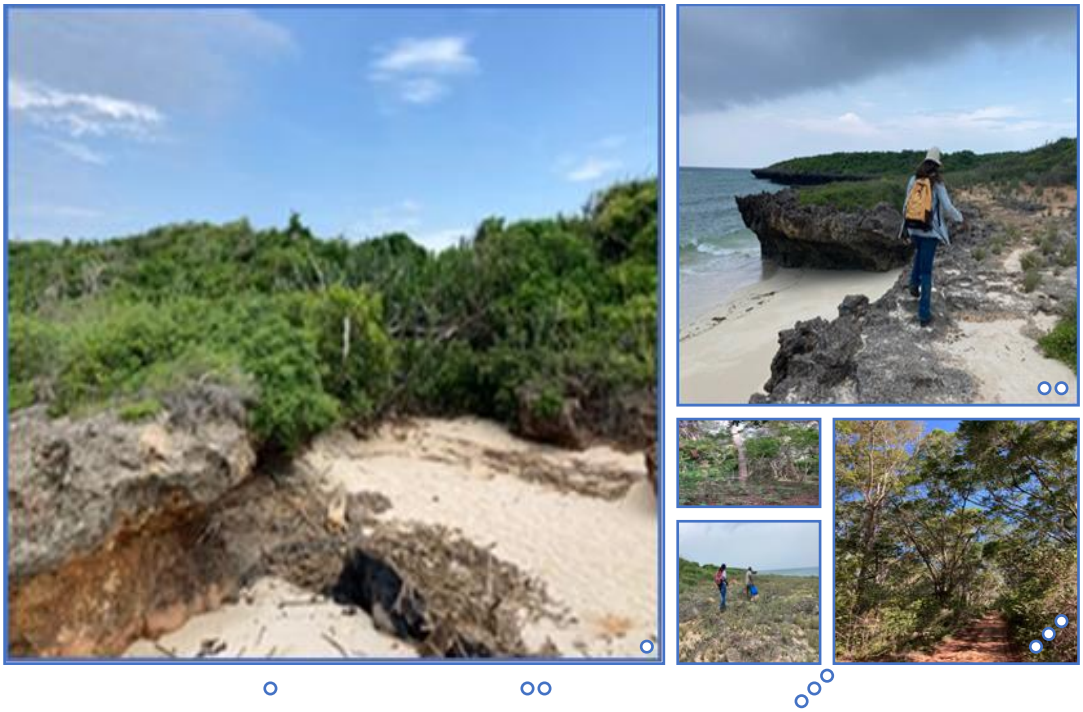
BUILDING A BLUE FUTURE FOR ECOSYSTEMS AND PEOPLE ON THE EAST AFRICAN COAST

Flora Report

Maputo, August 2023

PRELIMINARY FIELDWORK REPORT

TERRESTRIAL COASTAL FLORA AND VEGETATION OF MEMBA AND MUSSORIL IN NAMPULA PROVINCE



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Maputo, August 2023

Contents

1 Background

As part of a baseline biodiversity assessment two experts in flora and vegetation of Mozambique were contracted by WCS (contract celebrated between WCS and Universidade Eduardo Mondlane- Faculdade de Ciências) to carry out a vegetation and plant survey in Memba and Mossuril Nampula Province, northern Mozambique for the Project "Building a Blue Future for Ecosystems and People on the East African Coast".

Mozambique is located in the south-eastern of Africa and bordered to the north by Tanzania, to the northwest by Malawi, to the west by Zambia and Zimbabwe, to the southwest and south by South Africa and Eswatini and to the east by the Indian Ocean. It has about 2450 km of coastline, and is characterized by a variety of ecosystems, both marine and terrestrial. In terms of variety of ecosystems or habitat types, there are many, namely: areas of miombo (dry or wet miombo), mopane woodland, coastal vegetation (forest and woodland), savanna, riverine wetland vegetation, upland grassland and moist forest are all potentially interesting in their biodiversity.

1.1 Eco-regions and Centres of Endemism

There are in Mozambique thirteen ecoregions (Burgess *et al*., 2004; Odorico *et al*., 2022), six Centres of Endemism in senso lato (Darbyshire *et al*., 2019), and hundreds of endemic plants (Darbyshire *et al*. 2019, Odorico *et al*., 2022. The project that encompass the coastal section of Memba, Nacala-a-Velha, Nacala Porto and Mussoril districts in Nampula Provinces, is within the Southern Zanzibar-Inhambane Coastal Forest Mosaic which runs along the coast of Mozambique (Burgess *et al*., 2004) and Rovuma Centre of Endemism (see **Figure 1**). The Rovuma Centre of Endemism is an extension also within the Zambezian Regional Centre of Endemism, that includes the coastal area of Cabo Delgado, Nampula and Zambezia Provinces (Darbyshire, *et al*., 2019).

In terms of ecosystems the study area is composed by eleven types of vegetation namely: Memba Dry Miombo, Memba Dry Deciduous Lowland Forest, Nampula Ironwood Forest; Nampula Coastal Palm Savanna, Northern Coastal Dry Woodland, Rovuma Dune Thicket, Rovuma Coral Rag Thicket, Icuria Coastal Forest, Tropical Coastal Salt Marshes, Tropical Indian Ocean African Mangroves and Tropical Seashore Vegetation (Lotter, in press).

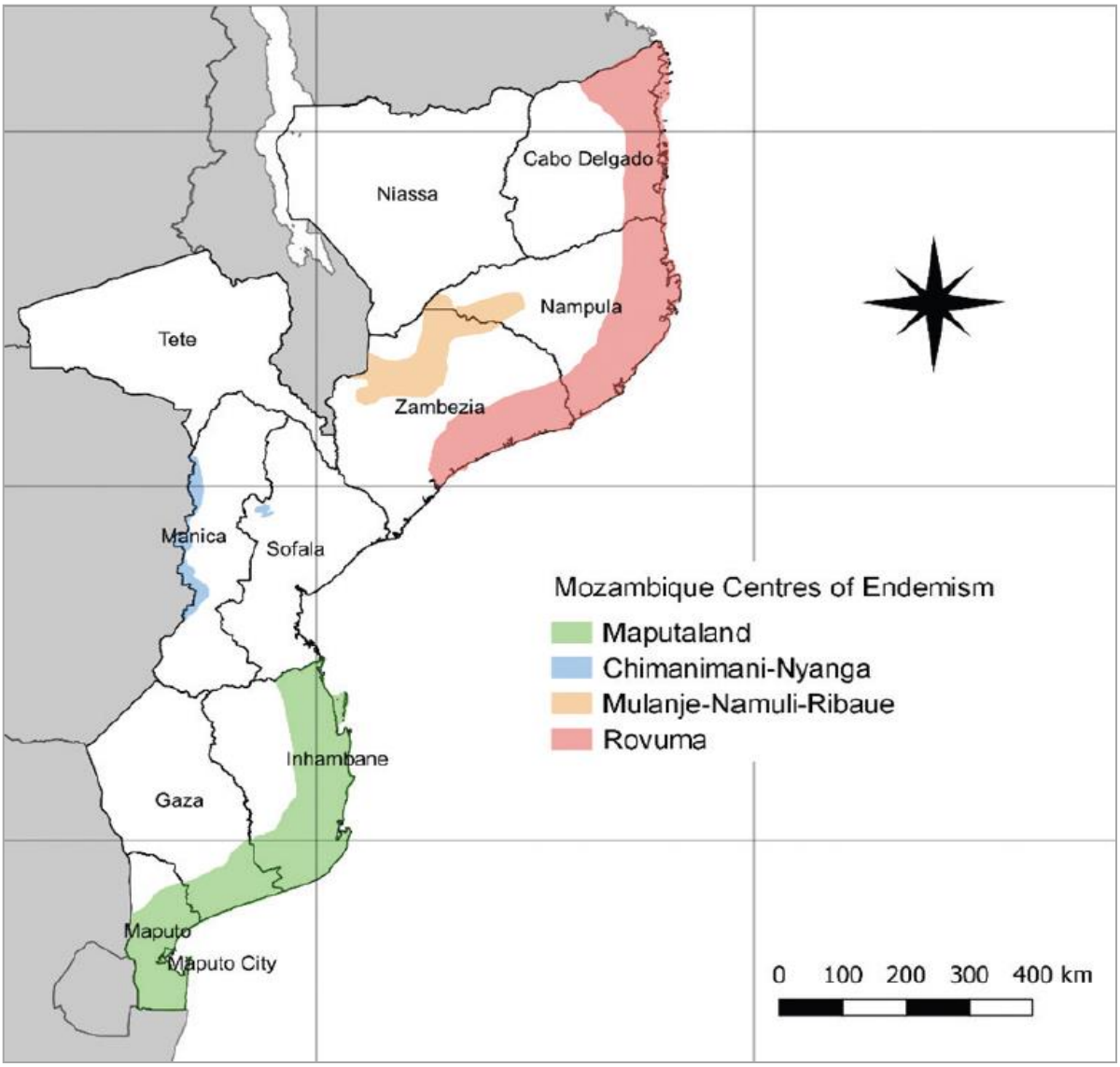

Figure 1: Mozambique's Centres of Endemism. Adapted from Darbyshire *et al*., 2019 and Odorico *et al*., 2022.

1.2 Plant diversity

Very recently, the plant endemism in Mozambique was assessed at 9.59% and includes 278 strict-endemic taxa and 403 near-endemic *taxa* (Darbyshire *et al*., 2019) this area shown the increase in the number of strict-endemic and near-endemic taxa compared to previous studies. This continuous progress suggests that the knowledge of the Mozambique's flora" is still not properly documented as many areas remain under-sampled.

Overall Odorico *et al*., (2022) estimation suggest 6,171 species natives to Mozambique within a total of 7,099 taxa (5,957 species, 605 subspecies, and 537 varieties), belonging to 226 families and 1,746 genera. There are 6,804 angiosperms, 257 pteridophytes, and 38

gymnosperms. This varied plant life stems, in part, from Mozambique's diverse geography, geology and climates, which have resulted in a wide range of habitats and biogeographical affinities (Darbyshire *et al.,* 2019). Of the known ecosystems and diversity of indigenous strict-endemics species to occurs in Mozambique, a number was a found in Nampula Province.

