PILIVILI ADDENDUM ESIA

SPECIALIST REPORT ON THE VEGETATION AND ECOSYSTEMS

30 PLUS YEARS OF CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

KENMARE PILIVILI ADDENDUM ESIA, MOZAMBIQUE

SPECIALIST REPORT ON THE VEGETATION AND ECOSYSTEMS

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ACRONYMS

AOO	Area of Occurrence
BI	Biodiversity Importance
CITES	Convention on International Trade in Endangered Species
CI	Conservation Importance
CR	Critically Endangered
EMPr	Environmental Management Programme
EN	Endangered
EOO	Extent of Occurrence
ESIA	Environmental and Social Impact Assessment
FI	Functional Integrity
FZ	Flora Zambeziaca
GBIF	Global Biodiversity Information Facility
GPS	Global Positioning System
Ha	Hectare
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
Km	Kilometre
MICOA	Ministry of Coordination of Environmental Affairs
MTA	Ministério da Terra e Ambiente
NGO	Non-Governmental Organization
NT	Near Threatened
RR	Receptor Resilience
PS	Performance Standard
SANBI	South African National Biodiversity Institute
SCC	Species Conservation Concern
SEI	Site Ecological Importance
VU	Vulnerable

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

1 BACKGROUND

Mozambique has 2,740 km of coastline characterized by diverse marine and terrestrial ecosystems, including extensive areas of miombo (dry or wet miombo), mopane woodland, coastal vegetation (forest and woodland), savanna, riparian wetland vegetation, upland grassland and moist forest, mangrove forests, rocky and sandy shores and seagrass meadows.

According to a preliminary checklist of vascular plants, the flora of Mozambique comprises 3,932 indigenous plant taxa and of these 177 are endemic (Da Silva *et al*., 2004). In an independent and more comprehensive analysis, Timberlake *et al.* (2006) documented 5,692 taxa and 251 endemics in Mozambique, including cross-border range-restricted endemics, giving the country an endemism rate of 4.4%. Based on more recent work Mozambique has about 271 strict-endemic taxa (235 species) and 387 near-endemic taxa (337 species) of vascular plants (Darbyshire *et al*., 2019). Together, these taxa constitute c. 9.3% of the total currently known flora of Mozambique and include five strict-endemic genera (*Baptorhachis, Emicocarpus, Gyrodoma, Icuria* and *Micklethwaitia*) and two near-endemic genera (*Triceratella* and *Oligophyton*) (Darbyshire *et al*., 2019).

Research is currently underway to complete an update of Flora Zambeziaca (FZ) (1960–present). This will provide a more accurate measure of species richness in Mozambique. MICOA (2014) reported on 5,781 known plant species, based on various expeditions completed recently (e.g. Timberlake *et al*., 2009; Timberlake *et al*., 2011; Burrows *et al.,* 2018). Lain *et al* (2019) reported 6,157 species from the "*Flora of Mozambique*" website (Hyde *et al*., 2019a) and associated databases of species records, which combine data from F.Z. with updates from relevant literature and field surveys. It is believed that this number will continue to grow as more botanical surveys are conducted. Note that Odorico *et al*. (2022) provides an updated list of 7,099 taxa, but this number includes non-native plant species.

In response to this high biodiversity, six centres of plant Endemism were recently identified namely:

1) Rovuma – this centre lies in the coastal zone of Cabo-Delgado, Nampula and Zambezia Provinces.
2) Maputaland - stretches from the Gaza coastal zone to Maputo and down to South Africa.
3) Lebombo-mountains within Maputo province, including Eswatini and South Africa.
4) Inhambane – which stretches from the coastal zone of the Save River to Gaza Province.
5) Chymanimani-Nyanga – includes most of the mountains in Manica and mount Gorogonsa.
6) Mulanji-Namuli-Ribaue in Zambezia and Nampula inland provinces, stretching into Malawi (Darbyshire et al. 2019).

Pilivili (in the Moma district) lies within the broader geographical area larger sense referred to as the Swahilian-Maputaland Regional Transition Zone phytogeographical region, which covers much of the coastal-belt of Mozambique (Clarke, 1998). More specifically Pilivili falls in the Southern Zanzibar-Inhambane Coastal Forest Mosaic Ecoregion, stretching for around

2,200 km along the eastern coast of the African continent, from southern Tanzania to Xai-Xai (Gaza Province) in Mozambique (Schipper and Burgess, 2015). This ecoregion is predominantly comprised of a coastal forest mosaic along the Indian Ocean.

In a narrower phytogeographical sense, the site is located within the Rovuma centre of endemism (Darbyshire *et al*., 2019) (Figure 1.1) and is included in the recently identified "Number 11-APA-Ilhas Primeiras e Segundas Key Biodiversity Area (KBA)" (WCS *et al*., 2021) (Figure 1.2). This area includes a range of ecosystem types delineated and provisionally assessed for the Red List of Ecosystems by Lötter *et al.* (2021), namely:

- Icuria Coastal Forest (EN; Occurs only in Mozambique between Nacala and Pebane).
- Pebane Sandy Shrub Miombo (EN; from Nicodale in Zambezia to just south of Angoche in Nampula).
- Zambezi Chenier Dune Thicket (VU; from just north of the Save River mouth in Sofala Province, northwards of Moma in Nampula Province).

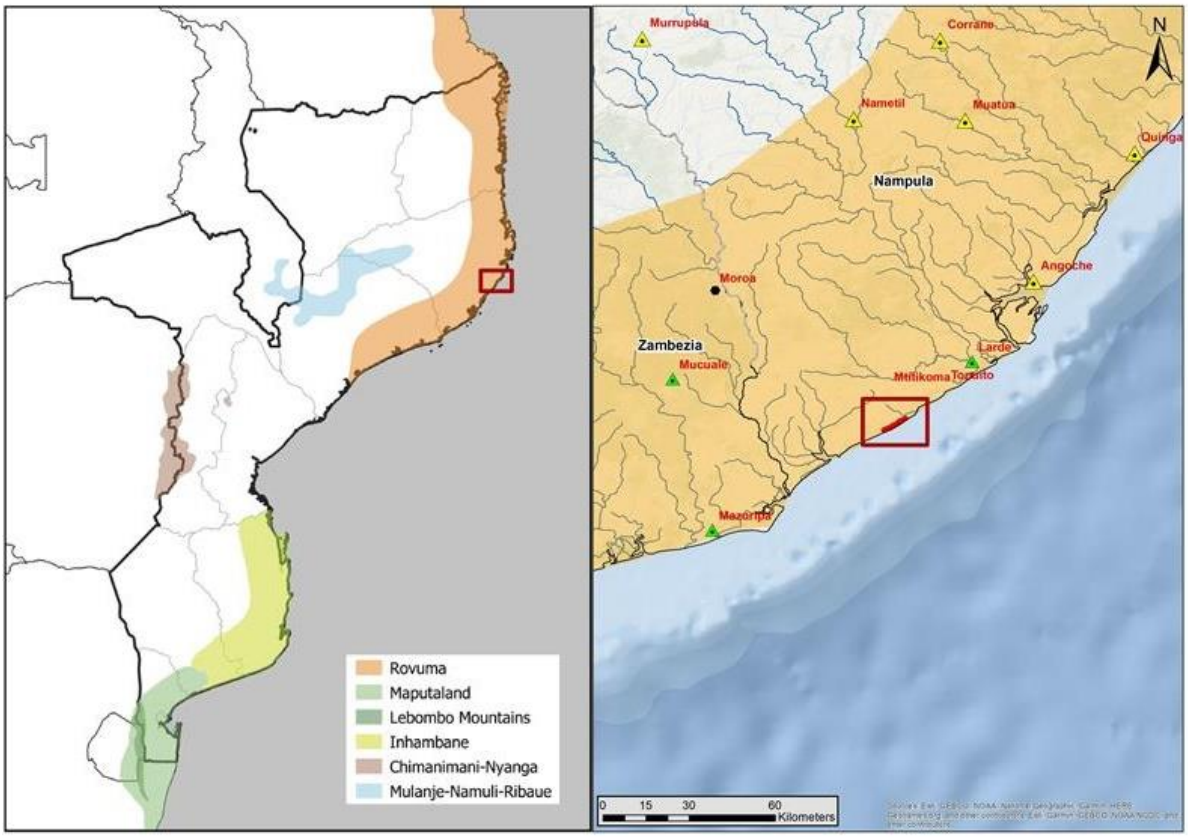
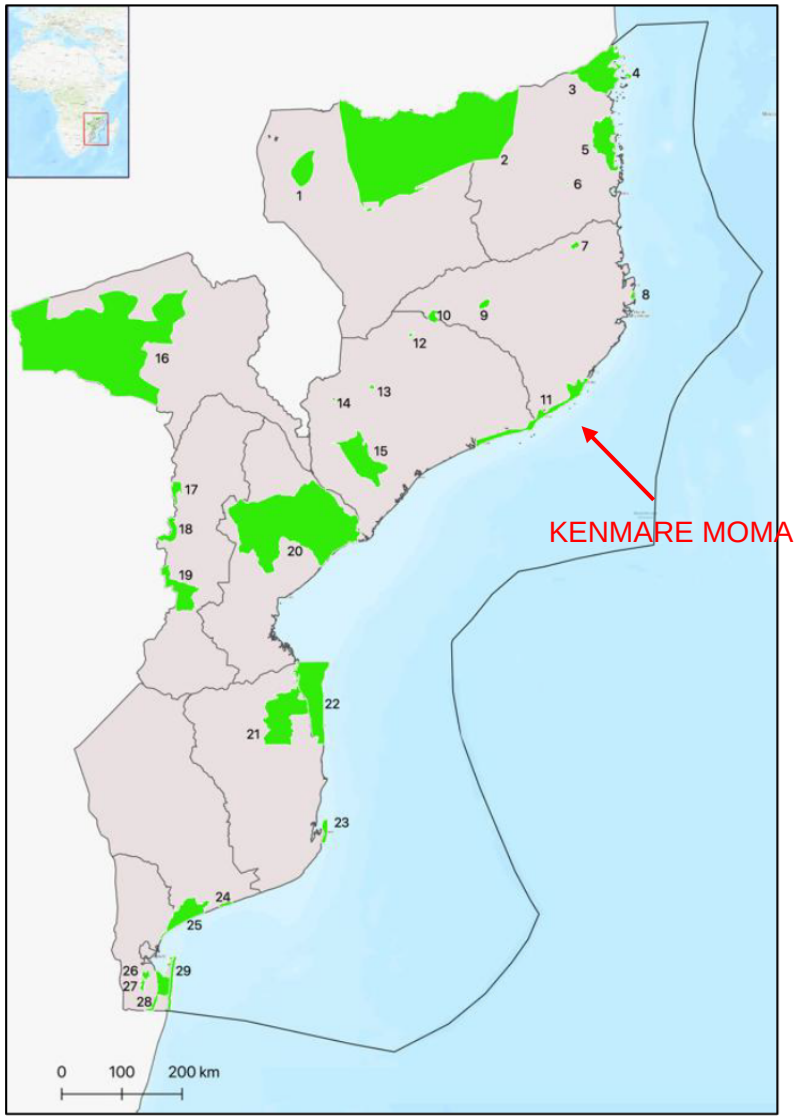


