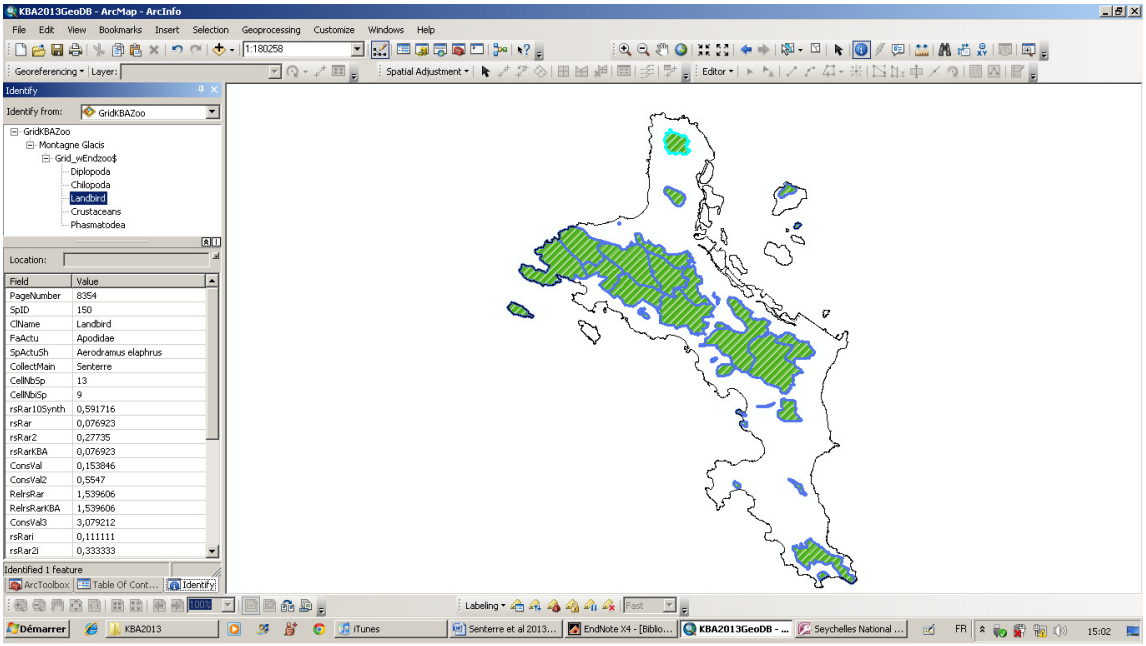


Figure 23. Print screen of the KBA geodatabase showing how to display the species list for any KBA site, here for Montagne Glacis area.



Appendix 7. Terms of references

FOR

LONG TERM NATIONAL CONSULTANCY

ASSESSMENT OF AREAS OF HIGH BIODIVERSITY FOR INFORMED DECISION-MAKING IN FUTURE LAND USE PLANNING AND MANAGEMENT

INTRODUCTION

The '*Mainstreaming Biodiversity Management into Production Sector Activities*" (or "*Mainstreaming Biodiversity*") Full sized Project was signed in October 2007 between the Government of Seychelles (GOS) and the United Nations Development Programme (UNDP), and is funded by a Global Environment Facility (GEF) grant of US$3,600,000. The project is part of the UNDP-GEF portfolio in Seychelles and is implemented under a Programme Coordination Unit (PCU). The objective of the project is to integrate biodiversity conservation into key production sectors of the economy. One of the means of achieving this objective is to seek integration of biodiversity conservation in land use planning and management.

The Project is currently seeking a group of consultants to identify and assess priority biodiversity sites in the terrestrial areas of the granitic islands of Seychelles. The deliverables of this consultancy would be stored in an environmental database as part of the knowledge management system development and also serve to assist in making informed decisions on the future use and management of land in Seychelles.