2 Objectives

As part of the ''Building a Blue Future for Ecosystems and People on the East African Coast'' Project, the overall objective of this survey is to assess the terrestrial coastal ecosystems and plant species of Memba and Mussoril districts of Nampula Province in North Mozambique.

Specifically, the survey is to:

- Identify, characterize and map the terrestrial ecosystems in terms of types, ecological condition, composition of endemic plant species and main threats to inform the development of the proposal for a future sustainable use Marine Protected Area (MPA);
- Identify sensitive ecosystems and sites with high diversity of plant species of high conservation concern (threatened species (CR, VU, EN) and endemic or restricted species) and potential important plant areas that should be protected/preserved/restored to ensure the functioning of ecosystems and the services they provide and that can inform the management and zoning plan of the future sustainable use MPA.

3 Methods

3.1 Study area

Memba is a district located in the northern Nampula Province, bordering to the north the Mecufi district of Cabo Delgado Province, to the south with the Nacala-a-Velha district, to the east with the Indian Ocean and to the west with the districts of Nacarôa and Eráti (MAE, 2005), whereas the Mussoril district is in south of Memba, also in the northeast of Nampula Province. Its geographically limited to the south by Mongicual district, to the east the Indian Ocean, to the north the Nacala-a-Velha district and to the west by Monapo (MAE, 2005).

3.2 Physical environment to the study area

Climate

The climate in Memba, Nacala-a-Velha, Nacala Porto and Mossuril is characterized by an annual average rainfall of 1,000 mm with a variation throughout the months of the year between 35 to 220 mm and with a seasonality defined by a wet period that goes between November and April, in which the precipitation value is equivalent to about 80% of the total annual value, February being the wettest. The dry season presents monthly rainfall averages of less than 35 mm during the period of May and October. The average annual temperature is 25.5° C, with highs up to 27.9 C recorded in January and lows below 4° C in the winter months (MICOA, 2012b).

Topography

As Memba is a coastal district, it is situated in areas of the great coastal plains and the topography tends to increase gently from the coast to inland. In the whole district the maximum altitudes do not exceed 500 m, with the exception of some mountain ridges in the eastern zone, which may exceed this value, but without expression in terms of surface area (MICOA, 2012b). For geology, the western part belongs to a very old geological era, the Mesoproterozoic of the Nampula Complex consisting of metamorphic rocks, while on the coast predominate Quaternary rocks dominated by sedimentary rocks, consisting of alluvium, sand, gravel, fluvio-marine alluvial clays, coastal stoneware and inland dunes interspersed by Cretaceous stoneware and argillites. The soils are of four types: lithic, shallow soils on non-limestone rock, alluvial and clay. The remainder is occupied by sandy-cover mananga soils, coastal dune soils, and medium-textured red soils. This means that about 90% of the soils of Memba are unsuitable for the practice of agriculture, and this activity is restricted to about 10% of the area (MICOA, 2012b).

Mossuril is situated in areas of the great coastal plains and altitude tends to increase gently from the coast to the interior of the district. On the coast of the district there are 3 geological zones. In the Lunga area, Quaternary rocks predominate, consisting essentially of fine reddish brown wind sand, medium to fine grained sand and fluvio-marine clay gravel and alluvium. In the zone of Mossuril Headquarters predominate Cretaceous rocks, sandstones and argillites interspersed and sandstones and conglomerates. In the Matibane zone we find rocks from

various periods, Cretaceous sandstone and conglomerate, fossiliferous limestone from the Tertiary and Quaternary rocks, fine reddish brown wind sand and medium to fine grained sand and gravel (MICOA, 2012a). For geology the southern part of the district belongs to a very old geological era, the Mesoproterozoic Nampula Complex. In the northern interior dominates the granodioritic gneiss and the leucocratic gneiss. In the coastal zone, to the north of the district, the soils consist of coastal dunes, shallow soils on non-limestone rock and mananga soils with sandy cover, soils that, in general, have low fertility. There are also red clayey soils derived from limestone rocks with good fertility. On the other hand, to the south of the district, in addition to coastal dune soils and mananga soils, soils of estuarine marine sediments and yellowish sandy soils occur in the coastal zone. These soils have low fertility (MICOA, 2012a).

3.3 Prior field-work

A desktop assessment was undertaken as prior activity to identify potential types of vegetation using the most recent historical vegetation map by Lotter et al. (in prep), to gather the endemic species of potential occurrence throughout the study through consulting the Darbyshire *et al*., 2019 and Odorico *et al*., 2022, the online platforms such as IUCN RED LIST (https://www.iucnredlist.org/) and Global Biodiversity Information Facility (https://www.gbif.org/pt/).

3.4 Field-work

Field work took place during the wet season from 5 to 14 March 2023, the team consisted by Alice Massingue, Castigo Datizua for flora and vegetation, and Cornelio Ntumi and Carmen Nhambe for faunal survey. For Flora and vegetation surveys, the tracks and sampling points recorded are shown in **Figure 2**.

The sampling was conducted through random transects conducting “ground truthing’’ by vehicle and foot along 1 km buffer from the coastline, wherein the terrestrial coastal ecosystems are located (see **Figure 2**). In each survey point the geographical coordinate was registered with support of a handheld GPS Garmin (global positioning system) and the identification and characterization of the vegetation types was done by the team, listing all species observed, seeking for endemic plant species and alien species.

The GPS location and number of individuals of Species of Conservation Concern (SCC) encountered within the sites, were recorded and have been included on the vegetation map (**Figure 3**). The alien plants were identified according to Bromilow (2010). In cases where identification was not possible in the field, specimens were collected, dried and taken to the Herbarium of the Eduardo Mondlane University (LMU) for their identification based on the Herbarium collections. The activities and phenomena's that can represent threats for the integrity of the ecosystems and species persistence were also registered.

3.5 Post field-work

Post-fieldwork activities under data collection were the confirmation of the scientific names identified in the field, using the collections of the Herbarium. Globally threatened species were identified by consulting the IUCN Red List (www.iucnredlist.org) and CITES (www.cites.org), while endemic and threatened species were identified Izidine and Bandeira (2002) and the Regulation of the Law on Forests and Wildlife (Decree No. 12/2002, of 6 June).

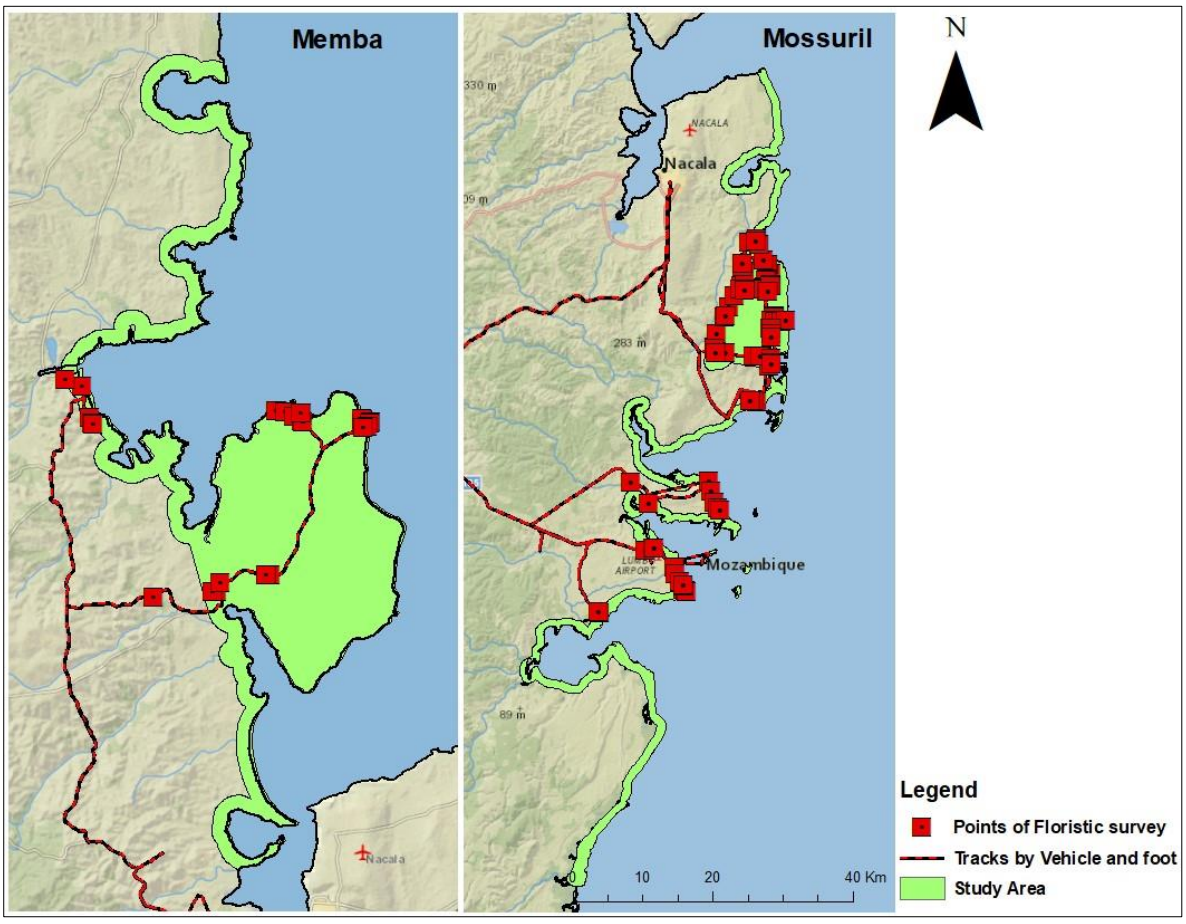

Figure 2: Survey tracks throughout the terrestrial coastal ecosystems of Memba and Mussoril. Map by C. Datizua (2023).

3.5.1 Site Sensitivity Assessment

The Species Environmental Assessment Guideline (SANBI, 2021) was applied to assess the Site Ecological Importance (SEI) of the study area. The habitats and the species of conservation concern in the area were assessed based on their conservation importance, functional integrity and receptor resilience (**Table 1**). The combination of these resulted in a rating of SEI and interpretation of mitigation requirements based on the ratings.