Figure 1.1: Cross- border Centres of Plant Endemism in Mozambique. Source: Darbyshire et al., 2019.



KBA	PROVINCE
1. Njesi Plateau	Niassa
2. Niassa Special Reserve	Niassa
3. Palma	Cabo Delgado
4. Vamizi	Cabo Delgado
5. Quiterajo	Cabo Delgado
6. Taratibu	Cabo Delgado
7. Eráti	Nampula
8. Matibane Forest Reserve	Nampula
9. Ribáuè-Mphalwe	Nampula
10. Mount Inago	Nampula
11. APAIPS	Zambezia
12. Mount Namuli	Zambezia
13. Mount Mabu	Zambezia
14. Mount Chiperone	Zambezia
15. Derre Forest Reserve	Zambezia
16. Tchuma-Tchato- Cahora Bassa Lake	Tete
17. Serra Choa	Manica
18. Machipanda	Manica
19. ChimanimaniNational Park	Manica
20. Gorongosa and Marromeu Complex	Sofala
21. Inhassoro-Vilankulos	Inhambane
22. Great Bazaruto	Inhambane
23. Tofo	Inhambane
24. Chongoene	**Gaza**
25. Manhiça-Bilene	**Gaza**
26. Matutuine	Maputo
27. Licuáti Forest Reserve	Maputo
28. Maputo Special Reserve	Maputo
29. Ponta do Ouro Partial Marine Reserve	Maputo

Figure 1.2: Mozambique Key Biodiversity Area map. Source: WCS et al. (2021).

2 AIMS

Because of the presence of species of high botanical importance within the coastal area of Nampula Province and particularly in Moma district, inclusive of Topuito where the Kenmare Moma mining project is currently in operation, a field survey was conducted in order to meet the following Terms of Refence for this vegetation and ecosystem report:

To record the plant species that occur within the Pilivilli expansion area;

- To identify any species of special concern, namely species with conservation status or which are endemic to the area.
- To comment on the conservation status of specific plant species.
- Assess the environmental significance of impacts on vegetation.
- To provide practical and realistic recommendations to mitigate impacts resulting from vegetation loss.

3 SURVEY METHODS

3.1 INTRODUCTION

The sampling was conducted by establishing random transects along the dune, accessible The botanical survey took place on 17 to 24 January 2022.

The survey team consisted of:

- Alice Massingue, Botanist from Eduardo Mondlane University-Faculty of Science, Department of Biological Science;
- Domingos Sandramo, field work assistant from SECOSUD-UEM;

Previous studies identified eight ecological systems in the Pilivilli area, namely: the marine – onshore and offshore ecosystem; the forest dune system; the estuarine system; the dune thicket and palm savanna; the coastal dune forest; the coastal lakes; woodlands and savanna and the freshwater streams and rivers (where hygrophilous grassland vegetation can be observed). Figure 3.1 shows the proposed expansion area and the type of vegetation that will be impacted by project activities.

Consequently this survey was conducted in the coastal dune thicket (Plate 3.1), coastal forest (Plate 3.2), Icuri forest (Plate 3.3) (mostly observed within coastal forest forming small aggregations), Hygrophilous grassland-Sedge meadow and palm savanna) and the Hygrophilous Grassland-Sedge Meadow (Plates 3.4 and 3.5, as these areas represent the area where the mining activities will occur should the project be approved by MTA. A large extent of the woodlands and savanna and coastal dune forest areas have been replaced by agriculture, mainly cassava and other crop cultivation to sustain the local families and large villages within the general area.

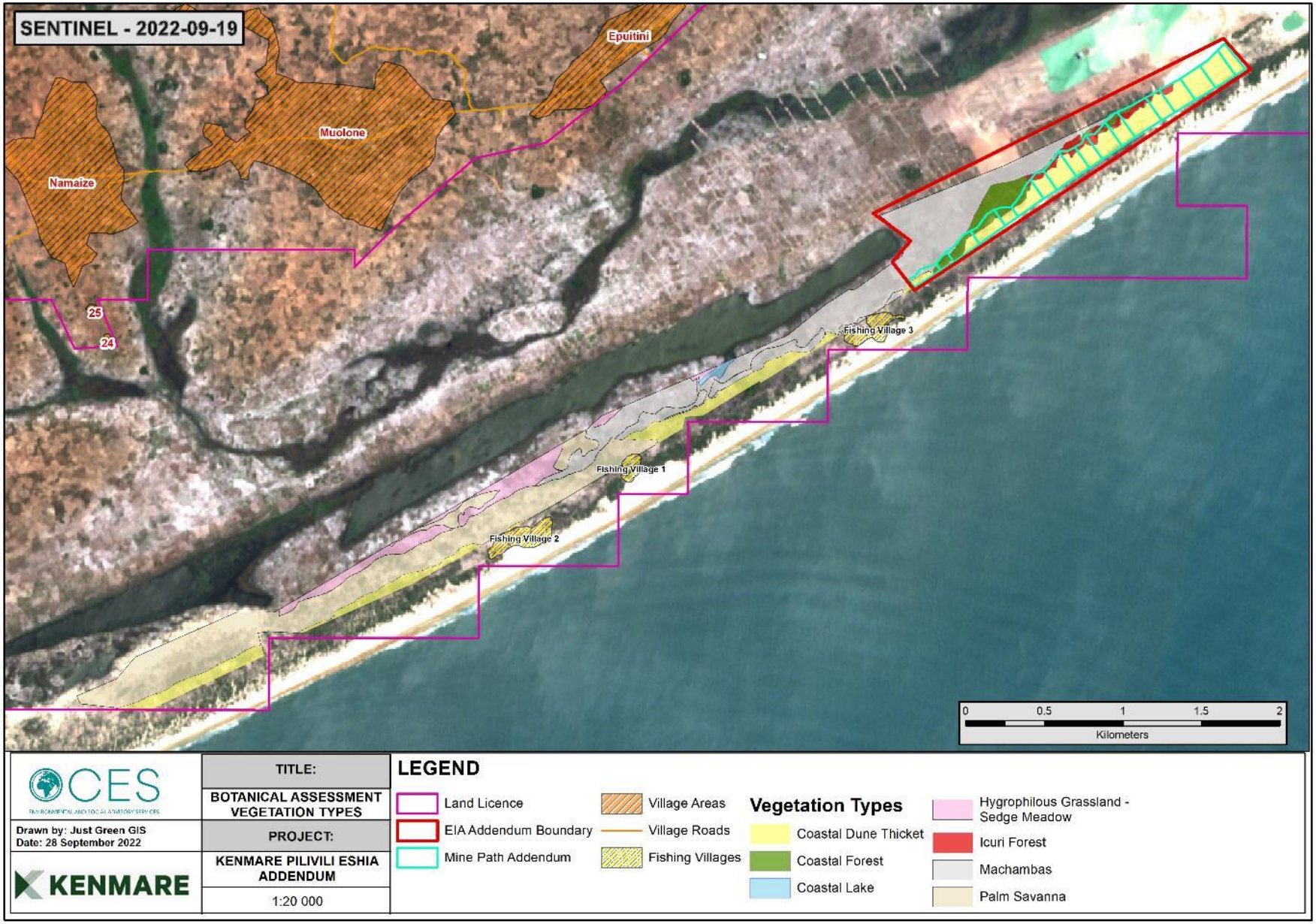


Figure 3.1: Pilivili mining expansion area – Vegetation Types.

Plate 3.1: Typical Coastal forest.

Plate 3.2: Coastal Thicket dominated by Brachystegia oblonga.

Plate 3.3: Coastal dune forest dominated by Icuria dunensis.

Plate 3.4: An overview of the dune thicket and palm savanna where sampling was conducted.

3.2 SAMPLING METHODOLOGY

The sampling was conducted by establishing random transects along the dune, accessible both by vehicle and on foot. To ensure the inclusion of the entire project area into the botanical assessment, maps of the area provided by the Environmental Department of Kenmare were reviewed and sampling points were selected randomly (Figure 3.2). Identified sampling points were located in the field by the use of a Global Positioning System (GPS). In addition, historical areas of occurrence of endemic and/or near endemic species known from this site were investigated. This data was obtained from previous studies conducted for the area during the original ESIA undertaken in 2018, on-going monitoring reports and the associated plant diversity data held in herbaria. All species along transects were recorded and GPS points were taken for all species of conservation concern.

