Occurrence of Endangered Species in the Parks, Reserves and Hunting Areas of Mozambique, in 2016

Victor Pereira, Sean Nazerali, September 2016[1]

[1] Study drawn up under the Project of Technical Assistance provided by the Consortium GITEC –Consult Gmbh, Brazilian Conservation Fund – FUNBIO and Verde Azul Consult Lda- VA, to the Foundation for the Conservation of Biodiversity, financed by KfW. Contacts of the authors: sean.nazerali@gmail.com, pereira.n.vitor@gmail.com.

English Summary

Mozambique has enormous wealth in both flora and fauna. It is the rich fauna which is the focus of the present study. It is important to recognize in a country with 7 National Parks, 12 National Reserves, 20 Coutadas (Hunting Areas), 51 Game Farms, 13 forest reserves and 14 ecological regions, that are home to a rich terrestrial fauna of approximately "3470 vertebrate species, including 271 species of mammals, 816 birds, 280 reptiles, 84 amphibians and 2019 fishes. 234 are endemic or nearly endemic species"[2], which are species at particular risk of extinction.

With this study we intend to attempt to:

- Identify the species that are most at risk of extinction in Mozambique;
- Determine the location of these species inside the current network of Conservation Areas (AC), specifically;
    - Which species have been identified as existing in each AC and listed in their management plans;
    - Which species have a species range that coincides with specific AC s and therefore should exist in the conservation areas, but have not been identified in those areas´ Management Plans;
    - Which species only exist in areas outside the current conservation areas;

The analysis covered the country's National Parks, National Reserves, and the Coutadas (Hunting Areas). The Forest Reserves and Game Farms have not been included in the present study.

From this analysis it was possible to conclude that of the existing species in Mozambique, 366 species are listed in the IUCN red list of threatened species as belonging to the 4 most threatened categories (Near Threatened, Vulnerable, Endangered, Critically Endangered), and 2381 species belong to the category of "least concern".

Approximately 90% of the species in these 4 most threatened categories are represented or expected to be represented in the current network of conservation areas, with only 10% located outside of this network.

Note that all data produced in this report is available for consultation at http://tiny.cc/ACs_especies

Resumo

Mozambique possui uma riqueza enorme biodiversidade animal e vegetal que faz deste Pais um sitio especial. É na rica Fauna que se centrou este estudo, pois é deveras importante perceber num Pais que possui 7 Parques Nacionais, 8 Reservas Nacionais, 20 Coutadas, 51 Fazendas de Bravio e 13 Reservas Florestais e 14 regiões ecológicas que são o habitat de uma rica fauna terrestre com cerca de "3470 espécies de vertebrados, nomeadamente 271 espécies de mamíferos, 816 de aves, 280 de répteis, 84 de anfíbios e 2019 de peixes. 234 são espécies endémicas ou quase endémicas"[2], quais as espécies que correm risco de extinção.

Com este estudo pretendemos tentar responder às seguintes questões:

- Quais as espécies que estão em maior risco de extinção;
- A sua localização face às actuais áreas de conservação de biodiversidade (AC);
    - Que espécies estão identificadas como existentes nas AC e listadas nos respectivos planos de maneio (PM);
    - Quais as espécies cuja distribuição indica que deveriam existir nas áreas de conservação, mas que não estão identificadas nos PM;
    - Quais são as espécies que existem em zonas, que não são AC;

O estudo cobriu os Parques e Reservas Nacionais, e as Coutadas, deixando fora de análise por enquanto as Reservas Florestais e Fazendas de Bravio.

A partir deste estudo foi possível obter um conjunto de resultados que permitiram chegar à conclusão que das espécies existentes em Moçambique, 366 espécies estão presentes na lista vermelha da IUCN de espécies ameaçadas, nas 4 categorias mais preocupantes (*Near Threatened, Vulnerable, Endangered, Critically Endangered*), e 2381 espécies pertencentes à categoria de menor preocupação (*Least Concern)*.