Table 1: Criteria for establishing Site Ecological importance and description of criteria

Criteria	**Description**
Conservation Importance (CI)	The importance of a site for supporting biodiversity features of conservation concern present e.g., populations of Threatened and Near-Threatened species (CR, EN and VU), Rare, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes.
Functional Integrity (FI)	A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts.
Biodiversity Importance (BI) is a function of Conservation Importance (CI) and the Functional Integrity (FI) of a receptor.	
Receptor Resilience (RR)	The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention.
Site Ecological Importance (SEI) is a function of Biodiversity Importance (BI) and Receptor Resilience (RR)	

4 Results

4.1. Main ecosystems observed

One of the aim of the study was to identify the different ecosystems that occur in the study area, cross-checking them against the map developed by Lotter (in press) (**Figure 3**). As a result of the observations in the field, a map with current ecosystems was developed (**see Figure 4**). It was noticed that most of the area is occupied by itinerant agriculture of food crops for local communities' subsistence and settlements.

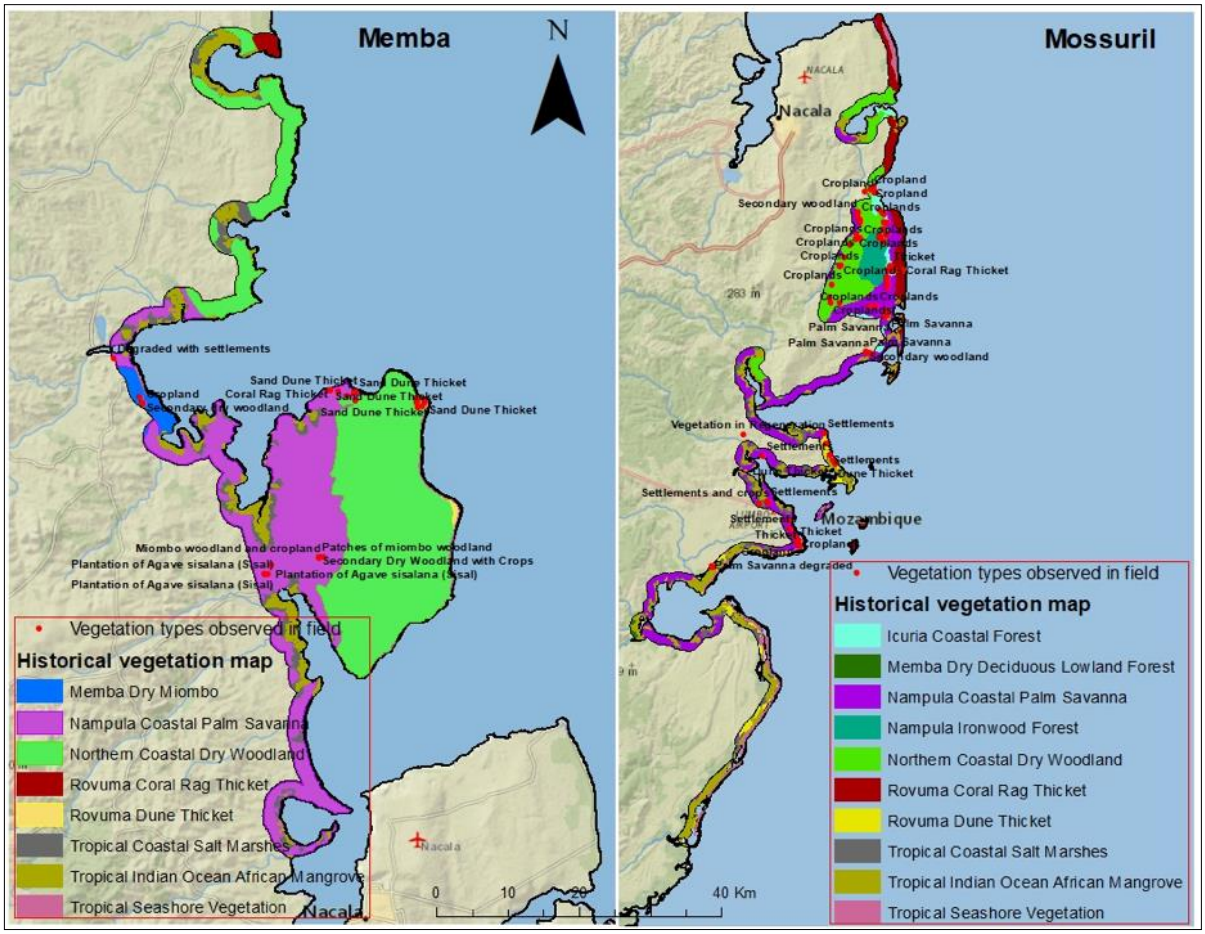

Figure 3: The vegetation types observed within the historical vegetation map classes (Lotter in press). Map by C. Datizua (2023).

4.1.1 Current Land Use

The study area is used to grow predominantly cassava, maize and variety of beans. Typically, areas are cleared through a combination of mechanical means and burning and crops planted

for a few seasons before being left fallow to regenerate. Areas that are left fallow within the project site return to a secondary woodland for a period of time before they are cleared again for crops. The secondary woodland is also used as a source of fuel wood, as a source of raw materials for charcoaling, as a source of wild food and for medicinal purposes.

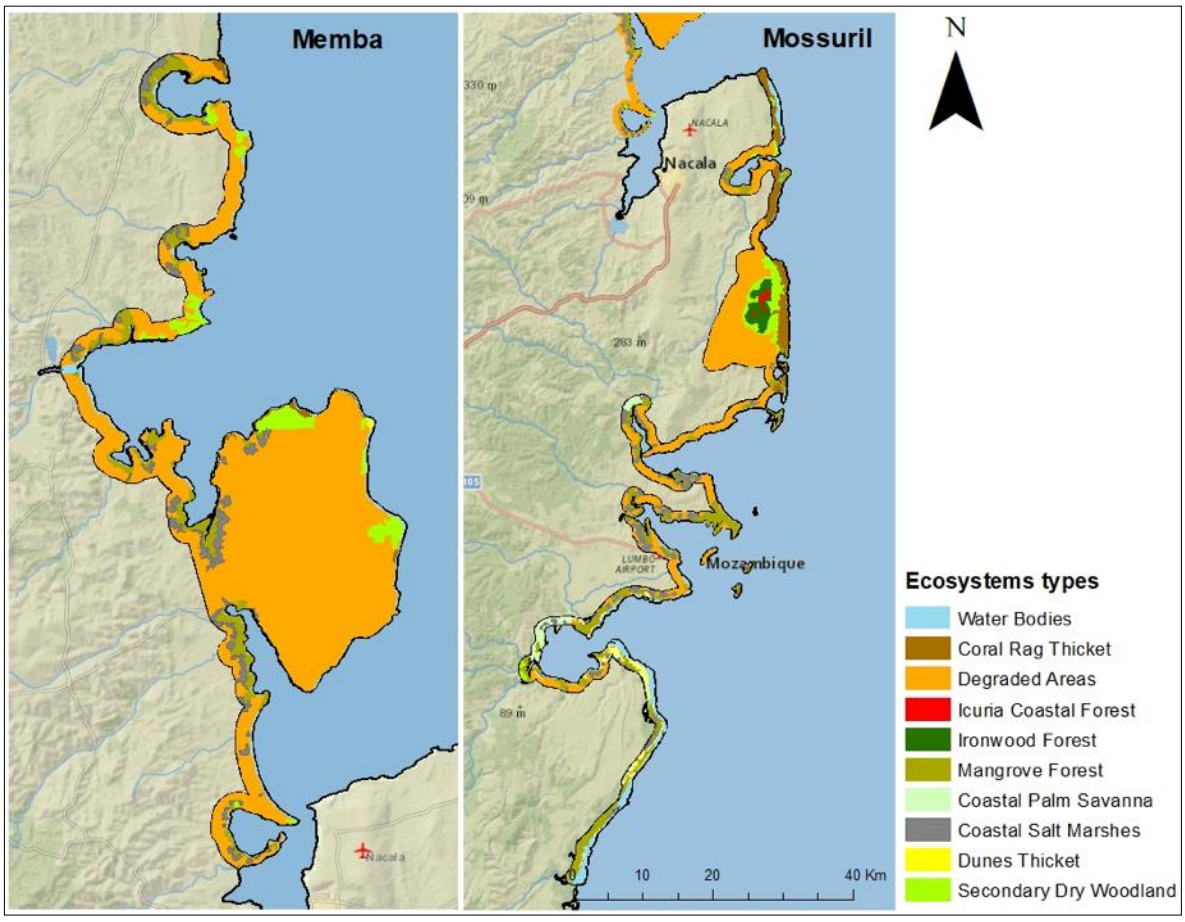

Figure 4: Identified and classified type of habitats currently found alongside the study area. Map by C. Datizua (2023).

4.1.2 Current Land Use of Matibane KBA and threats

The KBA Matibane Forest Reserve is currently mostly threatened by permanent agriculture, charcoal production and timber harvesting. Matibane Forest Reserve is located in Mossuril District, established in a very hard wood suitable commercial purpose. During a very long past it's been heavily damaged by harvesting for construction, particularly for railway, houses, energy poles, and fencing. It is home of one of the strictest endemic of Mozambique, the *Icuria dunensis*, only found from Moebase in Zambézia province up to Matibane Forest

Reserve and Serra da Mesa in Mossuril district, Nampula Province. Presently, besides cropland and settlements expansion which fragments and reduction of the area extent, Matibane Forest is also threatened by charcoal production (see **Figures** 5 below). The main market for charcoal produced in Matibane is Nacala Porto.