Along transects, observations were made in order to identify all plant species observed. Species listed under IUCN Red List, including the timber species protected according to Decreto no 12/2002, de 06 de Junho were recorded. Also, within transects quadrats were laid out to evaluate the dominance of species (refer to the sampling track on Figure 3.3).

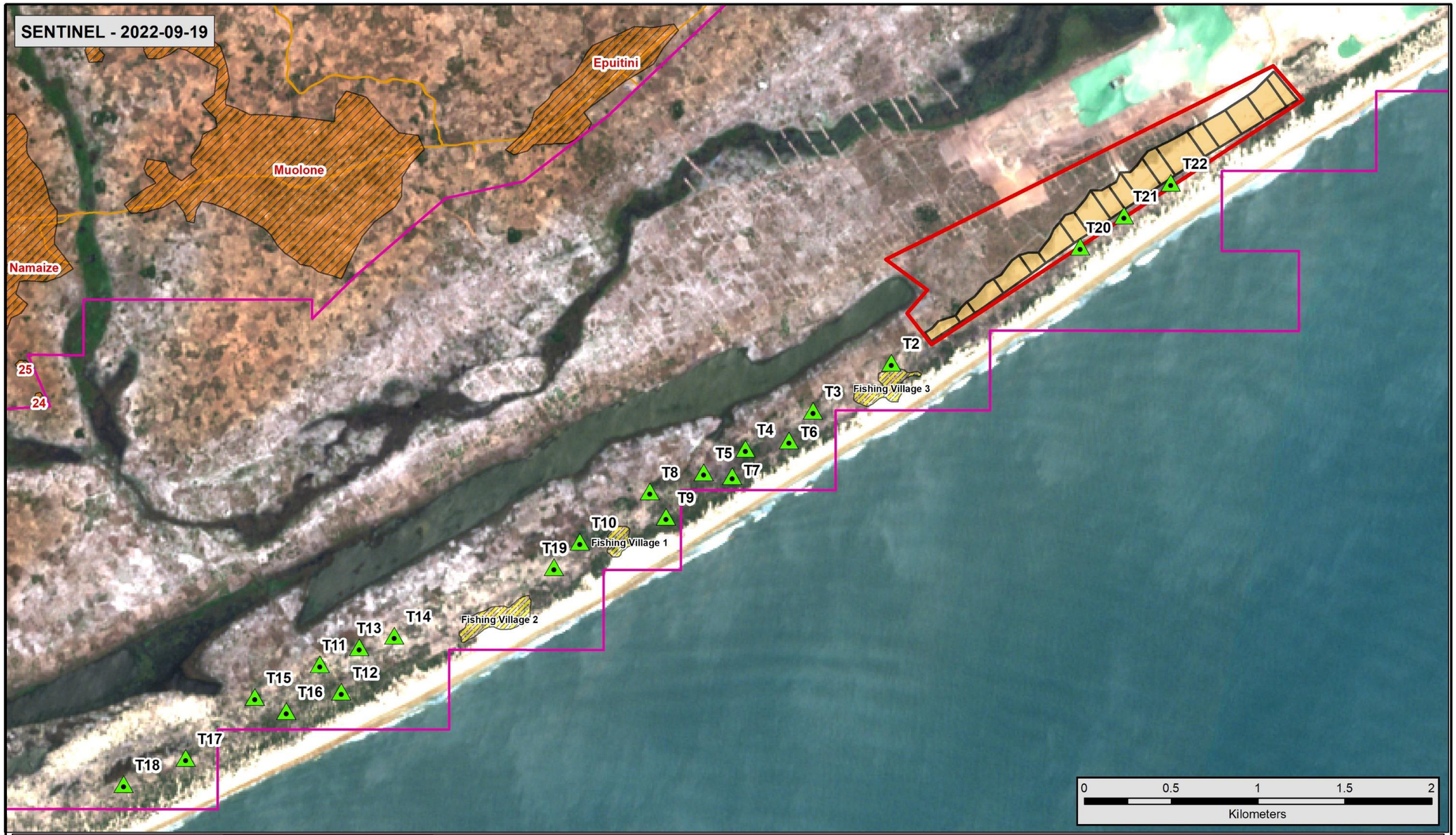


Figure 3.2: Sampling point.

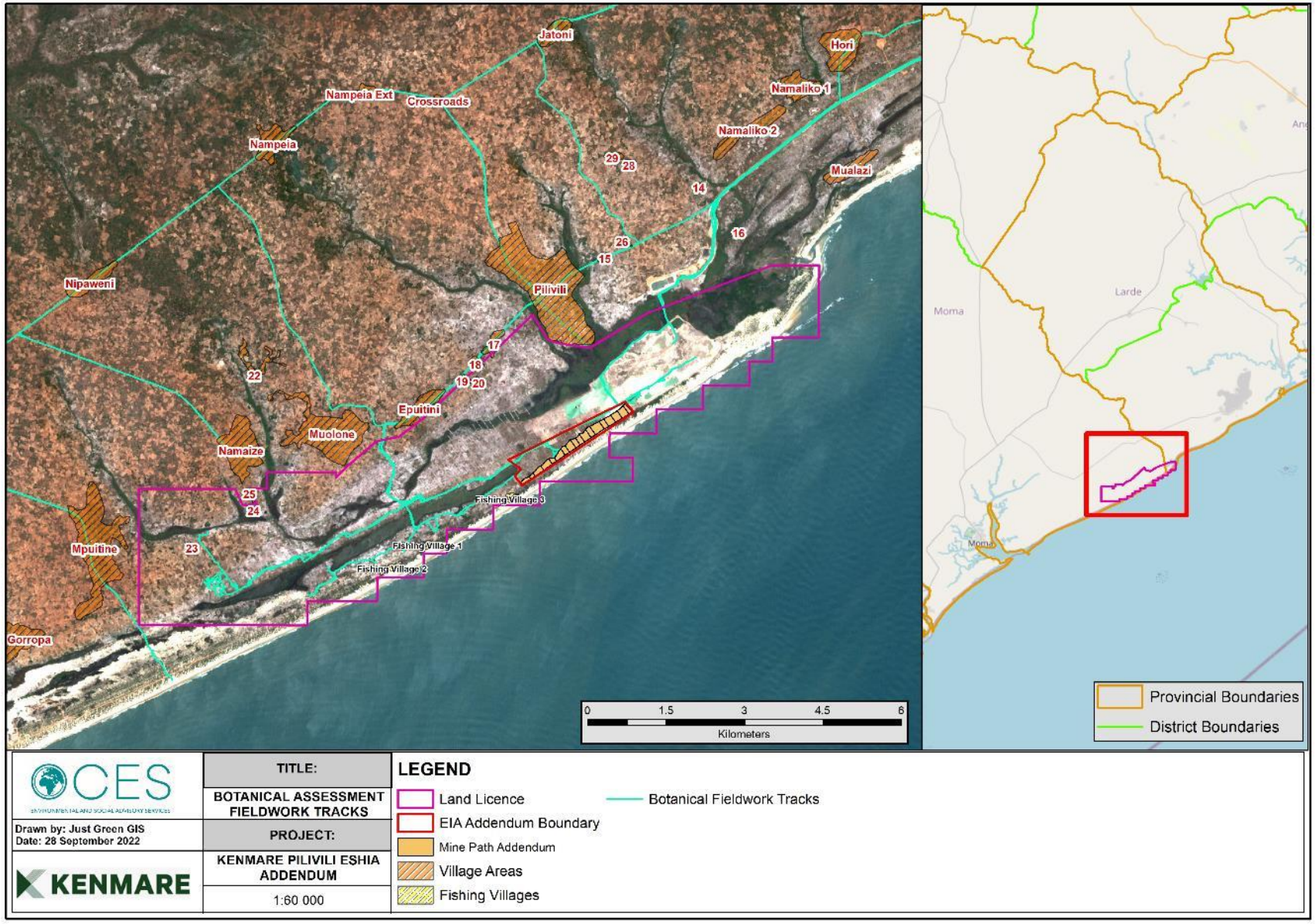


Figure 3.3: Fieldwork tracks (blue line).

3.3 PLANT IDENTIFICATION

The majority of plant species were identified in the field using literature such as Flora Zambesiaca and other relevant sources, such as the remarkable '' *Trees and Shrubs of Mozambique''* (Burrows *et al*. 2018) and other literature (Palgrave 2002; Van Wyk 2000, Oudtshoorn 2014). Species that could not be identified by this method were collected for identification through herbarium collections at the LMA herbarium and LMU herbarium at Eduardo Mondlane. The procedure includes building of a standard herbarium collection of flowering plants of the sampled areas.

3.4 RED DATA INVESTIGATION OF FLORA

Species of conservation concern (threatened, rare, endemic or with high value for the local communities) were identified as follows: threatened species (with different categories) were compared with those listed on Red Data List by Izidine and Bandeira (2002); rare and endemic species were compared with those listed in documents that describe the vegetation of the region, such as Flora Zambesiaca (on Flora Zambesiaca site - apps.kew.org/efloras, iucnred list; *online The Plant List* e GBIF (*Global Biodiversity Information Facility*) www.gbif.org/, www.iucnredlist.org and CITES (www.cites.org).