Aproximadamente 90% das espécies nas 4 categorias mais preocupantes, são representadas ou deveriam ser representadas na rede actual de Áreas de Conservação, com somente 10% localizadas fora desta rede.

Nota se que todos os dados produzidos no contexto do presente relatório são livremente disponíveis para partilha no site http://tiny.cc/ACs_especies

[2] (*Checklist' e Centros de Diversidade de Vertebrados em Moçambique, Michael F. Schneider, Victorino A. Buramuge, Luís Aliasse & Filipa Serfontein Department of Forestry Engineering, Eduardo Mondlane University, Maputo * author for correspondence: mfschneider@vr-web.de*)

Methodology

In order for this study could be undertaken, it was necessary to resort to a source of data that makes it possible to obtain the information about endangered species in Mozambique. To this end, we resorted to the IUCN Red List. The IUCN Red List is the most complete inventory on the conservation of species in the world. Regionally, lists of endangered species (Red Lists) are drawn up on the initiative of countries, or organisations, who draw up the lists based on unified methods used throughout the world which allows us to classify the risk of extinction of any particular species. This method is intended to be simple and easily understood.

To undertake this study, we opted to analyse the species identified in one of four selected categories. It was intended to accommodate all those species who are at immediate risk of extinction or which may, in the near future, be in danger of extinction. It was thus decided to study the species within these four categories:

- Near Threatened (NT): The species is placed at this level, when, if a series of criteria are analysed, it is seen that in the near future, it will be placed in one of the categories of endangered species (vulnerable, endangered and critically endangered);
- Vulnerable (VU): The species is identified as VU, when there is a high risk of possible extinction in the wild in the near future, but it is possible this will not happen, if the conditions that threaten its survival and reproduction improve. One of the greatest risks for species classified as vulnerable is the loss or destruction of habitat;
- Endangered (EN): When the available evidence indicates that it faces a great risk of extinction in the wild in the near future;
- Critically Endangered (CR): For wild species this is the category of greatest risk, covering those who face an extremely high risk of extinction in the wild. There is the possibility that species in this category may already be extinct in the wild.

Threatenned

Species belonging to the category of “Least Concern” have not been included, first because these are indeed species that are at lowest risk, but also because this category contains 2,381 species, and including them would make the exercise much longer.

1st stage- Decide which categories on the IUCN Red List of threatened species would be considered for use in the study.

The categories considered as valid for the study were selected based on the real danger of extinction or the possibility that, in the near future, they could face the danger of extinction.

2nd stage - Review each management plan of each conservation area in Mozambique, with the aim of confirming that each of the management plans possesses a list of the fauna and flora existing in its protected area.

3rd Stage – Use the IUCN Red List site to analyse, one by one, each of the species listed on the management plan of each conservation area, with the purpose of identifying which are within the 4 categories of the Red List of threatened species that we consider in this study. Based on this analysis, I proceeded to draw up an excel file, where it can be seen which species are on the Red List and in which ACs they are found.

4th Stage – Download from the IUCN site the list of native species in Mozambique which are on the Red List of threatened species, defining the taxonomy, the category (NT, VU, EN, CR), the type of system (terrestrial, marine or fresh water). It should be mentioned that, in the case of flora, this stage was not implemented, since the IUCN Red List site does not contain in its data base the spatial location of plant species. Hence, in order not to increase uncertainty in the study, only the plant species identified in the PM were mentioned.

5th Stage – Analyse each of the lists taken from the site: http://www.iucnredlist.org/. This analysis should be done by species, and should resort to a Feld that exists in the summary description for each of the species, which is the **Range Map**.

Figure 1- Range Map of the species Lycaon pictus (source: http://maps.iucnredlist.org/map.html?id=12436)

6th Stage- Identify the location of each of the species through the Range Map. The following lists were then drawn up, which I included in the excel file:

- ACs where the species is not identified in the PM, but where its geographical distribution indicates that it should be present (Range Map);
- Species that exist in areas not covered by the ACs;
- Species that are included in the Red List of threatened species in Mozambique, but which have no geographical location on a Range Map.