CONTEXT

The geographic complexity and isolated nature of the granitic islands of Seychelles have led to the development of extremely high levels of endemism of both fauna and flora. This is especially evident on the main granitic islands of Seychelles, which is believed to have been free of continental influences for approximately 65 million years. However, the extreme vulnerability of island ecosystems and species to impacts such as habitat destruction and invasive species has resulted in the fauna and flora becoming endangered and/or threatened.

Conservation outcomes can be defined at these scales – species, site and landscape, reflecting a simplification of a complex hierarchical continuum of ecological scales. The three scales interlock geographically through the presence of species in sites and sites in landscapes. If species are to be conserved, the sites on which they live must be protected and the landscapes or seascapes must continue to sustain the ecological services on which the sites and the species depend. Given threats to biodiversity at each of the three levels, quantifiable targets for conservation can be set in terms of extinctions avoided, sites protected and, where appropriate, biodiversity conservation corridors created or preserved. This can only be done when accurate data are available on the distribution of threatened species across sites.

Despite Seychelles' past efforts and achievements, guided by national plans and international conventions and agreements, there are several weaknesses in national biodiversity management in Seychelles. Although some good baseline data exists, e.g. on birds, some marine species and small island ecosystems, biodiversity information is largely fragmented (between government organizations, NGOs, international research organizations and individuals) and inventory data is incomplete for many islands. Furthermore, conservationists worldwide are frequently unable to

assist all species under threat usually due to a lack of funding or a lack of knowledge as to the location of their habitats.

Over the last two decades, recognition has grown that protected areas alone will never be adequate to conserve a representative sample of biodiversity and maintain functioning ecosystems. Maintaining ecological processes, and the services derived from these, requires management over large areas of land, or landscapes, and conservation efforts need to extend beyond the boundaries of the protected area system.

Working across landscapes, rather than only in protected areas, means that throughout the landscape, areas that are important for biodiversity conservation can be maintained and actively managed in a natural or near-natural state. This has the multiple benefits of increasing potential ranges for species, allowing for movement of species, ensuring that minimum representative areas for particular ecosystem types are maintained, and enabling the maintenance of ecological processes that operate at a large scale, which is increasingly important in the face of anticipated climate change.

The landscape/mainstreaming approach has 3 essential elements:

- Working beyond the boundaries of PAs
- Focusing conservation efforts on biodiversity priority areas within the landscape
- Using a range of tools in these priority areas to expand protected areas, mainstream biodiversity priorities in land-use planning and decision-making, and engage with production sectors to encourage biodiversity-compatible production practices.

Not all parts of the landscape are equally important for biodiversity. Spatial planning tools to identify priority areas for biodiversity conservation underpin the implementation of the landscape approach. Biological diversity also is one of the most frequently used measures of conservation value. It can be expressed as the total number of species (species richness) or (more useful for conservation purposes) the number of endemic, restricted-distribution or threatened species. Because areas of different taxonomic groups might overlap, conservation of areas of high biodiversity value in well-studied groups often lead to conservation of less-known taxa.

This consultancy is a continuation of previous work conducted by the Island Biodiversity Working group in 2010. The existing terrestrial and marine biodiversity data in Seychelles were synthesized, according to defined and agreed objectives and criteria, the knowledge gaps analyzed and prioritized, and a meta-database was set up, in order to provide the basis to better define biodiversity conservation priorities. Recommendations were made for new inventories to be conducted.

OBJECTIVE

The overall objective of the consultancy is to identify sites of biodiversity priority (national areas of biodiversity importance for conservation action) on the granitic islands of Seychelles with the aim of conducting new inventories and evaluating the conservation priorities of these areas and to provide recommendations for gap identification for future research.