3.5 SENSITIVITY ASSESSMENT

The South African Species Environmental Assessment guideline (SANBI, 2020) was applied to assess the Site Ecological Importance (SEI) of the project area. The habitats and the species of conservation concern in the project area were assessed based on their conservation importance, functional integrity and receptor resilience (Table 3.1). The combination of Conservation Importance, Functional Integrity and Receptor Resilience results in an overall rating of Site Ecological Importance (SEI) (or site sensitivity).

This data was then used to develop a sensitivity map.

Table 3.1: Criteria for establishing Site Ecological importance and description of criteria (SANBI, 2020).

Criteria	Description
Conservation Importance (CI)	*The importance of a site for supporting biodiversity features of conservation concern present e.g. populations of IUCN Threatened and Near-Threatened species (CR, EN, VU & NT), 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)	

3.6 IMPACT RATING METHODOLOGY

The methodology that was used for assessing these impacts and risks is described individually below. The environmental significance scale evaluates the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the assessor/s making the judgement. Four factors need to be considered when assessing the significance of impacts, namely:

a) Relationship of the impact to **temporal** scales - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

b) Relationship of the impact to **spatial** scales - the spatial scale defines the physical extent of the impact.

c) The severity of the impact - the **severity/beneficial** scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word 'mitigation' means not just 'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.

d) The **likelihood** of the impact occurring - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss or clearance of vegetation), but other impacts are not as likely to occur (e.g. vehicle accidents), and may or may not result from the project operations. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Table 3.2 below summarizes the above-described factors' categorical limits and criteria.

Table 3.2: Impact Significance Rating Criteria.

Effect	**Temporal scale**	
	Short term	Less than 5 years
	Medium term	Between 5 and 20 years
	Long term	Between 20 and 40 years (a generation) and from a human perspective almost permanent.
	Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there
	Spatial Scale	
	Localized	At localized scale and a few hectares in extent
	Study area	The proposed site and its immediate environs
	Regional	District and provincial level
	National	Country
	International	Internationally

	Severity		**Benefit**
	Slight / Slightly Beneficial	Slight impacts on the affected system(s) or party(ies)	Slightly beneficial to the affected system(s) or party(ies)
	Moderate / Beneficial	Moderate impacts on the affected system(s) or party(ies)	An impact of real benefit to the affected system(s) or party(ies)
	Severe / Beneficial	Severe impacts on the affected system(s) or party(ies)	A substantial benefit to the affected system(s) or party(ies)
	Very Severe / Very Beneficial	Very severe change to the affected system(s) or party(ies)	A very substantial benefit to the affected system(s) or party(ies)
Likelihood	**Temporal scale**		
	Unlikely	The likelihood of these impacts occurring is slight	
	May Occur	The likelihood of these impacts occurring is possible	
	Probable	The likelihood of these impacts occurring is probable	
	Definite	The likelihood is that this impact will definitely occur	

A four-point impact significance scale is then applied to the project impacts (Table 3.3 below).

Table 3.3: Environmental Significance Rating Scale.

Significance rating	Description
Very High	VERY HIGH impacts would constitute a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects.
High	These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by the project decision makers as constituting an important and usually long-term change to the (natural and/or social) environment. These would have to be viewed in a serious light.
Moderate	These impacts will usually result in medium to long-term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by the project decision makers as constituting a fairly important and usually medium-term change to the (natural and/or social) environment. These impacts are real but not substantial.
Low	These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW are generally fairly unimportant and usually constitute a short-term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.

4 RESULTS

4.1 VEGETATION TYPES PRESENT

Pilivili is a complex of ecosystems that interact to create a high diversity of vegetation types within a relatively small spatial extent. However, with the mining project and the pressure of the local population establishing machambas (crops land) most of the vegetation types have been impacted or removed. Thus, the remaining vegetation forms aggregations, but the characteristics of the early habitats facilitated the study, and these were selected based on the descriptions from the initial ESIA undertaken for the Pilivilli project site.

Coastal Dune Thicket (35 ha in extent of which 27 ha will be mined)

The dune plains and slacks that occur immediately behind the foredunes on young Holocene ridges and swales are colonized by Coastal Dune Thicket**.** This vegetation type often occurs as bush clumps with bare sand between the clumps of woody vegetation on the ridges, or as wet hygrophilous grassland in lower-lying areas. Here the coastal dune thicket and bush clumps are usually dominated by the water loving palm (*Hyphaene coriacea*), and more characteristic bush clumps occur in the area to the northeast near the mouth.

Other species found in these vegetation types include the shrubs *Strychnos madagascariensis, Strychnos spinosa, Xylotheca tettensis, Coptosperma littorale, Olax dissitiflora, Mimosops obtusifolia, Brachystegia oblonga, Hymenaea verrucose, Drypetes natalensis* and *Croton pseudopulchellus*.

Coastal Forest (18 ha in extent of which 5 ha of Coastal Forest and 3 ha of *Icuri* Forest will be mined)

The Coastal Forest (associated with *Icuria dunensis* forest) occurs at the margin of the thicket on a high dune ridge, parallel to the shoreline. This ridge forms the barrier between the dune system and the interior wetlands and is colonized by remnant Coastal Dune Forest. Remnant patches of forest were also observed further inland between the coastal lake and coastal stream but these have since been lost. The forest owes it presence along this dune ridge and adjacent lowlands to the adequate moisture along the wetter interior that is able to sustain the larger trees and shrubs. The accumulation of nutrients in the alluvial deposits below the canopy would have been deposited over the millennia. It is likely that this vegetation type was much more extensive in the past, having been cleared for timber and crops, especially in the last few decades. Common species found within the coastal forests include *Hymeneae verrucosa*, *Scorodophloeus torrei, , Maprouneia africana, Croton pseudopulchellus, Garcinia livingstonei, Grewia occidentalis,* and *Olax dissitiflora*.

4.2 CONDITIONS WITHIN THE PROJECT SITE

The majority of area within the coastal dune forest and small areas of the dune thicket have been transformed into other land uses (primarily agricultural fields) dominated by crops, most notably cassava (*Manihot esculenta*) (Plate **4.1** and Plate 4.2 show recently cleared areas in

January 2022). Though already transformed, these areas still afford suitable conditions for the emergence of many species that mainly occur in disturbed areas, mostly grasses such as: *Melinis repens* and *Eragrostis ciliaris*. *Albertisia delagoensis* is a near-endemic species that was observed in this vegetation type.

Plate 4.1: Coastal forest in Pilivilli dominated by *Icuria dunensis* transformed into Machambas (crop cultivation).

Plate 4.2: Dune thicket and palm thicket transformed into Machambas (crop cultivation).

Since completion of the field work for the Botanical Assessment in January 2022, there has been substantial and unsustainable clearing of both the Coastal Dune Forest and Coastal Dune Thicket by local communities (Plates 4.3 and 4.4). This has led to vast degradation of almost the entire set-aside area as defined in the original ESHIA conducted for the Pilivili Mine (completed in 2020). This clearance is unsustainable and is not in accordance with the Management Plan for the Preimeras and Secundas Protected Area as well as the existing Pilivili Biodiversity Management Plan. The temporary fishing villages identified during the social surveys undertaken for the resettlement plan conducted in 2018 have expanded substantially into permanent villages. This led to further degradation of these habitats within the sensitive coastal dune system. Plate 4.3 below shows the extent of clearance that has taken place between January 2022 and October 2022.

Plate 4.3: Extensive areas of the dune system and Dune thicket and forest has been cleared for agriculture (image September 2022, vicinity of Lake Maveli)).

Plate 4.4: The clearing of Dune Thicket and Dune Forest extends to the southern end of Lake Maveli (image September 2022).

4.3 FLORISTICS

A total of 134 species from 54 families were recorded within the project site (a full species list has been included in Appendix 1). The Fabaceae family had the highest number of species (sixteen species) followed by Rubiaceae (twelve species), Phyllanthaceae (eight species) Strychnaceaea (five) and then Anacardiaceae, Apocynaceae, Burceraceae, Capparaceae, and Euphorbeaceae (all with four species) (**Table** 4.1).

Table 4.1: Number of species in for each family.

Families	N˚ sp	Families	N˚ sp	Families	N˚ sp	Families	N˚ sp
Acanthaceae	2	Convolvulaceae	2	Moraceae	3	Sapotaceae	2
Amararyllidaceae	1	Cucurbitaceae	1	Myrtaceae	1	Solanaceae	2
Anacardiaceae	4	Cyperaceae		Ochnaceae	3	Strychnaceae	5
Annonaceae	3	Ebenaceae	3	Olacaceae	1	Thymelaeaceae	2
Apocynaceae	4	Euphorbiaceae	4	Orchydaceae	2	Vitaceae	1
Arecaceae	1	Fabaceae	16	Passifloraceae	1	Zygophyllaceae	1
Asparagaceae	3	Flagellariaceae	1	Pedaliaceae	1		
Boraginaceae	2	Kiggelariaceae	2	Phyllanthaceae	8		

Families	N˚ sp	Families	N˚ sp	Families	N˚ sp	Families	N˚ sp
Burceraceae	4	Lamiaceae	2	Poaceae			
Cactaceae	1	Linaceae	1	Polygalaceae	1		
Capparaceae	4	Malvaceae	2	Putranjivaceae	2		
Celastraceae	3	Mapighiaceae	1	Rubiaceae	12		
Celtidaceae	1	Melastomataceae	2	Rutaceae	2		
Chrysobalanaceae	1	Meliaceae	2	Salicaceae	1		
Clusiaceae	1	Menispermaceae	1	Samydaceae	1		
Combretaceae		Montiniaceae	1	Sapindaceae	3		

4.4 Species of Conservation Concern

Species of conservation concern (SCC) are defined as species listed on the red data list as Critically Endangered, Endangered, Vulnerable, Near Threatened, Critically Rare, Rare, Declining or Data Deficient. Within the SCC is a subgroup of Threatened Species comprised of Critically Endangered, Endangered and Vulnerable species (Figure 4.1). In addition to this, endemic and near endemic species are also considered species of conservation concern.