7th Stage – Creation of a project in QGIS software on the distribution of all threatened species in Mozambique, for which the following was necessary:

- Downloading all the shapefiles available on the IUCN Red List site, concerning the different classes;
- Use of the QGIS programme to create a map of Mozambique with the threatened species, resorting to the following shapefiles:
    - Shapefile of Mozambique;
    - Shapefile of the provinces;
    - Shapefile of the ACs of Mozambique;
    - Shapefile of each of the classes of animals;
- Use of the geoprocessing – intersect tool, making it possible to create a map of Mozambique with the native species;
- After this it was necessary to make a selection of species of each of the classes that belong to each of the 4 categories chosen (near threatened, vulnerable, endangered, critically endangered) through the table of attributes, and after this it was necessary to **save as**, selecting, when the window appears, the option "only save the elements selected" to create a new shapefile. Here it is possible to identify in its name and class to what category the species contained in this file belong, e.g: *Mammals_categ_CR.shp;*
- For the case of marine species, a special shapefile was created of Mozambique extending 22 km (12 nautical miles) into the Ocean. This is the distance recognised as the maritime area of Mozambique. To achieve this, we first obtained a shapefile with the oceans represented, by downloading the file from the site: http://www.naturalearthdata.com/downloads/10m-physical-vectors/10m-ocean/ ;

- After creating a project, where I had the shapefile of Mozambique and of the Ocean, I created a buffer, with a distance approximating "0.1976", which made it possible to obtain a new shapefile of Mozambique with the 22 Km of marine area.
- In this way, the analysis of threatened marine species of Mozambique, will be undertaken through this new shapefile of Mozambique, following the same method mentioned above.

8th stage- Insertion of the coutadas shapefile into the general project

- After the first work with the ACs it was decided to include a shapefile of the coutadas in the project, as well as in the excel file on the analysis of the native species of Mozambique that are on the Red List of threatened species;
- Using QGIS software, it was possible to add the shapefiles of the coutadas in the general project and to collect the following information:
    - Which endemic species present on the Red List exist in the current coutadas in Mozambique;
    - Later, through the table of attributes, it was possible to remove the species that exist in the coutada, and which fall into the 4 categories (NT,VU,EN,CR) and transfer them to the excel file.
- In this way the acquisition of the data necessary for later analysis, through the excel file was concluded.

Results

The results obtained from analysis of all the data referring to the 366 species in Mozambique that are on the Red List of threatened species, in the 4 categories analysed (NT, VU, EN, CR), allows us to draw the following conclusions:

- 170 species are identified as present in an AC in at least one management plan, that is, 48 % of the total number of species analysed;
- A further 157 species, or 42 % of the species, are not registered in any management plan, but their geographical distribution, according to the IUCN, covers at least 1 AC in Mozambique;
- 25 species, about 7% of the species analysed, exist in a geographical distribution not covered by any AC;
- The location of 14 species, or 4% of the species that are registered as native in Mozambique, is not recorded on the Range Map, or their known territory does not cover Mozambique. That is, it is not known whether they may exist inside or outside the ACs.

In short, then, 90% of the species in Mozambique indicated on the Red List of threatened species, in the 4 categories analysed, ought to be represented in the current network of conservation areas, with only 10% located outside this network.

After obtaining this data, it was necessary to understand which conservation areas contain the largest number of threatened species. To this end, 2 tables were drawn up, that allow us to observe which are the reserves/parks with the largest number of threatened species and into which category these species are classified in the PM, as well as the species which, although not identified in the management plan, are located in the area of the AC.

It is possible to reach this conclusion by analysing the Range Map made available by the IUCN Red List site.

For the endemic flora of Mozambique, as explained earlier, it was impossible to use the same resources as were used for the fauna, since the maps of occurrence are not available. Hence only the species identified in the PM, and whose existence was later confirmed on the Red List of threatened species, were considered. This demonstrates that a great deal of work must still be undertaken to identify and locate the flora.