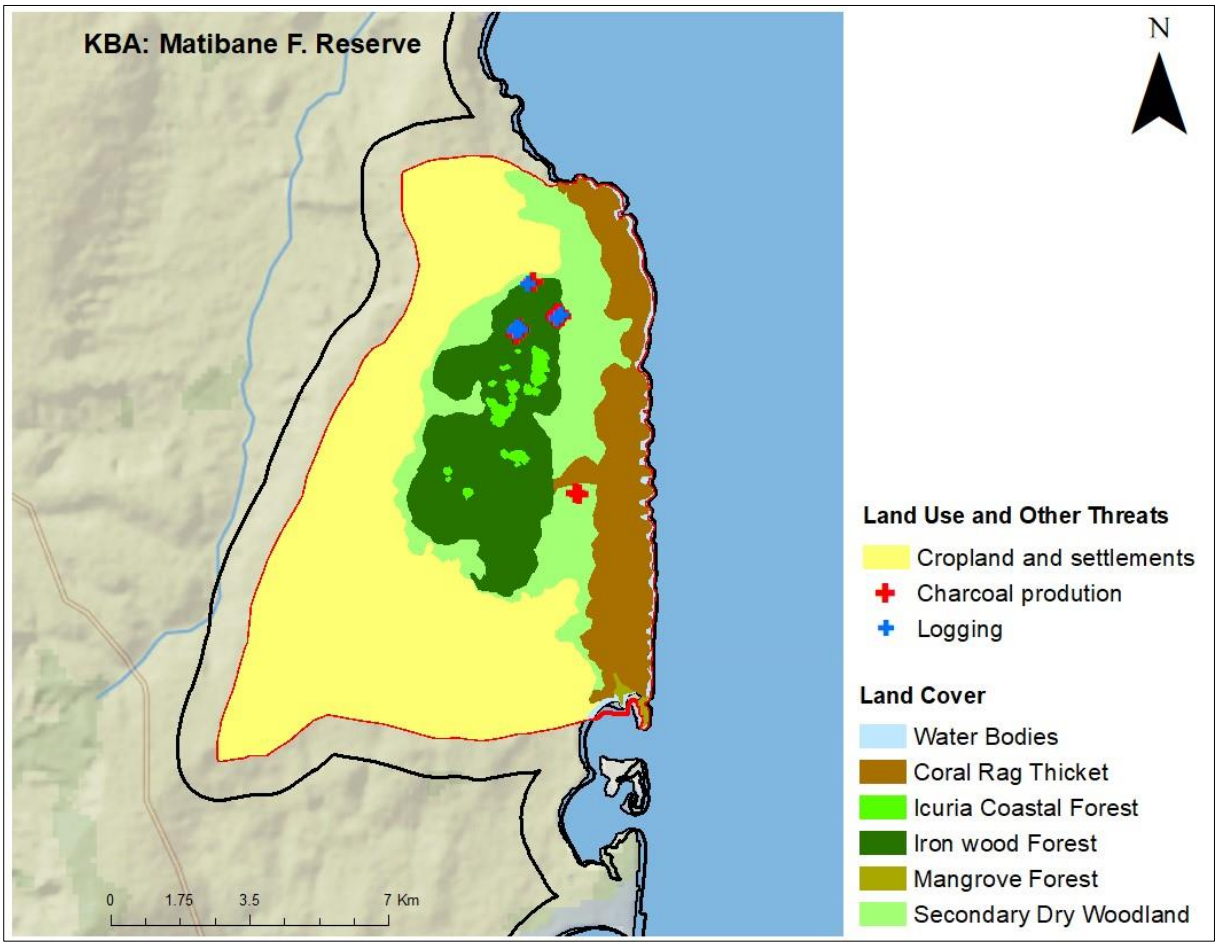

Figure 5: Land Cover, Land use and other threats of the KBA Matibane Forest Reserve. Map by C. Datizua (2023).

The study area is a remarkable complex of ecosystems that are harmoniously interacting and results in a highly productive area of the coastline. Additionally, these complexes of ecosystems interact to create a high diversity of vegetation types and flora within a relatively small spatial extent area. However, due to pressure of the local population establishing agriculture fields and/or settlements, most of the vegetation types have been impacted or removed in most of the case. Thus, the remaining vegetation forms aggregations. The characteristics of the historical ecosystems facilitated the study of the area and it is still possible to detect the following ones:

a) The **foredune dune system** that is under threat from rising sea levels and storm effects so that it is an eroding system that is degraded over much of its length.

b) The dune plains and slacks that are colonized by coastal **dune thicket or sometimes palm savanna (**Palm savanna often in bushclumps with wet hygrophilous grassland in low-lying areas)**.**

c) The remains of drier **Secondary dry Woodlands** that has been removed by slash and burn to be replaced by crops.

d) **Coastal forest (*Icuria dunensis* forest and Ironwood Forest)** occurs at the margin of the Rag coral thicket, parallel to the shoreline.

e) The **marine – onshore and offshore ecosystems** with both rocky shores and sandy beaches.

Note that, although the mangroves and waterbodies vegetation were mapped **(Figure 5**), in this study were not surveyed, and so, there is no any characterization taken ahead under this report. These ecosystems a specific report was developed and provindes a detailed description of these ecosystems throughout the project area.

4.2 Ecosystems Characterization

Coastal Dune Thicket or dune thicket (the historical ''Rovuma Dune Thicket'')

The dune plains and slacks that occur immediately behind the foredunes on young Holocene ridges and swales are colonized by Coastal Dune Thicket. Note that the dunes in this area are very low. Most of the vegetation along the dunes was removed for tourism activities and or agriculture (see **Figure 6**). Species found in these vegetation types include the shrubs *Strychnos spinosa, Xylotheca tettensis, Coptosperma littorale, Olax dissitiflora, Mimosops obtusifolia, Drypetes natalensis* and *Croton pseudopulchellus*.

Figure 6: Coastal dune thicket found along the study area. (Photo by A. Massingue 2023).

Secondary dry Woodlands (the historical '' Northern Coastal Dry Woodland'')

These vegetation types are no longer as extensive or pristine as the natural vegetation has largely been removed for cultivation of cassava that must be very productive on these soils which probably are rich in nutrients at least in some parts (see Figure 7). Only trees useful for fruits such as *Anacardium occidentale* (cashew nuts) are maintained.

Figure 7: Coastal secondary dry woodland found along the study area. (Photo by A. Massingue 2023)

Coastal Forest of Ironwood forest and Icuria dunensis (the historical '' Nampula Ironwood Forest'')

The Coastal Forest in this study was only observed at Matibane Forest Reserve. This is *Androstachys johnsonii* forest associated with *Icuria dunensis* forest (see **Figure 8**) occurs at the margin of the Coral rag vegetation or thicket, parallel to the shoreline. Remnant patches of forest in secondary stage were also observed further inland (see **Figure 9**). It is likely that

this vegetation type (both *Icuria* forest and *Androstachys* forest) was much more extensive in the past, having been cleared for timber and crops, especially in the last few decades. These two species tend to be monospecific so the *Icuria dunensis* forest forms aggregation within the *Androstachys johnsonii* forest that is the biggest. Besides the two species mentioned another common species in the coastal forest is *Croton pseudopulchellus*.

Figure 8: *Androstachys johnsonii* in association with *Icuria dunensis* in Matibane Forest Reserve. (Photo by A. Massingue 2023)

Figure 9: Remnant forest in secondary stage at surrounding areas of Matibane Forest Reserve. (Photo by A. Massingue 2023

Vegetation on coral Rag (the historical '' Rovuma Coral Rag Thicket'')

A distinctive vegetation associated on Coral Rag was observed from Memba to Lumbo (for specific locations see the table below with GPS points) where it occurs alternately with sandy dunes. The type of plant species occurring on Coral Rag and Sandy Dunes are generally different, although there are species that can occur in both habitats.

The best developed and preserved patches of this vegetation were observed in Memba (along the lodge and nearby) and Matibane. In Matibane the formation forms a dense thicket (Coral Rag Thicket) (see **Figures 10**). The dominant species observed were: *Jatropha subaeuiloba,* an endemic to Mozambique and a new record for this area (see Massingue *el al*., in press); *Coptosperma litoralle*; *Sideroxilon inerme*; *Euphorbia angularis*; *Capparis cartilaginea*; *Drypetes natalensis*; among others.

Figures 10: Coral Rag carpets and thicket vegetation found along study area. (Photos by A. Massingue 2023)

Palm Savanna (the historical '' Nampula Coastal Palm Savanna'')

Palm Savanna occurs on the flat, low-lying areas and has mostly been cleared and replaced by crops and residences and are no longer as extensive nor pristine as the natural vegetation has largely been removed. This vegetation type is dominated by *Hyphaene coriacea*, *Phoenix reclinata* and sometimes *Ozoroa obovata* with a grass understory. This type of vegetation was only observed in very small area in Matibane and Lumbo (see **Figures 11**).

Figures 11: Palm Savanna, one of the most rare ecosystems in the study area. (Photo by A. Massingue 2023)

Degraded areas

In most of the study area the natural historical vegetation was removed for agriculture purpose and residences (**Figures 12**). No intact areas are found except small intact patches of *Androstachys johnsonii* forest and *Icuria dunensis* forest that can be observed at Matibane Forest Reserve. However, there is a strong threat of Ironwood clearing for charcoal production and later transformation into agricultural fields (see **Figures 13**).

Figures 12: The main crops observed are: pearl millet, maize, cassava and beans. (Photo by A. Massingue 2023)

Figures 13: Ironwood removed for charcoal production and later agriculture fields. (Photo by A. Massingue 2023)

4.2.1 Vegetation regeneration

Another aspect observed in this area is that the local people practice itinerant agriculture (the common throughout the country). Therefore, in some areas that were abandoned vegetation has already established naturally. But it seems that once the vegetation establishes, the population comes back to do more machambas, meaning that once the vegetation is established (probably due to the presence of high level of nutrients), they use it again to do machambas (**Figures 14**).

Figures 14: Regeneration of Vegetation: disturbed (left) and then intact (right). (Photo by A. Massingue 2023)

4.3 Floristic composition

RA total of 225 species from 62 families were recorded within the project area (Refer to **Table 2**) (a full species list has been included in Appendix 1). The Rubiaceae and Fabaceae families had the highest number of species (24 and 25 species, respectively) followed by Poaceae and Euphorbiaceae (13 species), Malvaceae (nine species), Phyllanthaceae and Lamiaceae (seven species). The remaining families have six or less species. Of the 225 recorded species, 38 are considered to be species of conservation concern (refer to **Table 2** for further details).