Fifteen SCC, including endemic and near-endemic species (some of which are threatened under IUCN red-list and protected accordingly (Decreto nº 12/2002, de 06 de Junho)) were recorded within the project site (refer to Table 4.1 for further details). Of these fifteen species, nine are threatened species, namely: two critically engendered, four endangered and three vulnerable species. Note that species such as *Scorodophloeus torrei* and *Icuria dunensis* were observed only along the forest dune system (see Figure 4.1).

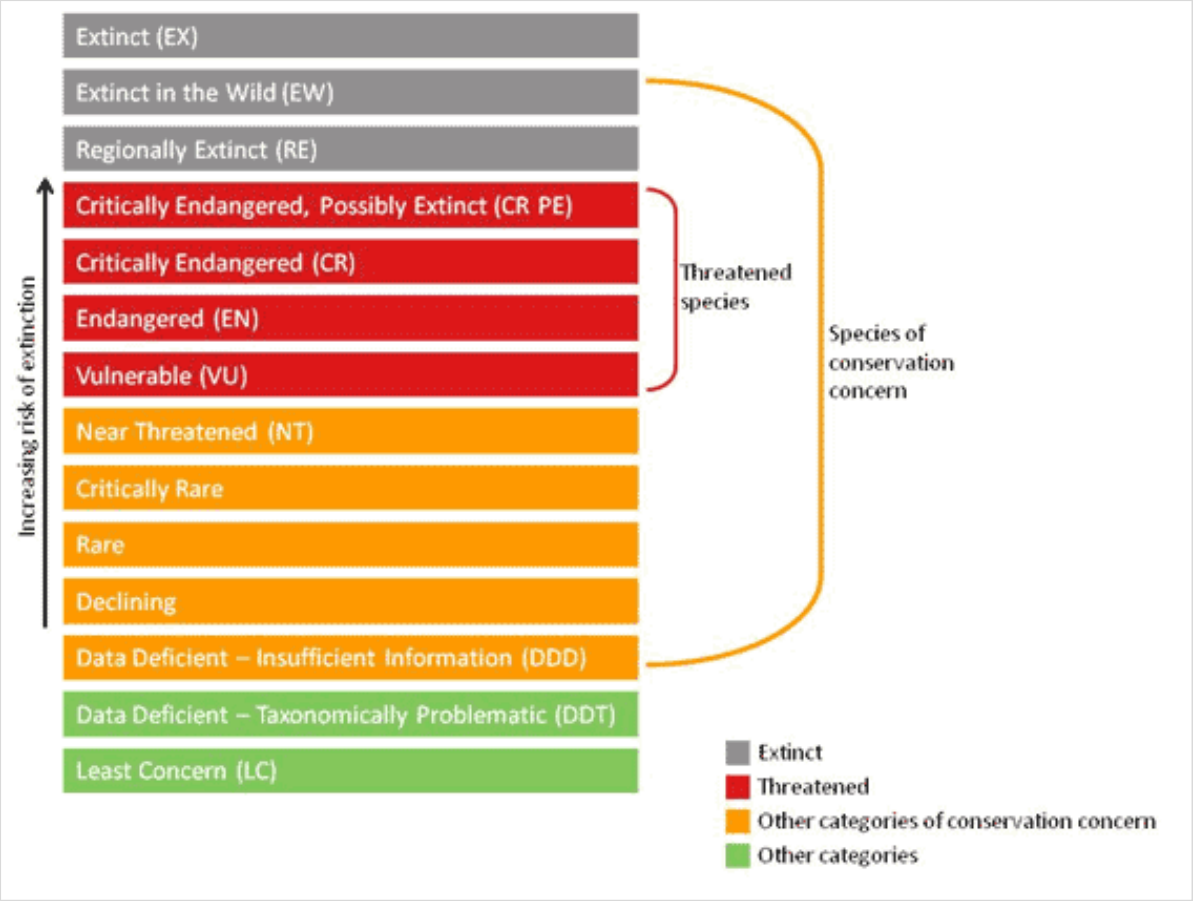


Figure 4.1: Illustration showing SCC and the subgroup of Threatened Species (Source: SANBI, 2021).

Additionally, there are two species (cf. *Mimusops sp*. and cf. *Croton sp*/cf. *Alchornea sp*.) that need to still be identified but could be either new species or new records of a species for Mozambique.

A synopsis of each SCC that was identified within the site and summarised in **Table** 4.1 is provided below, along with a comment on whether the species could be a trigger for critical habitat. Please note that the AOO and EOO is not available for all species of special concern. Where the information is available this has been added.

***Afzelia quanzensis* (Least Concern)**
Occurs from Somalia down to KwaZulu Natal in South Africa and is widespread throughout Mozambique (Hills, 2019). It is listed as Lower Risk/Near threatened on the Mozambique Red Data List and as Least Concern on the IUCN Red Data List. EOO is estimated to be over 6 million km^2. The main threat to this species survival is the illegal harvesting of wood to make wood carvings and for construction. It is likely that habitat loss is also a threat to this species survival. This species is not a trigger for critical habitat but should be considered as a species to be planted during rehabilitation.

Albertisia delagoensis
This species is a near endemic to Mozambique. It's known distribution is from Kwa-Zulu Natal in South Africa, into southern Mozambique making it a near endemic. The record of this species at the site indicates a possible range extension for this species.

Blepharis dunensis (Endemic and Endangered)

Blepharis dunensis is endemic to Mozambique and listed as an Endangered species with an estimated EOO of 2,342km^2 and an AOO of 16km^2 (Figure 4.2). It is found along the coastline from Quinga to Pebane and is typically restricted to coastal dunes and beach sands. Given its small AOO and its listed status, this species could be a trigger for Critical Habitat. There are 20 records of this species recorded within the site.

***Brachystegia oblonga* (Endemic and Critically Endangered)**

Brachystegia oblonga 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, and only two known sub-populations, one of which is extinct and the other degraded and limited to 50 individuals (Burrows *et. al.*, 2018; Alves *et. al., 2014,* Darbyshire *et.al.,* 2019, Hyde *et. al.,* 2021*)* (Figure 4.3). Recently three individuals were recorded at the Nataka Deposit, north of Pilivilli. The EOO for this species is 82 km^2.This species was recorded at nine sites within the coastal dunes. Based on available information, this species could potentially be a trigger for critical habitat. Criterion 1 of the Guidance notes of PS6 of the IFC Performance Standards (GN72(a)) state that: *Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species*) is considered to be Critical Habitat. In this instance, what this means is there would need to be at least 5 adult flowering / fruiting trees on site for this area to be considered critical habitat. Based on the survey, 9 adult individuals were present on site and unless proven otherwise, this area is highly likely to be considered Critical Habitat.

Carpolobia suaveolens (Endemic and Least Concern)

Carpolobia suaveolens is an endemic species to Mozambique and listed as Least Concern which means its population is stable. It is known from 12 localities in central and northern Mozambique and has an AOO of 52 km^2 but this is believed to be a significant underestimate and the EOO is given as 225,688km^2. There are 13 records of this species within the project site.

Hexalobus mossambicensis (Vulnerable)

Hexalobus mossambicensis is an endemic species to the north-eastern part of Mozambique and is listed on the IUCN red data list as Vulnerable (Cosiaux *et al.*, 2019). It has an Extent of Occurrence of 37,965 km^2 and a small area of occupancy (AOO) of 52 km^2 which could be explained by this species being under collected. However, it has been predicted that this species is known from less than 10 locations, six of which are threatened due to habitat loss. There are 12 records of this species within the project site.

Icuria dunensis (Endemic and Endangered)

Icuria dunensis is an endemic species that is listed as Endangered. This species occurs between Nacala and Moebase in Nampula and Zambezia Provinces. A bioregional survey for the Pillivilli ESIA was undertaken in 2017 and 2018. It was determined that the number of trees within the Pillivilli site was below the threshold for Critical Habitat at that time as the bioregional survey showed that the Pilivilli site contained 0.7% of the global population. However, it should be noted that the guidance notes on PS6 were updated at the end of June 2019 (i.e., after the completion of the bioregional survey and initiation of the construction phase of the mine). The thresholds for Critical Habitat were updated from areas that support more than 1% of the global

population of globally important concentrations of an IUCN Red-listed EN or CR species to 0.5%. As such, there is the potential for *Icuria dunensis* to now trigger the criteria for Critical Habitat. However, it should also be noted that community clearance of this species has been ongoing (refer to Plate **4.1** included above). The clearance has been undertaken at a very large scale and at a rapid rate and as such it is very likely that the quantified population figure of 0.7% has been significantly reduced in the last 4 years since the bioregional survey was completed.

***Ochna cf. beirensis* (Endemic and Endangered)**

Ochna cf. beirensis is listed as Endangered and is only known from two localities (Beira and Chiniziua Forest) in central coastal Mozambique. It has a very small AOO of 8 km^2 (Figure 4.4). EOO is not provided on the IUCN website. Individuals at two localities were recorded within the project site. This species is likely to be a trigger for critical habitat.

***Ormocarpum sennoides subsp. zanzibaricum* (Vulnerable)**

Ormocarpum sennoides subsp. zanzibaricum is listed as Vulnerable. This species was originally thought to occur in Kenya, south eastern Tanzania and Zanzibar, but has also been found in northern Mozambique (Burrows *et al,* 2018) and is associated with coastal dry forest. Individuals at 13 localities were recorded within the project site.