Fauna							Flora				
			Categories (IUCN)					Categories (IUCN)			
AC	**Type of AC**	**Total species by AC (Sum of species identified in the PM and those not identified in the PM)**	NT[3]	VU[4]	[5]EN	[6]CR	**Total species identified by AC in the PM**	NT	VU	EN	CR
Quirimbas National Park	Terrestrial/Marine	171	94	68	7	2	9	3	5	1	0
1st and 2nd Islands Area of Environmental Protection	Terrestrial/Marine	157	93	55	7	2	0	0	0	0	0
São Sebastião Zone of Total Protection	Terrestrial/Marine	128	54	59	13	2	2	1	1	0	0
Limpopo National Park	Terrestrial	33	16	6	6	5	2	1	1	0	0
Gorongosa National Park	Terrestrial	31	10	13	5	3	0	0	0	0	0
Ponta do Ouro Partial Marine Reserve	Marine	76	27	33	14	2	1	0	1	0	0
Gilé National Reserve	Terrestrial	18	8	8	2	0	5	4	1	0	0
Bazaruto National Park	Terrestrial/Marine	108	44	53	10	1	0	0	0	0	0
Lake Niassa Partial Marine Reserve	Terrestrial/Aquatic	31	10	13	5	3	1	1	0	0	0
Banhine National Park	Terrestrial	13	6	4	1	2	2	0	0	0	0
Marromeu National Reserve	Terrestrial	25	13	7	2	3	3	1	2	0	0
Maputo Special Reserve	Terrestrial	11	3	5	2	1	0	0	0	0	0
Mágoè National Park	Terrestrial	12	3	4	2	3	0	0	0	0	0
Niassa National Reserve	Terrestrial	10	5	3	2	0	3	0	0	0	0
Zinave National Park	Terrestrial	7	3	3	0	1	1	1	0	0	0
Chimanimani National Reserve	Terrestrial	10	4	6	0	0	6	1	3	2	0
Malhazine Ecological Park	Terrestrial	2	2	0	0	0	0	0	0	0	0
Pomene National Reserve	Terrestrial	8	3	5	0	0	0	0	0	0	0

List with the number of endangered species by category in each of the Parks and Reserves

[3] NT – "Near threatened"
[4] VU – "Vulnerable"
[5] EN – "Endangered"
[6] CR – "Critically Endangered"

Coutadas	Near threatened (10%)	Vulnerable (20%)	Endangered (30%)	Critically endangered (40 %)	Total endangered species in the maps of occurrence
Coutada 4	10	5	0	1	16
Coutada 5	79	51	5	1	136
Coutada 7	10	4	0	1	15
Coutada 9	9	4	0	1	14
Coutada 10	79	50	4	1	134
Coutada 11	11	4	0	1	16
Coutada 12	11	5	0	1	17
Coutada 13	11	5	0	1	17
Coutada 14	11	4	0	1	16
Coutada 15	11	4	0	1	16
Coutada Marrupa/Niassa reserve	0	2	0	0	2
Lureco basin coutada/Niassa reserve	0	2	0	0	2
Messalo Coutada	0	1	0	0	1
Nungo Coutada	0	1	0	0	1
Nipepe Coutada	0	1	0	0	1
Nacumua Coutada	0	3	0	0	3
Nincage Coutada	0	1	0	0	1

List with the number of endangered species by category in each of the Coutadas

	Total species that exist in the AC and which are identified in the PM																	
Red List Category	**Banhine**	**Chimanimani**	**Gilé**	**Gorongosa**	**Lake Niassa**	**Marromeu**	**Ponta de Ouro**	**1st and 2nd Islands**	**Bazaruto**	**PNL**	**Pomene**	**Quirimbas**	**S. Sebastião**	**Zinave**	**REM**	**Malhazine**	**Mágoé**	**Niassa**
Near threatened	4	2	7	8	7	11	2	44	3	14	1	37	13	1	1	0	1	4
Vulnerable	4	3	7	12	4	6	8	12	8	6	5	22	14	3	5	0	4	1
Endangered	1	0	1	4	1	1	5	1	2	6	0	2	5	0	2	0	1	0
Critically endangered	2	0	0	3	0	3	1	1	0	5	0	1	1	1	1	0	2	0
Total species identified in the PM	11	5	15	27	12	21	16	58	13	31	6	62	33	5	9	0	8	5

Table 1. No. of species by Red List category, identified in the PM.