Table 2: List and number of families recorded during the fieldwork

Families	No of species	Families	No of species	Families	No of species
Acanthaceae	3	Commelinaceae	1	Menispermaceae	1
Achariaceae	1	Connaraceae	2	Moraceae	3
Anacardiaceae	5	Convolvulaceae	1	Myrtaceae	1
Annonaceae	7	Cucurbitaceae	2	Ochnaceae	5
Apocynaceae	7	Cyperaceae	1	Olacaceae	3
Araceae	1	Dilleniaceae	1	Oleaceae	2
Arecaceae	3	Ebenaceae	4	Orchidaceae	2
Asparagaceae	2	Ehretiaceae	1	Passifloraceae	2
Asphodelaceae	1	Erythroxylaceae	1	Phyllanthaceae	7
Bignoniaceae	1	Euphorbeaceae	13	Picrodendraceae	1
Burseraceae	4	Fabaceae	25	Poaceae	13
Capparaceae	2	Flacourtiaceae	1	Polygalaceae	3
Celastraceae	3	Flagellariaceae	1	Putranjivaceae	2
Celtidaceae	1	Lamiaceae	7	Rhamnaceae	2
Chrysobalanaceae	1	Linaceae	1	Rhizophoraceae	1
Clusiaceae	2	Malvaceae	9	Rubiaceae	24
Colchicaceae	1	Melastomataceae	2	Rutaceae	5
Combretaceae	2	Meliaceae	5	Salicaceae	2
Sapindaceae	3	Taccaceae	1	Violaceae	1
Sapotaceae	3	Thymelaeaceae	2		
Strychnaceae	5	Vitaceae	6		

4.4 Species of Conservation Concern

The most relevant species here presented and discussed will be later (in **section 4.7**) used to evaluate the Integrity of Ecosystem. Are categorized under can be used to evaluate the Integrity of Ecosystem. For this study only three categories of IUCN in **Table 3** were used.

In general, thirty-eight species of conservation concern were recorded within the project area (**Table 4**, Appendix). The map (**Figure 15**) resumes the location of these species into IUCN threatened categories. The Critically Endangered (CR) category is composed by two species, the Brachystegia oblonga and shrub or small-tree Warneckea sessilicarpa; The Endangered (EN) are: the north coastal endemic tree of Mozambique Icuria dunensis, Drypetes sclerophylla and Croton kilwae. Nevertheless, Vulnerable (VU) is the most diversity category with nine (9) species, namely: Afrocanthium vollesenii, Coffea schliebenii, Croton inhambanensis, Euphorbia angularis, Hexalobus mossambicensis, Jatropha subaequiloba, Micklethwaitia carvalhoi, Monanthotaxis trichantha, Vepris sansibarensis

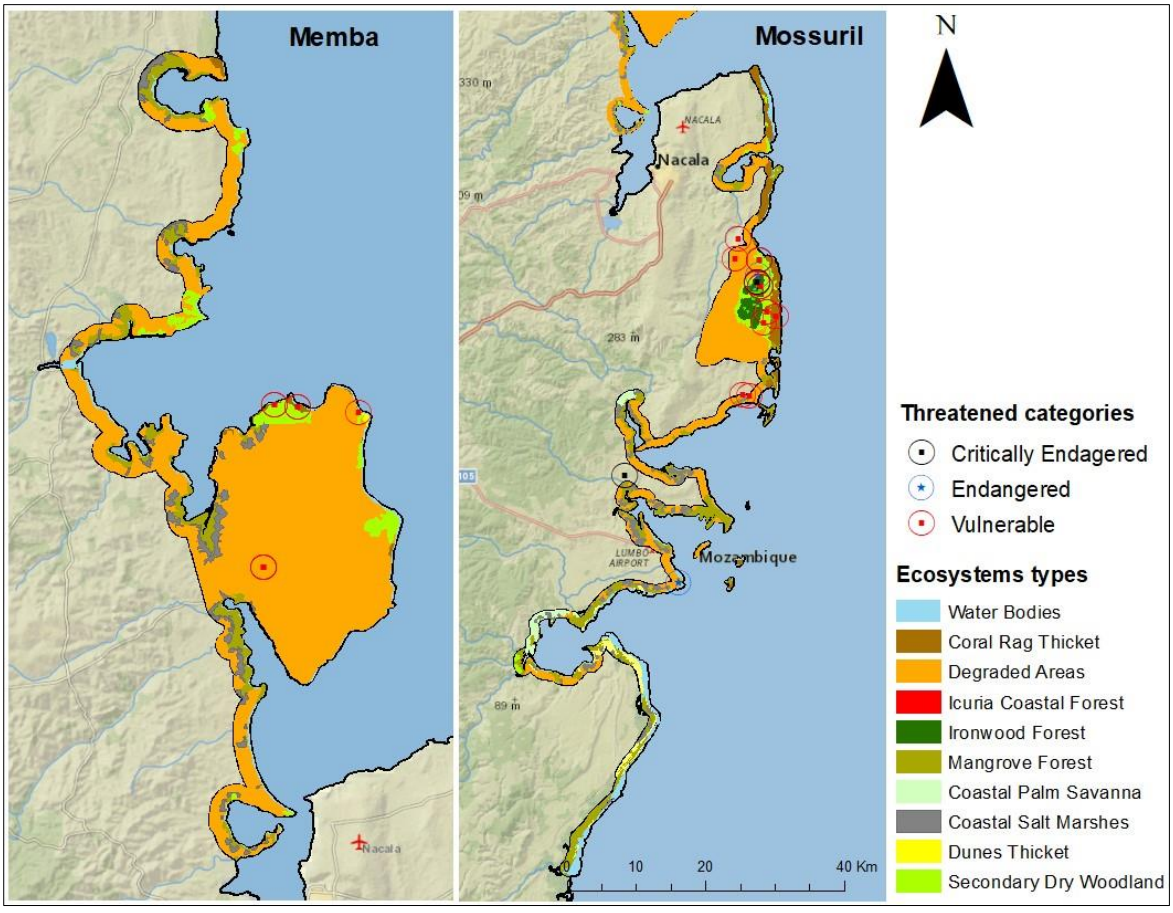

Figure 15: Map of group species by endemism status and IUCN threatened categories, recorded in different sites alongside the study area. Map by C. Datizua (2023).

Table 3: Occurrence of the species of high conservation concern in the study area.

Family	Species Name	Threatened Species	Locations	Coordinates	
				Latitude	Longitude
Rubiaceae	Afrocanthium vollesenii	Vulnerable	Baixo Pinda and Matibane	-14.204089	40.711743
				-14.727884	40.821656
				-14.659668	40.779899
Fabaceae	Brachystegia oblonga	Critically Endagered	Baixo Pinda, Matibane and Chocas Mar	-14.306324	40.648723
				-14.660868	40.811969
				-14.940065	40.635659
				-14.66772	40.81 277
Rubiaceae	Coffea schliebenii	Vulnerable	Matibane	-14.727884	40.821656
Euphorbeaceae	Croton inhambanensis	Vulnerable	Matibane	-14.837571	40.79772
Euphorbeaceae	Croton kilwae	Endangered	Matibane and Lumbo	-15.078855	40.705938
Rubiaceae	Drypetes sclerophylla	Endangered	Matibane	-14.680417	40.809449
Annonaceae	Hexalobus mossambicensis	Vulnerable	Matibane	-14.306324	40.648723
				-14.689365	40.807702
Fabaceae	Icuria dunensis	Endangered	Matibane	-14.695635	40.812055
Euphorbiaceae	Jatropha subaequiloba	Vulnerable	Baixo Pinda and Matibane	-14.199034	40.656418
				-14.20012	40.671716
				-14.733474	40.833071
Fabaceae	Micklethwaitia carvalhoi	Vulnerable	Baixo Pinda and Matibane	-14.306324	40.648723
				-14.660868	40.811969
				-14.690836	40.807772
				-14.742185	40.817485
				-14.835169	40.790352
Annonaceae	Monanthotaxis trichantha	Vulnerable	Matibane	-14.695635	40.812055
Rutaceae	Vepris sansibarensis	Vulnerable	Matibane	-14.695635	40.812055
Melastomataceae	Warneckea sessilicarpa	Critically Endagered	Matibane	-14.689365	40.807702

4.4.1 Local assessment of the most important Species of Conservation Concern

Here below are descried (assessed) in detail all the main species of conservation importance found throughout the study area.

- ***Brachystegia oblonga*** (Endemic) is listed as Critically Endangered on the IUCN red data list and is endemic to the region, with occurrences noted between Moma and Maganja da Costa. According IUCN valuation it has an extent of occurrence (EOO) of 82 km^2 and an area of occupancy (AOO) of 9 km^2. There are only two known sub-populations, one of which is extinct and the other is degraded and limited to 50 individuals (Burrows et. Al., 2018; Alves et. Al., 2014, Darbyshire et.al., 2019, Hyde et. Al., 2021). This study brings more results about this specie and some individuals were observed in the Baixo Pinda, Matibane and Chocas Mar.
- ***Warneckea sessilicarpa*** (Endemic) is listed as Critically Endangered on the IUCN red data list. It is a deciduous shrub or small tree occurring in woodland and thicket on coastal dunes. So far, this species was only known from three localities around Angoche town, with an EOO of 20 km^2 and AOO of 12 km^2 (Darbyshire et. al., 2019). In this study this species was recorded at Matibane Forest Reserve. According Massingue et al. (*in press*) this species occurs from Moebase Zambezia Province to Serra da Mesa in Nampula province.
- ***Icuria dunensis*** **(Endemic)** is listed as Endangered at IUCN red list. This species occurs between Nacala and Moebase in Nampula and Zambezia Provinces. According to the bioregional survey undertaken in 2017 for the Kenmare Environmental and Social Impact Assessment (ESIA) an ecological assessment was done by (Massingue *et al*, in press) from Moebase Zambezia to Nampula and a new population was found at Serra da Mesa. For this study this species was found at Matibane Forest Reserve, and this population was already known.
- ***Croton kilwae*** **(Endemic)** is listed as Endangered at IUCN red list. This species was only known from Kenya and Tanzania, it was found first time in Mozambique by (Burrows et al., 2018). It's rare in Mozambique, for this study was found in Matibane and Lumbo.
- ***Drypetes sclerophylla*** is listed as Endangered under IUCN criteria, was known only from 3 to 5 location in Tanzania, it was found first time in Mozambique by (Burrows

et al., 2018). Very few individuals of this species were observed at Matibane Forest Reserve.