Premna hans-joachimii (Vulnerable)

This species is typically restricted to south-eastern Tanzania and north-eastern Mozambique in Cabo Delgado Province (Darbyshire, 2020). It has a small EOO of 10,644 km^2 and an AOO of 48 $km^{2.}$ It is associated with dry coastal forest, thicket and woodland on sandy soils. There are 2 records of this species within the project site.

***Scorodophloeus torrei* (Endemic and Endangered)**

Scorodophloeus torrei is listed as Endangered and is only known from three widely spaced sub-populations between Memba (between Angoche and Quinga) and Olinga (Figure 4.5) (Darbyshire and Rokni, 2020). It is associated with coastal vegetation with an EOO of 24,659 km^2 and AOO of 24 km^2. Although this may be an underestimate due to under sampling, based on habitat availability it is estimated that the maximum extent of AOO would be less than 50 km^2. There are 34 records for this species within the site. This species is likely to be a trigger for critical habitat.

Warneckea sessilicarpa (Endemic and Critically Endangered)

Warneckea sessilicarpa is listed as Critically Endangered and is a deciduous shrub or small tree occurring in woodland and thicket on coastal dunes. This species is only known from three localities around Angoche town and has an AOO of 12 km^2 and an EOO of 20 km^2 (Darbyshire *et. al.*, 2019) (Figure 4.6). This species was recorded at one locality within the coastal dunes. As with *Brachystegia oblonga*, this species could be a trigger for Critical Habitat if it is determined that ≥ 0.5% of the global population AND ≥ 5 reproductive units are present.

Table 4.2: Species of high conservation importance found in sampled area (Pilivili).

Family	Species	Vegetation Type that species occurs in	Endemism	Global IUCN-REDLIST	Mozambique-REDLIST	Possible trigger for critical habitat (Y)
Fabaceae	*Afzelia quanzensis*	Coastal Dune Forest & Coast Dune Thicket			Vulnerable	
Menispermaceae	*Albertisia delagoensis*	Coastal Dune Forest & Coast Dune Thicket & Palm Savanna	Near-Endemic	Least Concern (SA red list)		
Acanthaceae	*Blepharis dunensis*	Coastal Dune Forest & Coast Dune Thicket	Endemic	Endangered		Y
Fabaceae	*Brachystegia oblonga*	Coastal Dune Forest & Coast Dune Thicket	Endemic	Critical Endangered		Y
Polygalaceae	*Carpolobia suaveolens*	Coastal Dune Forest & Coast Dune Thicket	Endemic	Not Yet Evaluated		
Euphorbiaceae	Cf. Croton sp. or Alchornea sp.	Machambas			Probably new or new record for Mozambique	
Sapotaceae	Cf. Mimusops sp.	Coastal Dune Forest & Coast Dune Thicket			Probably new or new record for Mozambique	
Annonaceae	*Hexalobus mossambicensis*	Coastal Dune Forest & Coast Dune Thicket	Endemic	Vulnerable		
Fabaceae	*Icuria dunensis*	Coastal Dune Forest & Coast Dune Thicket	Endemic	Endangered		Y
Ochnaceae	*Ochna cf. beirensis*	Coastal Dune Forest & Coast Dune Thicket	Endemic	Endangered		Y
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	Coastal Dune Forest & Coast Dune Thicket		Vulnerable		
Lamiaceae	*Premna hans-joachimii Verdc.*	Coastal Dune Forest & Coast Dune Thicket		Vulnerable		
Fabaceae	*Scorodophloeus torrei*	Coastal Dune Forest & Coast Dune Thicket & Palm Savanna	Endemic	Endangered		Y
Thymelaeaceae	*Synaptolepis oliveriana*	Coastal Dune Forest & Coast Dune Thicket	Near-endemic			
Melastomataceae	*Warneckea sessilicarpa*	Coastal Dune Forest & Coast Dune Thicket	Endemic	Critically Endangered		Y

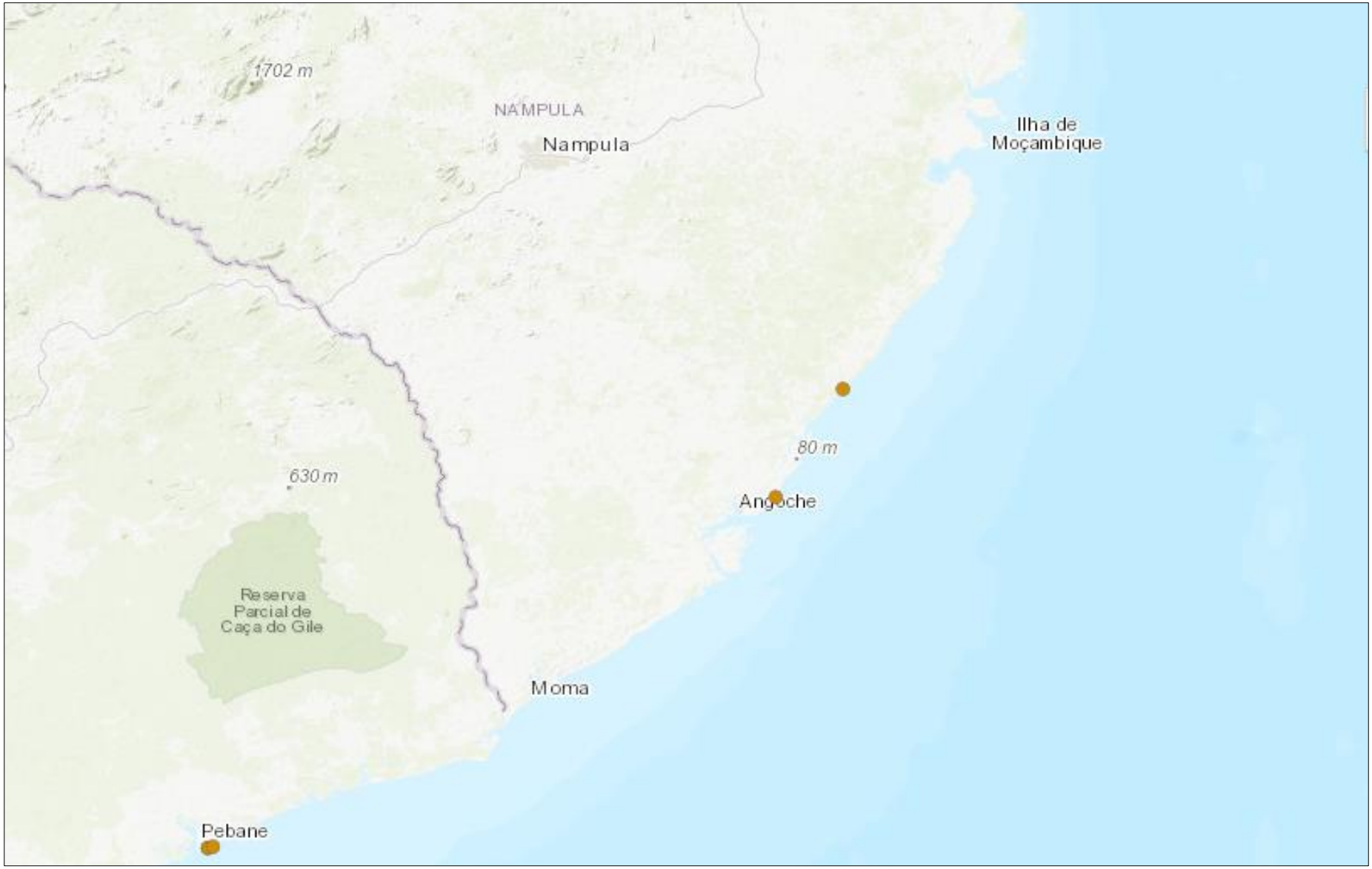


Figure 4.2: Location for *Blepharis dunensis* recorded as occasional in Angoche and recently in Pebane (Source: RBG, Kew 2019. *Blepharis dunensis.* The IUCN Red List of Threatened Species. Version 2021-3).