	Total species that exist in the maps of occurrence in the AC but which are not identified in the PM																	
Red List Category	Banhine	Chimanimani	Gilé	Gorongosa	Lake Niassa	Marromeu	Ponta de Ouro	1st and 2nd Islands	Bazaruto	PNL	Pomene	Quirimbas	S. Sebastião	Zinave	REM	Malhazine	Mágoé	Niassa
Near threatened	2	2	1	2	3	2	25	49	41	2	2	57	41	2	2	2	2	1
Vulnerable	0	3	1	1	9	1	25	43	45	0	0	46	45	0	0	0	0	2
Endangered	0	0	1	1	7	1	9	6	8	0	0	5	8	0	0	0	1	2
Critically endangered	0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	0	1	0
Total species that exist on the maps of occurrence	2	5	3	4	19	4	60	99	95	2	2	109	95	2	2	2	4	5

Table 2. No of species by Red List category, not identified in the PM, but located in the AC.

List of plants identified with resort to the PM

	Total species that exist in the AC and which are identified in the PM																
Red List Category	Banhine	Chimanimani	Gilé	Gorongosa	Lake Niassa	Marromeu	Ponta de Ouro	1st and 2nd	Bazaruto	PNL	Pomene	Quirimbas	S. Sebastião	Zinave	REM	Malhazine	Mágoé	Niassa
Near threatened	0	1	4	0	1	1	0	0	0	0	0	3	1	1	0	0	0	0
Vulnerable	0	3	1	0	0	2	1	0	0	0	0	5	1	0	0	0	0	0
Endangered	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Critically endangered	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total species identified in the PM	0	6	5	0	1	3	1	0	0	0	0	9	2	1	0	0	0	0

Table 3. No of plant species on the Red List identified in the PM and which exist in the ACs

It was also possible to obtain a series of figures corresponding to the number of species present in the Red List, but which are found outside the areas of the nature reserves/parks of Mozambique, as well as a list of species which, because they are not identified in the management plan and in the Red List,were listed. These data are shown in appendices A and B.

Discussion and conclusions

Based on the analysis made of the PM, it can immediately be noted that there are clear differences in regard to the areas of greatest concern or of specialisation of the staff responsible for drawing up the PM. In some there is a great concern to list all the animal species existing in the Park/Reserve, while in other cases only the large animals are identified. It is also possible to perceive what the specialist area is of the staff member responsible for identifying the fauna characteristic of this, when he presents a detailed list of birds or of fishes living in this area. The same can be said about the flora. In a few PMs, it is possible to see a list with some detail about the species existing in the area, while in others there is data about the groups of plants in the ACs, while in other PMs this information is sparse or does not exist.

Apart from the factors mentioned above, there are other aspects which limit drawing up this more detailed analysis such as, for example, the size of the conservation area, the short time staff have to write the PM, the limited budget, and also the difficulty in reaching the interior zones of the AC, due to the lack of communication routes.

Consequently there are considerable differences between PMs of different ACs which could be observed based on the study undertaken. In some cases it is possible to verify that a smaller number of species is identified in the PM of an AC, compared with the number of species existing in the same area, but only identified on the basis of the Range Map of the IUCN Red List.

This greater difference is observed in conservation areas that contain part of the marine zone. In conservation areas that are exclusively terrestrial this is not observed.