- ***Hexalobus mossambicensis*** **(Vulnerable)** occur from Moebase to Nampula (Massingue et al., in press), it's quite common along the forest, for this study it was found in Matibane Forest Reserve;
- ***Afrocanthium vollesenii*** observed very few individuals in Baixo Pinda and Matibane;
- ***Coffea schliebenii*** only observed one individual in Matibane;
- ***Croton inhambanensis***, this species was only known to occur at Inhambane Endemism centre, and recently found in Matibane by (Massingue at al., in press), only two individuals were observed for this study also in Matibane;
- ***Jatropha subaequiloba***, was also known only from three locations in Inhambane Endemism centre and found up to Matibane by (Massingue at al., in press). During this study more location was observed in Baixo Pinda, Memba and Lumbo;
- ***Micklethwaitia carvalhoi*** was only known from Tanzania, it was found first time in Mozambique by (Burrows et al., 2018), for this study the specie occurs in Baixo Pinda, Memba and Matibane;
- ***Monanthotaxis trichantha***, in Mozambique was only known from Cabo-Delgado and recently by (Massingue at al., in press) found it in Moma district in Nampula, for this study it was found in Matibane, the same its applied for ***Vepris sansibarensis***.

Overall, the main threats for all these species observed along the study area are the clearance for land crops (Machambas) and or residences that has been undertaken at a very large scale and at a rapid rate and as such it is very likely that the quantified population has been significantly reduced.

4.5 Uses of plant species by local communities

The study did not have a big focus on the use of plants by local communities, but it was notable the use of some plant species by local people. For example, a charcoal production and *Hyphaene coriaceae* (Figure 16) These activities were mostly observed in Matibane.

Figure 16: *Hyphaene coriaceae* for rope and roof cover (left), and *Androstachys johnsonii* for charcoal production (Photo by A. Massingue 2023).

4.6 Ecosystem condition and threats to plant diversity

Overall observations in the field show that the major threat to ecosystems is a rapid expansion of crop field by local communities, settlements, charcoal production, timber harvesting, tourism activities, as detailed below:

- Transformation of the ecosystems into other land uses (primarily agricultural fields) dominated by crops, most notably cassava (*Manihot esculenta*); maize (*Zea mays*); pearl millet (*Pennisetum glaucum*) and variety of beans (see **Figure 17-a, b**). For example, in Baixo Pinda and Memba it was observed that the local communities practice agriculture (field crops) even at the edge of the beach (see Figure 18)
- Transformation of land for houses and tourism activities (observed mostly in Memba Village and from Matibane to Lumbo) (See Figure 17-d).
- Matibane Forest Reserve is also under transformation by yimber harvesting and Charchoal prodution activities (see Figure 19)

Figure 17: The pattern of agriculture land and settlements found all over the stuy area. (Photo by A. Massingue 2023)

Figure 18: The pattern of agricultural activity undertaken at the edge of sea in Baixo Pinda and Memba (Photo by A. Massingue 2023).

Figure 19: Timber harvesting and Charchoal prodution activities ongoing in Matibane Forest Reserve. (Photo by A. Massingue 2023)

4.6.1 Invasive Alien Plant species

Although the country has many documented reports on invasive plant species. The government and partners are still designing strategies for how to evaluate them and monitor them. So, for the categorization of species identified in the area, international studies such as IUCN and The Southern African Plant Invaders Atlas (SAPIA) were used.

According to Browillon, (2010); Henderson, (1995; 2001); SAPIA, the classification in two forms (weed or invader) and in three categories according were used.

- Category 1- declared weeds, there are prohibited plants, which must be controlled or eradicated. These plants serve no economic purpose and possess characteristics that are harmful to humans, animals or the environment;
- Category 2 - declared invader, plants with a commercial or utility value (e.g. soil stabilization, animal fodder, and more) and;
- Category 3. Mostly ornamental.

Eigth (8) invasive species distributed into six families were identified in the study area (see **Table 3** below).

Table 3: List of invasive plants species observed in along the study area.

Species	Family	SAPIA	Category	IUCN/CABI
Agave sisalana	Asparagaceae	Invader	2	
Casuarina equisetifolia	Casuarinaceae	Invader	2	
Imperata cylindrica	Poaceae			X
Moringa oleifera	Moringaceae			X
Opuntia monacantha	Cactaceae	Weed	1	
Ricinus communis	Euphorbiaceae	Invader	2	
Senna occidentalis	Fabaceae			X
Albizia lebbeck	Fabaceae	Invader	2	X

The **Figures 20** below show two invader plant species that are common in Mozambique. For example, *Casuarina equisetifolia* (**Figure-20-b**) is planted over all coastal zone due to erosion protection, whereas *Agave sisalana* (**Figure 20-a**) it is of historical culture, used in Mozambique for production of sisal, where it is still grown for commercial purposes in the northern part of the country, mainly in Nampula province. In this study this species was observed in a huge plantation in Baixo Pinda and Matibane. Sisal fiber has multiple uses in industry in Mozambique, mainly for the production of ropes, sacks and threads. *Opuntia monacantha* (Figure 20-c) is the one of the most common and widespread over the all

country, this plant species can be observed in all type of habitat. In this study, it was most common along the beach and near residences in Memba and Lumbo.

Figures 20: Invasives plant species observed along the study area. *Agave sisalana* (a), *Casuarina equisetifolia* (b) and *Opuntia monacantha* (c). (Photo by A. Massingue 2023)

4.7 Ecosystems of high Ecological Sensitivity

The overall sensitivity of Coastal forest (Ironwood Forest and *Icuria dunensis* forest) and Coral Rag Thicket has been assessed to be high, primarily due to the presence of the Endangered species *Icuria dunensis*, *Croton kilwae*, *Drypetes sclerophylla*, *Warneckea sessilicarpa* and *Brachystegia oblonga* (critically endangered) and the low resilience of this vegetation types to the expected clearing that is already occurring for charcoal production.

Coastal ticket and Coral Rag Thicket

Conservation Importance (CI) (High) – five species, where, two are critically endangered *Brachystegia oblonga* and *Warneckea sessilicarpa* and the other two species are also endangered *Icuria dunensis*, *Drypetes sclerophylla* were recorded only within the Coastal forest and Croton kilwae also endangered occurring in Coral Rag. There are very few known populations of these species globally.

Functional Integrity (FI) (Medium) – There are only narrow corridors of good habitat connectivity with large areas of transformed land between intact patches in Matibane and at Baixo Pinda (Nuaro Lodge) in Memba.

Receptor Resilience (Medium) – Seedling recruitment is limited by rainfall events, the availability of establishment sites and competition from established plants (Vetter, 2009). Annual species typically recover more quickly from a disturbance than perennial species as they put more energy into reproduction from seed than perennial species do. It would therefore be expected that woodland in Nuaro Lodge would take longer to recover and have a low resilience to disturbance. Montfort et.al. (2021) have found that woody species richness and diversity in some forest took between 20 and 25 years to reach similar values to that of mature forest. These studies were undertaken at sites where slash and burn had occurred, and hence the soil structure and seed bank remained intact.

In the instance of charcoal production, all vegetation will be cleared, the soil structure will be disrupted and the seed bank disturbed. Recovery of this vegetation is difficult under these circumstances and the resilience has therefore been assessed as low as it is unlikely that more than 50% of the site will fully recover to its original state after 15 years of rehabilitation, that's why the SEI is considered (High).

4.8 Key threats for the Ecosystems

The threats / risks presented below have been assessed in line with the International Finance Corporation (IFC) Performance Standard 6: Biodiversity Conservation & Sustainable Natural Resource Management. Themes include: (i) Protection and Conservation of Biodiversity (habitat, modified habitat, natural habitat, critical habitat, legally protected areas, invasive alien species).

4.8.1 Loss of Coastal forest and Coral Rag Thicket

Although the site is fragmented and large sections of the site have been transformed and planted with crops such as maize, cassava and beans, there are still strips of remaining natural vegetation that have a relatively high diversity of species and provide ecological functions and processes. The charcoal production process will result in the clearance of the remaining vegetation within the study area. No process of rehabilitation is being implemented in the area for indigenous species (e.g., endemic, and near endemic species or threatened species). Consequently, this will result in the permanent loss of this vegetation type within the project area. However, Coastal Ironwood Forest occurs also in Inhambane and Gaza provinces. Icuria dunensis (the one form Icuria forest) is an endemic species restricted to the Zambezia and Nampula province and it does contain a high species diversity. The further loss of this vegetation is therefore likely to be high due to the uniqueness habitat and the overall risk is rated as a high risk.

4.8.2 Loss of Plant Species of Conservation Concern

The project area contains >0.5% of the global population and >5 reproductive individuals of *Icuria dunensis*. therefore, the population of this species has been considered globally important and further loss of this species will have a Very High impact rating, which is considered of an Extreme Risk. The overall risk will be a Major risk. Due to the clearance of the forest where this specie occurs. *Icuria dunensis* itself it has no value for the local people, the value of this specie is more ecological, existence value.

4.8.3 Disruption of Ecosystem Function and Process

Fragmentation is one of the most important impacts on vegetation as it creates breaks in previously continuous vegetation, causing a reduction in the gene pool and a decrease in species richness and diversity. This impact occurs when more and more areas are cleared,

resulting in the isolation of functional ecosystems, which results in reduced biodiversity and reduced movement due to the absence of ecological corridors. Although the project area is already fragmented due to clearing for machambas, the remaining vegetation still functions as ecological corridors allowing the dispersal of seeds. The loss of this vegetation as a result of clearing activities, will result in a large open area that is likely to take in excess of 15 years (probably more) to recover to its current state. During this period ecosystem function and process will be limited.