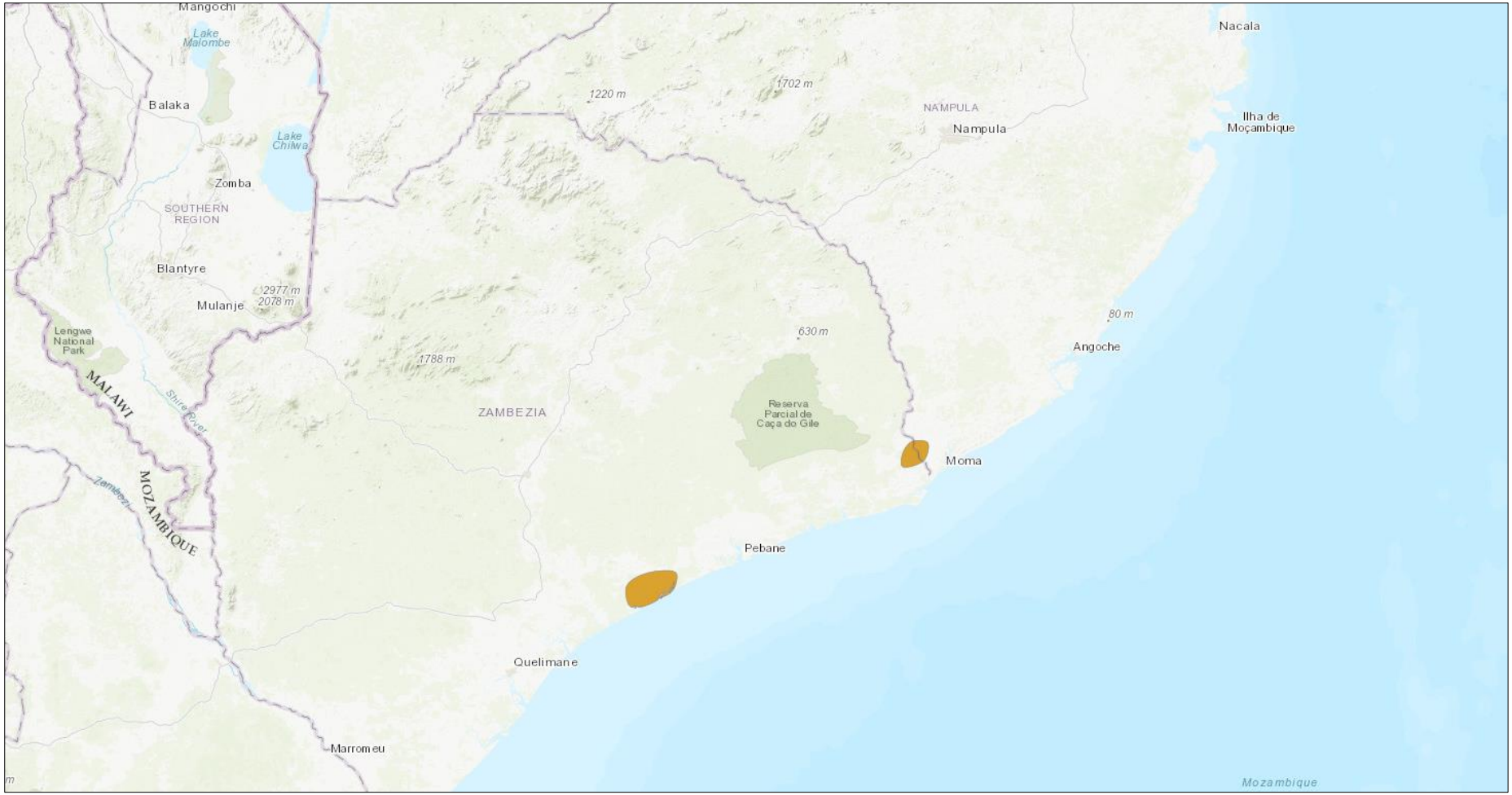


Figure 4.3: Location for *Brachystegia oblonga* sampled in two areas (Source: Southern African Plant Specialist Group 2014. *Brachystegia oblonga*. The IUCN Red List of Threatened Species. Version 2021-3).

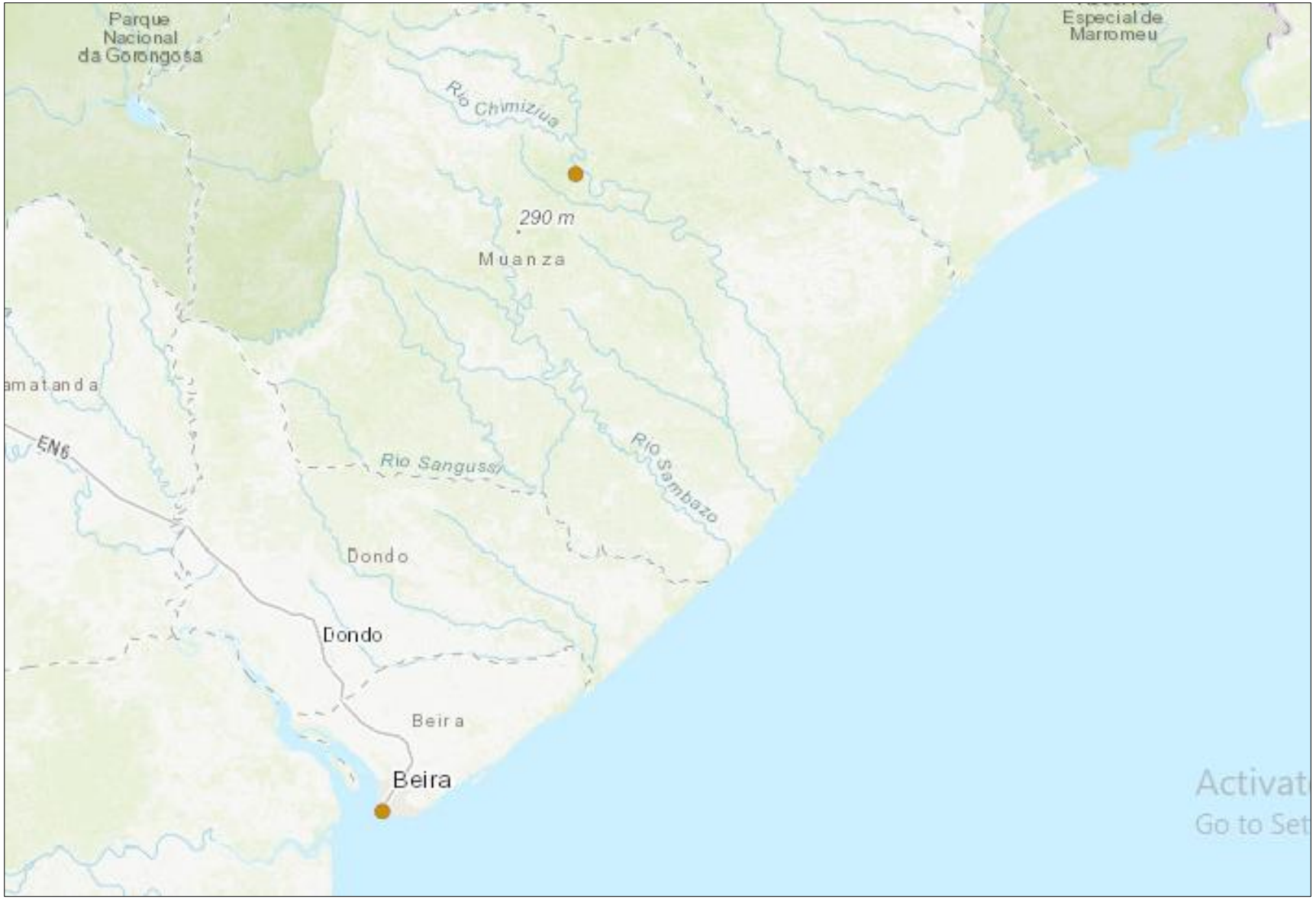


Figure 4.4: Location for *Ochna beirenseis* two samples only from Beira (Source: RBG, Kew 2019. *Ochna beirensis*. The IUCN Red List of Threatened Species. Version 2021-3).

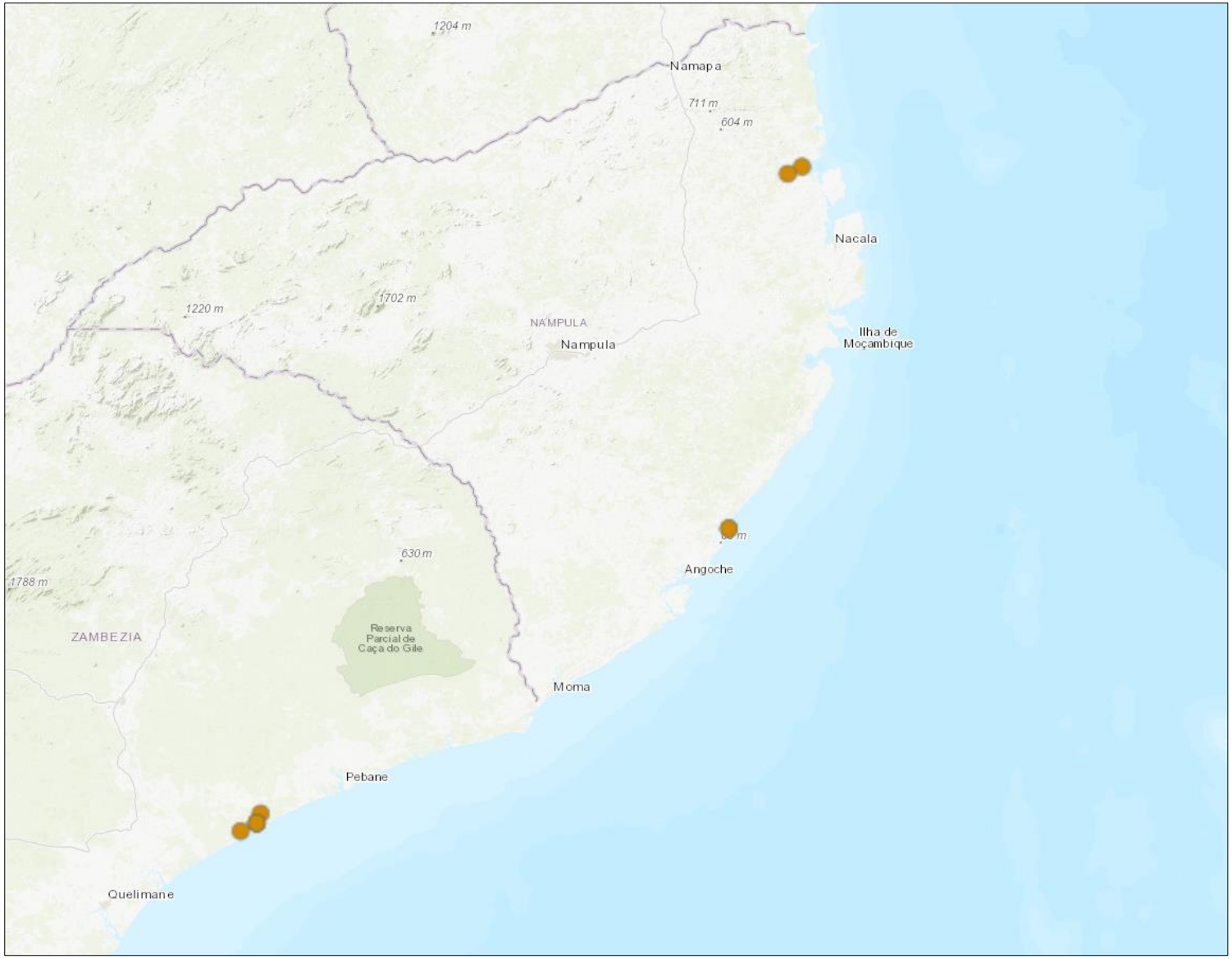


Figure 4.5: Location for *Scorodophloeus torrei* sampled in three areas (Source: RBG, Kew 2019. *Scorodophloeus torrei*. The IUCN Red List of Threatened Species. Version 2021-3).