Furthermore this could be the trigger that was missing for undertaking new studies about the species existing in the ACs. Another question is raised about the species that are identified in the IUCN Red List as natives of Mozambique, but which are in other parts of the country, and not within the boundaries of the conservation areas. Although there are only a small number of these species, in comparison with those existing inside the ACs, they still deserve attention – perhaps more attention than the ACs that are already enshrined in law. For these are places which, since they do not possess any legal status as protected areas, are subject to greater pressure from man-made threats.

Greater care should be taken over the flora, for it is possible to perceive that there is lesser concern to conserve and protect the flora in the conservation areas than the fauna.

We can conclude that there is greater natural wealth than that which is only identified in the management plans of Mozambique's national parks and reserves, and that it should be protected.

Mozambique also has legal resources to create zones of protection, which are not obligatorily national parks and reserves, and which make it possible to protect this unique wild life wealth.

With this article, and resorting to the Excel file created, as well as to the QGI project files, it is possible to start a new discussion about the importance of knowing better what really exists inside the ACs, so that it will be possible to take measures to protect threatened species, as well as to project new protected areas in Mozambique, which shelter internationally threatened species. Note that all the data produced in the context of the present report are freely available for sharing on the site http://tiny.cc/ACs_especies.

Bibliography:

The IUCN Red List of threatened species - http://www.iucnredlist.org/

The catalogue of life - http://www.catalogueoflife.org/

Birdlife International - http://www.birdlife.org/datazone/species

Checklist' e Centros de Diversidade de Vertebrados em Moçambique, Michael F. Schneider, Victorino A. Buramuge, Luís Aliasse & Filipa Serfontein Department of Forestry Engineering, Eduardo Mondlane University, Maputo * author for correspondence: *mfschneider@vr-web.de*

Nature Earth - http://www.naturalearthdata.com/

Appendix A. Endangered species without spatial location, on the IUCN Red List

Category	Scientific Name
Near threatened (NT)	Favonigobius melanobranchus
Near threatened (NT)	Favonigobius reichei
Near threatened (NT)	Haematopus ostralegus
Near threatened (NT)	Lanistes elliptus
Near threatened (NT)	Montipora cryptus
Vulnerable (VU)	Actinopyga mauritiana
Vulnerable (VU)	Actinopyga miliaris
Vulnerable (VU)	Cymatoceps nasutus
Vulnerable (VU)	Diomedea exulans
Vulnerable (VU)	Galeorhinus galeus
Vulnerable (VU)	Pomatomus saltatrix
Endangered (EN)	Bellamya robertsoni
Endangered (EN)	Liza luciae
Endangered (EN)	Thalassarche chlororhynchos

Appendix B. Species found in areas outside the ACs

Category	Scientific name
Near threatened (NT)	Apalis lynesi
Near threatened (NT)	Limosa limosa
Near threatened (NT)	Nadzikambia baylissi
Near threatened (NT)	Rhampholeon maspictus
Vulnerable (VU)	Apalis chariessa
Vulnerable (VU)	Carpitalpa arendsi
Vulnerable (VU)	Haplochromis tweddlei
Vulnerable (VU)	Makaira nigricans
Vulnerable (VU)	Modulatrix orostruthus
Vulnerable (VU)	Montipora friabilis
Vulnerable (VU)	Montipora lobulata
Vulnerable (VU)	Platysaurus imperator
Vulnerable (VU)	Rhampholeon nebulauctor
Vulnerable (VU)	Strongylopus rhodesianus
Endangered (EN)	Acrocephalus griseldis
Endangered (EN)	Aetomylaeus vespertilio
Endangered (EN)	Alethe choloensis
Endangered (EN)	Arthroleptis francei
Endangered (EN)	Mertensophryne anotis
Endangered (EN)	Nothophryne broadleyi
Endangered (EN)	Paraxerus vincenti
Endangered (EN)	Zoothera guttata
Critically endangered (CR)	Artisornis moreaui
Critically endangered (CR)	Rhampholeon bruessoworum
Critically endangered (CR)	Rhampholeon tilburyi