4.8.4 Invasion by alien plant species

The potential invasion of alien species into the area seems to be low, although eight species were observed. However, as with all disturbances, the introduction of alien and invasive species is highly probable as with disturbance comes the influx of aliens. Alien invasive species need to be consistently managed. Since the project area currently shows scarce signs of alien infestations the significance rating is considered moderate to low. In term of management, although it is known that invasive plant species are harmful to the ecosystem where they occur. There are still few methods of managing these species in Mozambique. This is still worrisome when these species are found in rural areas where little information exists about them. Many of the invasive plant species are used as medicinal examples *Opuntia* and *Ricinus communis* and or ornamental *Agave sisalana*. Therefore, the management of these species in the study area must first go through the sensitization of local communities. However,

5 Constraints of the study

As fieldwork days was few, was strategically tried to survey all different vegetation types, assuming that, a certain type of vegetation is ecologically equal wherever, that is, would be composed by the same species diversity throughout whole study area. In addition, the most extent of the study area is already transformed by land use (settlements, cashew and mango trees, and itinerant agriculture of food crops). Therefore, we did not do any survey as it was no longer natural.

6 Conclusions

The study is composed by 9 types of natural ecosystems: Coral rag thicket, Icuria Coastal forest, Ironwood Forest, Coastal Palm Savanna, Coastal Salt Marshes, Dunes thicket, water bodies, Mangrove forest, secondary Dry woodland; and one that represents degraded areas of agriculture and settlements uses. This area although mostly occupied by agriculture fields and settlements, and has a very high species richness, including endemic and threatened species making it a floristically important area. Based on the presence of these species, it is highly probable that the site will be considered critical habitat. Are in total 13 plant species of high conservation concern (VU, EN, CR) occurring within the most of these ecosystems. But in general are thirty-eight SCC identified to occur within the project area. Of these, twenty-two are considered to be threatened species (CR, EN, VU or NT).

Based on the sensitivity analysis for the project area, the forest and vegetation on coral Rag was determined to be very high. This is based on the presence of the high number of threatened SCC.

7 Additional remarks

Another approach would be to determine whether there are other populations of these threatened species along the region (Rovuma Endemism centre). One of the main problems facing plant conservation in Mozambique is the lack of sound information on which to base conservation strategies. A survey of these species within the Rovuma Centre of Endemism will be useful to increase knowledge on plant diversity in the country, and design strategies for their conservation. According Massingue et al., in press noted that the major concentration of endemic and threatened species along Rovuma endemism centre a concentrated in Afungi in Cabo-Delgado Province and from Moma to Angoche districts in Nampula Province.

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9 Appendixes

Table 4: Species of Conservation Concern

FAMILY	SPECIES NAME	IUCN	MOZ RED LIST
Fabaceae	*Afzelia quanzensis*		Lower Rist- Near Threatened
Rubiaceae	*Afrocanthium vollesenii*	Vulnerable	
Moraceae	*Bosqueiopsis carvalhoana*		Near Endemic 1
Fabaceae	*Brachystegia oblonga*	Critically Endangered	Endemic
Polygalaceae	*Carpolobia suaveolens*	Least Concern	Endemic
Apocynaceae	*Carvalhoa campanulata*		Endemic
Rubiaceae	*Catunaregam stenocarpa*		Near Endemic 1
Rubiaceae	*Coffea schliebenii*	Vulnerable	Endemic
Euphorbeaceae	*Croton kilwae*	Endangered	Endemic
Euphorbeaceae	*Croton inhambanensis*	Vulnerable	Endemic
Fabaceae	*Dalbergia bracteolata*	Least Concern	Near Endemic
Ebenaceae	*Diospyros mafiensis*	Near threatened	
Rubiaceae	*Drypetes sclerophylla*	Endangered	
Euphorbiaceae	*Euphorbia ambroseae var. ambroseae*		Endemic

FAMILY	SPECIES NAME	IUCN	MOZ RED LIST
Euphorbiaceae	*Euphorbia angularis*		Endemic
Malvaceae	*Grewia transzambezica*		Endemic
Annonaceae	*Hexalobus mossambicensis*	Vulnerable	Endemic
Fabaceae	*Icuria dunensis*	Endangered	Endemic
Euphorbiaceae	*Jatropha subaequiloba*	Vulnerable	Endemic
Fabaceae	*Micklethwaitia carvalhoi*	Vulnerable	Endemic
Fabaceae	*Millettia mossambicensis*	Least Concern	Near- endemic-Near threatened
Fabaceae	*Millettia stuhlmanii*		Lower Rist- Near Threatened
Annonaceae	*Monanthotaxis trichantha*	Vulnerable	Near Endemic
Fabaceae	*Ormocarpum schliebenii*	Near threatened	Near-endemic
Rubiaceae	*Oxyanthus latifolius*		Near Endemic
Rubiaceae	*Oxyanthus pyriformis subsp.A*		Endemic
Anacardiaceae	*Ozoroa obovata var. elliptica*		Near Endemic
Passifloraceae	*Paropsia braunii*	Near threatened	
Malvaceae	*Pavonia leptocalyx*	Near threatened	
Meliaceae	*Pseudobersama mossambicensis*	Near threatened	
Fabaceae	*Pseudoprosopis euryphylla*	Near threatened	
Rubiaceae	*Psydrax moggii*	Least Concern	Near-endemic
Thymelaeaceae	*Synaptolepis oliveriana*		Near-endemic 1
Meliaceae	*Trichilia sp. A*		Endemic
Rutaceae	*Vepris sansibarensis*	Vulnerable	
Melastomataceae	*Warneckea sessilicarpa*	Critically Endangered	Endemic
Melastomataceae	*Warneckea sousae*	Near threatened	Near Endemic
Annonaceae	*Dielsiothamnus divaricatus*		Near-Endemic

Tabela 5: General list of plant species found alongside terrestrial coastal ecosystems of Memba and Mussoril in Nampula Province.

FAMILY	SPECIES NAME	IUCN	MOZ RED LIST
Fabaceae	*Abrus precatorius*		
Fabaceae	*Afzelia quanzensis*	Least Concern	Lower Rist- Near Threatened
Fabaceae	*Albizia adianthifolia*	Least Concern	
Fabaceae	*Albizia versicolor*	Least Concern	
Euphorbiaceae	*Alchornea laxiflora*	Least Concern	
Sapindaceae	*Allophylus tanzaniensis*		
Apocynaceae	*Ancylobothrys petersiana*		
Picrodendraceae	*Androstachys johnsonii*	Least Concern	
Annonaceae	*Annona senegalensis*	Least Concern	
Phyllanthaceae	*Antidesma venosum*	Least Concern	
Annonaceae	*Artabotrys brachypetalus*	Least Concern	
Asparagaceae	*Asparagus africanus*		
Asparagaceae	*Asparagus falcatus*		
Malvaceae	*Adansonia digitata*		
Malvaceae	*Azanza garckeana*		
Rubiaceae	*Afrocanthium vollesenii*	Vulnerable	
Acanthaceae	*Barleria repens*		
Moraceae	*Bosqueiopsis carvalhoana*		Near Endemic 1
Fabaceae	*Brachystegia microphylla*	Least Concern	
Fabaceae	*Brachystegia spiciformis*	Least Concern	

FAMILY	SPECIES NAME	IUCN	MOZ RED LIST
Fabaceae	*Brachystegia oblonga*	Critically Endagered	Endemic
Phyllanthaceae	*Bridelia cathartica*	Least Concern	
Rubiaceae	*Bullockia setiflora*		
Flacourtiaceae	*Caloncoba welwitschii*	Least Concern	
Apocynaceae	*Carissa macrocarpa*	Least Concern	
Polygalaceae	*Carpolobia suaveolens*	Least Concern	Endemic
Apocynaceae	*Carvalhoa campanulata*		Endemic
Salicaceae	*Casearia gladiiformis*	Least Concern	
Fabaceae	*Cassia afrofistula*	Least Concern	
Rhizophoraceae	*Cassipourea mossambicensis*		
Lauraceae	*Cassytha filiformis*		
Rubiaceae	*Catunaregam stenocarpa*		Near Endemic 1
Vitaceae	*Cissus cactiformis*		
Vitaceae	*Cissus integrifolia*		
Vitaceae	*Cissus quadrangularis*		
Vitaceae	*Cissus rotundifolia*		
Phyllanthaceae	*Cleistanthus schlechteri var. schlechteri*	Least Concern	
Lamiaceae	*Clerodendrum glabrum*	Least Concern	
Lamiaceae	*Clerodendrum robustum var robustum*	Least Concern	
Rubiaceae	*Coddia rudis*		
Rubiaceae	*Coffea schliebenii*	Vulnerable	Endemic
Commelinaceae	*Commelina sp.*		

FAMILY	SPECIES NAME	IUCN	MOZ RED LIST
Burseraceae	*Commiphora africana*	Least Concern	
Burseraceae	*Commiphora serrata*	Least Concern	
Burseraceae	*Commiphora ugogensis*	Least Concern	
Burseraceae	*Commiphora zanzibarica*	Least Concern	
Rubiaceae	*Coptomosphera litoralle*		
Rubiaceae	*Coptomosphera nigrescens*		
Fabaceae	*Cordyla africana*	Least Concern	
Fabaceae	*Craibia zimmermannii*	Least Concern	
Euphorbeaceae	*Croton pseudopulchellus*		
Euphorbeaceae	*Croton kilwae*	Endangered	Endemic
Euphorbeaceae	*Croton inhambanensis*	Vulnerable	Endemic
Cyperaceae	*Cyperus spp.*		
Fabaceae	*Dalbergia bracteolata*	Least Concern	Near Endemic
Sapindaceae	*Deinbollia oblongifolia*	Least Concern	
Fabaceae	*Dichrostachys cinerea*	Least Concern	
Poaceae	*Digitaria eriantha*		
Poaceae	*Digitaria sp.*		
Ebenaceae	*Diospyros consolatae*	Least Concern	
Ebenaceae	*Diospyros loureiriana subs loureiriana*		
Ebenaceae	*Diospyros mafiensis*	Near threatened	
Putranjivaceae	*Drypetes natalensis*	Least Concern	
Rubiaceae	*Drypetes sclerophylla*	Endangered	
Putranjivaceae	*Dirichletia pebescens*		
Ehretiaceae	*Ehretia amoena*	Least Concern	