ACTIVITIES/TASKS

The main tasks of the assignment consist of the following:

1. Select the subset of plant and animal taxa of special concern (endemic, threatened and endangered species that have been adequately surveyed) under the following categories only:
    a. Plants
    b. Landbirds
    c. Reptiles
    d. Amphibians
    e. Freshwater Fishes
    f. Terrestrial and Freshwater Invertebrates.
2. Collate all existing spatial data on taxa through the conduction of a desktop study on the selected species occurrence data;
3. Undertake a stakeholder consultation process to document all existing spatial knowledge of selected taxa that are verifiable;
4. Consolidate and map the species distributions for selected species and input all data into a Geographical Information System database agreed on with the GIS Units of the Ministry of Land Use and Housing and Department of Environment.
5. Develop suggested methodologies of the species selected that can be used for complete inventories of the selected areas of biodiversity priority.
6. Through a participatory stakeholder workshop process, using visual tools e.g. A1/A0 printed maps of each island with all collated information of selected species illustrated, define criteria for and select areas of biodiversity importance. Areas that lack adequate information but are thought by participants to be of high biodiversity should also be identified. The proposed inventory methodology(ies) should also be endorsed by the participants in the workshop.
7. Conduct inventories of plant and animal species within the selected sites and define the boundaries of these sites. The anthropogenic impact and threat to these sites should also be assessed and recorded.
8. Based on these inventories and previously recorded information, select sites of biodiversity priority.
9. Define and map these sites of biodiversity priority giving ample reason why from a biodiversity perspective these areas should be considered priority sites.

10. Provide recommendations on future research and rank on level of importance of the research for each site's biodiversity management as well as of level of importance of doing the research from a Seychelles' biodiversity management perspective.

11. Validate the findings of the assignment through a participatory stakeholders validation workshop.

DELIVERABLES / OUTPUTS

1. An approved Inception Report, describing how the consultant team plans to implement the Assignment, including a detailed timeline and scope of the assignment to be submitted one (1) week after start of the assignment.

2. A stakeholder-endorsed list of species on which the initial collation of spatial data will be based.

3. A report summarizing all the collected data from stakeholders and institutions e.g. National herbarium, clearly stating the source and its authenticity.

4. Present in the most efficient format as well as in hard copies (e.g. mapping per island or per group of species) the distribution for the selected species collected from authentic sources'.

5. A document containing the stakeholder-endorsed selection of sites of biodiversity importance in Seychelles as well as a methodology of undertaking a sample inventory of a specific area within the Seychelles.

6. Completion of new field inventories

7. An approved final report defining the selected sites of biodiversity priority, supporting the selection of these sites with evidence of each selection based on biodiversity value, with maps of each granitic island's sites of biodiversity priority, as well as recommendations on future research to be conducted in the different sites and the ranking of the research recommendations on level of importance for each individual site, as well as for the Seychelles. This should include reporting for each site describing the importance of the site in terms of biodiversity value, the threats that the site face, the inventory following the agreed methodology and maps defining the boundaries of the site. The maps should also be provided in the preferred MLUH/DoE .format/system

8. A validation report detailing the deliberations in the workshop and the recommendations made by stakeholders.

TYPE OF CONTRACT

A short term contract for a group of national contractors with all work to be undertaken in Seychelles.

DURATION AND TIMELINE

The main assignment is expected to take place over the period August 2011 –January 2013. The total duration is estimated at 750 working days over this period, all in-country.

RESPONSIBILITIES AND REPORTING

The Consultants / Contractors reports to the UNDP-GEF Biodiversity Programme Manager (PM). The PM is responsible for the effective implementation of the assignment and she in turn reports to the UNDP-GEF Programme Coordinator (PC) and UNDP-GEF Biodiversity Programme Steering Committee. Deliverables (Draft and Final Reports) will be submitted to and discussed with the Programme Manager.

QUALIFICATIONS/SKILLS REQUIRED

1. Advanced University Degree in Botany, Zoology, Conservation Biology or other related field
2. Experience in undertaking biodiversity inventories, assessments, monitoring, and/or other ecological oriented fieldwork in a variety of taxonomic fields;
3. Skills and experience in biodiversity data collection, management and analysis;
4. Experience in undertaking biodiversity gap analyses;
5. Experience with participatory, consultative processes with a variety of stakeholders;
6. Excellent reporting skills;
7. Fluent written and oral communication in English.