FAMILY	SPECIES NAME	IUCN	MOZ RED LIST
Rubiaceae	*Empogona coriacea*		
Poaceae	*Eragrostis chapelieri*		
Poaceae	*Eragrostis ciliaris*		
Erythroxylaceae	*Erythroxylum emarginatum*	Least Concern	
Ebenaceae	*Euclea natalensis*	Least Concern	
Myrtaceae	*Eugenia capensis*		
Orchidaceae	*Eulophia petersii*		
Euphorbiaceae	*Euphorbia ambroseae var. ambroseae*		Endemic
Euphorbiaceae	*Euphorbia angularis*		Endemic
Euphorbiaceae	*Euphorbia lividiflora*		
Euphorbiaceae	*Excoecaria bussei*		
Moraceae	*Ficus sp.*		
Salicaceae	*Flacourtia indica*	Least Concern	
Flagellariaceae	*Flagellaria guineensis*		
Phyllanthaceae	*Flueggea virosa subsp. virosa*	Least Concern	
Clusiaceae	*Garcinia livingstonei*		
Colchicaceae	*Gloriosa superba*	Least Concern	
Malvaceae	*Grewia bicolor*		
Malvaceae	*Grewia sp.*		
Malvaceae	*Grewia sulcata*		
Malvaceae	*Grewia transzambezica*		Endemic
Rubiaceae	*Heinsia crinita subsp. parviflora*		
Annonaceae	*Hexalobus mossambicensis*	Vulnerable	Endemic

FAMILY	SPECIES NAME	IUCN	MOZ RED LIST
Chrysobalanaceae	*Hirtella zanzibarica*	Least Concern	
Apocynaceae	*Holarrhena pubescens*	Least Concern	
Lamiaceae	*Hoslundia opposita*		
Linaceae	*Hugonia orientalis*	Least Concern	
Euphorbeaceae	*Hymenocardia ulmoides*	Least Concern	
Rubiaceae	*Hyperacanthus microphyllus*		
Poaceae	*Hyperthelia dissoluta*		
Arecaceae	*Hyphaene coriaceae*		
Celastraceae	*Hyppocratea sp.*		
Fabaceae	*Icuria dunensis*	Endangered	Endemic
Oleaceae	*Jasminum fluminense subs. fluminense*		
Oleaceae	*Jasminum stenolobum*		
Euphorbiaceae	*Jatropha subaequiloba*	Vulnerable	Endemic
Apocynaceae	*Landolphia kirkii*		
Rubiaceae	*Langynias lasiantha*		
Anacardiaceae	*Lannea schweinfurthii*		
Moraceae	*Maclura africana*	Least Concern	
Capparaceae	*Maerua triphylla var.pubescens*		
Euphorbiaceae	*Mallotus oppositifolius var. lindicus*		
Anacardiaceae	*Mangifera indica*	Least Concern	
Sapotaceae	*Manilkara bicolor*		
Sapotaceae	*Manilkara concolor*		

FAMILY	SPECIES NAME	IUCN	MOZ RED LIST
Euphorbiaceae	*Maprounea africana*		
Phyllanthaceae	*Margaritaria discoidea var.fagifolia*		
Bignoniaceae	*Markhamia obtusifolia*	Least Concern	
Malvaceae	*Melhania forbesii*	Least Concern	
Poaceae	*Melinis repens*		
Convolvulaceae	*Merremia tridentata*		
Fabaceae	*Micklethwaitia carvalhoi*	Vulnerable	Endemic
Fabaceae	*Millettia mossambicensis*	Least Concern	Near- endemic-Near threatened
Fabaceae	*Millettia stuhlmanii*		Lower Rist- Near Threatened
Fabaceae	*Millettia usaramensis subsp. australis*		
Sapotaceae	*Mimusops obtusifolia*		
Cucurbitaceae	*Momordica balsamina*		
Cucurbitaceae	*Momordica charantia*		
Annonaceae	*Monanthotaxis trichantha*	Vulnerable	Near Endemic
Fabaceae	*Mundulea sericea*	Least Concern	
Celastraceae	*Mystroxylon aethiopicum subsp.schlechteri*		
Ochnaceae	*Ochna arborea var. arborea*		
Ochnaceae	*Ochna kirkii*	Least Concern	
Ochnaceae	*Ochna mossambicensis*	Near threatened	
Ochnaceae	*Ochna natalitia*	Least Concern	
Ochnaceae	*Ochna ovata*		
Olacaceae	*Olax dissitiflora*	Least Concern	

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Fabaceae	*Ormocarpum schliebenii*	Near threatened	Near-endemic
Rubiaceae	*Oxyanthus latifolius*		Near Endemic
Rubiaceae	*Oxyanthus pyriformis subsp.A*		Endemic
Anacardiaceae	*Ozoroa obovata var. elliptica*		Near Endemic
Sapindaceae	*Pancovia holtzii subsp holtzii*		
Poaceae	*Panicum coloratum*		
Poaceae	*Panicum maximum*		
Passifloraceae	*Paropsia braunii*	Near threatened	
Rubiaceae	*Paveta decumbens*		
Malvaceae	*Pavonia leptocalyx*	Near threatened	
Poaceae	*Pennisetum purpureum*		
Poaceae	*Perotes patens*		
Phyllanthaceae	*Phyllanthus reticulatus var. reticulatus*		
Phyllanthaceae	*Phyllanthus welwischianus*	Least Concern	
Poaceae	*Pogonatria squarrosa*		
Polygalaceae	*Polygala capillaris*		
Meliaceae	*Pseudobersama mossambicensis*	Near threatened	
Fabaceae	*Pseudoprosopis euryphylla*	Near threatened	
Clusiaceae	*Psorospermum febrifugum*	Least Concern	
Rubiaceae	*Psychotria pumila var.pumila*		
Rubiaceae	*Psychotria sp. C.*		
Rubiaceae	*Psydrax moggii*	Least Concern	Near-endemic
Rutaceae	*Ptaeroxylon obliquum*		

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Combretaceae	*Pteleopsis myrtifolia*	Least Concern	
Vitaceae	*Rhoicissus revoilii*	Least Concern	
Vitaceae	*Rhoicissus tomentosa*		
Violaceae	*Rinorea ilicifolia var. ilicifolia*		
Rubiaceae	*Rothmannia ficheri subsp. moramballae*		
Connaraceae	*Rourea coccinea subsp. boiviniana*	Least Concern	
Connaraceae	*Rourea orientalis*	Least Concern	
Rubiaceae	*Rubiaceae sp. new1*		
Celastraceae	*Salacia elegans*		
Asphodelaceae	*Sansivieria hyacithoidea*		
Passifloraceae	*Schlehterina mitostemmatoides*		
Anacardiaceae	*Sclerocarya birrea*		
Acanthaceae	*Sclerochiton coeruleus*	Near threatened	
Anacardiaceae	*Searcia natalensis*		
Polygalaceae	*Securidaca longepedunculata*	Least Concern	
Fabaceae	*Senna petersiana*	Least Concern	
Poaceae	*Setaria incrassata*		
Annonaceae	*Sphaerocorne gracilis subsp. gracilis*		
Apocynaceae	*Strophanthus petersianus*		
Strychnaceae	*Strychnos henningsii*		
Strychnaceae	*Strychnos madagascariensis*		
Strychnaceae	*Strychnos myrtoides*	Least Concern	

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Strychnaceae	*Strychnos panganensis*		
Strychnaceae	*Strychnos spinosa*		
Araceae	*Stylochaeton natalensis*		
Euphorbiaceae	*Suregada zanzibariensis*		
Thymelaeaceae	*Synaptolepis alternifolia*		
Thymelaeaceae	*Synaptolepis oliveriana*		Near-endemic 1
Apocynaceae	*Tabernaemontana elegans*		
Taccaceae	*Tacca leontopetaloides*	Least Concern	
Rubiaceae	*Tarenna junodii*	Least Concern	
Fabaceae	*Tephrosia purpurea*		
Combretaceae	*Terminialia sericea*		
Dilleniaceae	*Tetracera boiviniana*	Least Concern	
Poaceae	*Themeda triandra*		
Menispermaceae	*Tiliacora funifera*		
Celtidaceae	*Trema orientalis*		
Meliaceae	*Trichilia emetica*		
Meliaceae	*Trichilia sp. A*		Endemic
Meliaceae	*Turraea nilotica*	Least Concern	
Meliaceae	*Turraea wakefieldii*	Least Concern	
Annonaceae	*Uvaria lucida subsp. virens*		
Rubiaceae	*Vangueria infausta*		
Orchidaceae	*Vanilla roscheri*		
Rutaceae	*Vepris lanceolata*		
Rutaceae	*Vepris trichocarpa*		
Rutaceae	*Vepris sansibarensis*	Vulnerable	

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Fabaceae	*Vigna sp.*		
Lamiaceae	*Vitex doniana*	Least Concern	
Lamiaceae	*Vitex madiensis subsp. milanjiensis*		
Lamiaceae	*Vitex mombassae*		
Melastomataceae	*Warneckea sessilicarpa*	Critically Endagered	Endemic
Melastomataceae	*Warneckea sousae*	Near threatened	Near Endemic
Olacaceae	*Ximenia americana*	Least Concern	
Olacaceae	*Ximenia caffra var.caffra*		
Achariaceae	*Xylotheca tettensis*	Least Concern	
Malvaceae	*Cola cf. greenwayi var. greenwayi*		
Fabaceae	*Albizia sp.*		
Acanthaceae	*Sp.A new (In Massingue et al., in press)*		
Rutaceae	*Zanthoxylum teniupedicellatum*		
Rhamnaceae	*Colubrina asiatica*		
Capparaceae	*Capparis cartilaginea*		
Annonaceae	*Dielsiothamnus divaricatus*		Near-Endemic
Rubiaceae	*Sp.A new (In Massingue et al., in press)*		
Arecaceae	*Borassus aethiopum*		
Fabaceae	*Albizia lebbeck*		
Arecaceae	*Phoenix reclinata*		

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Rhamnaceae	*Ziziphus mucronata*		