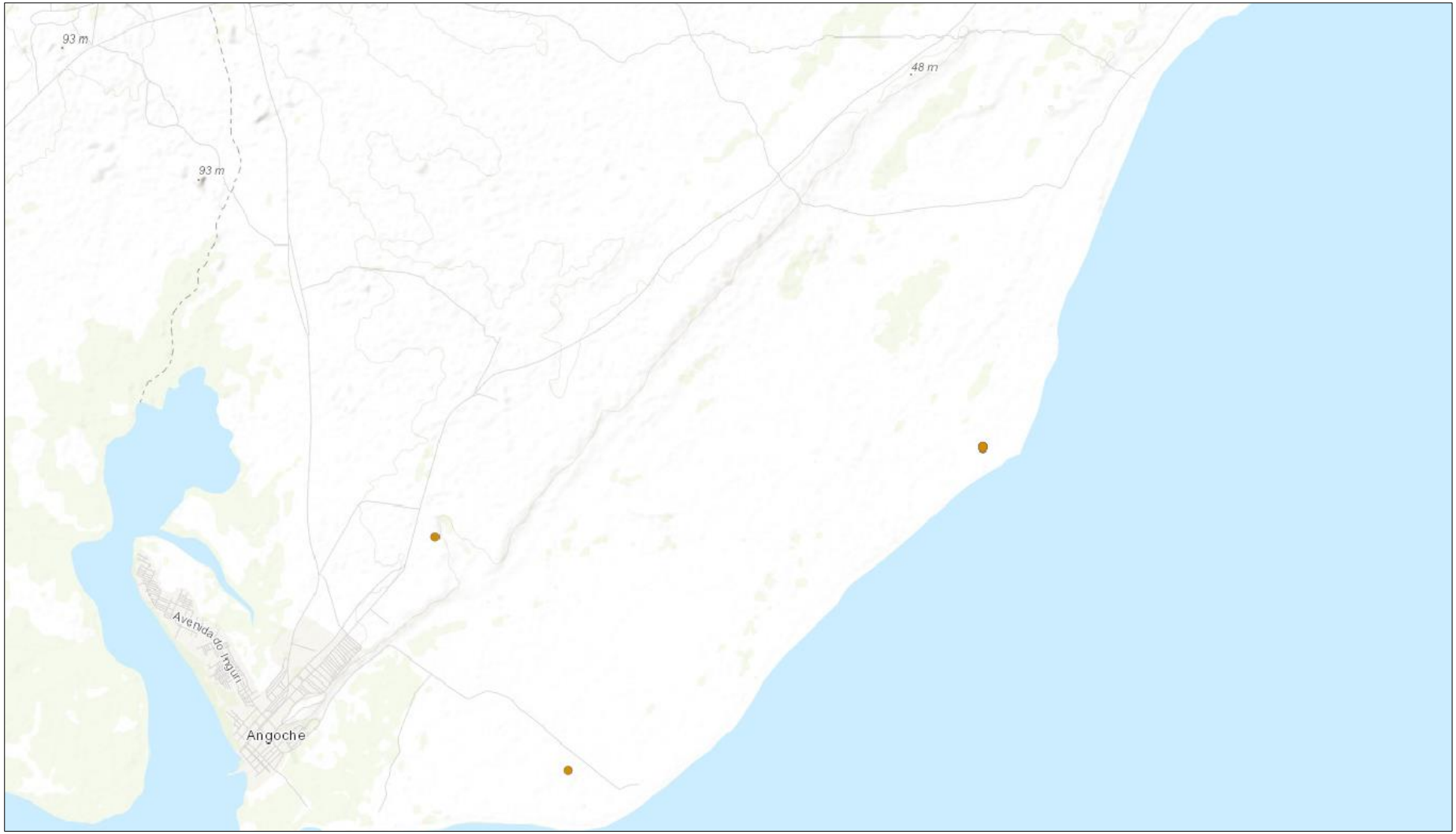


Figure 4.6: Location for *Warneckea sessilicarpa* sampled only around Angoche (Source: RBG, Kew 2019. *Warneckea sessilicarpa*. The IUCN Red List of Threatened Species. Version 2021-3.).

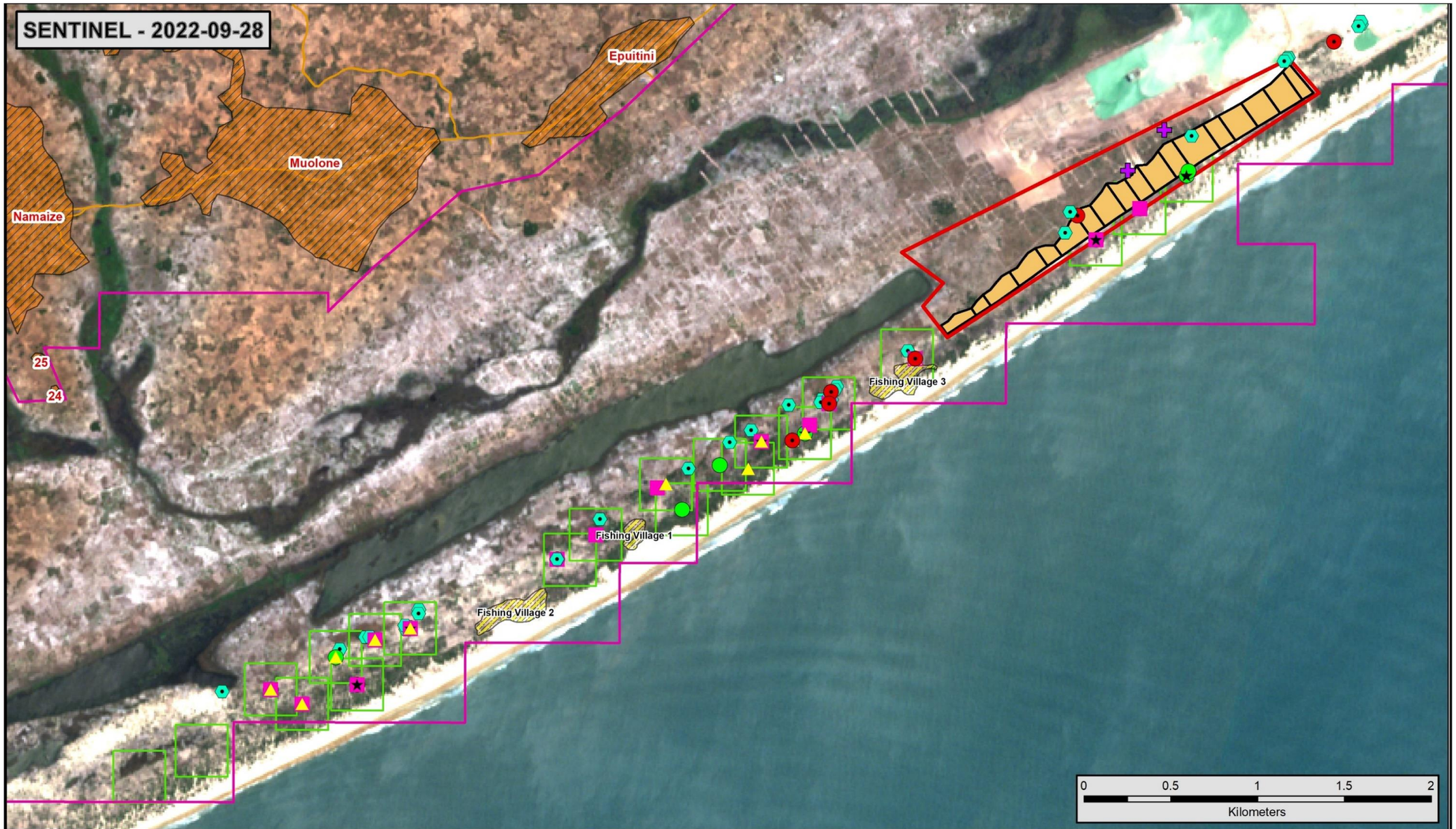


Figure 4.7: Distribution of endemic and near endemic species found along the sampled area (coastal dune forest, dune thicket and palm thicket).

4.5 SENSITIVITY ASSESSMENT OF THE PROJECT AREA

Using the Species Environmental Assessment Guideline (SANBI, 2021) document it was determined that coastal dune forest and coastal dune thicket have a very high sensitivity due to the confirmed presence of two Critically Endangered species, four Endangered species and three Vulnerable species, and because this habitat has a low resilience and is unlikely to recover to 50% of its original species composition after a period of 15 years (Table 4.3). For areas with a very high SEI the guideline document recommends the following "*Avoidance mitigation – no destructive development activities should be considered and offset mitigation is not possible"* as these areas are important systems for range restricted species.

Although areas within the dune system have been transformed for agriculture, there are still SCC (e.g. *Ormocarpum sennoides subsp. zanzibaricum*) found to occur within these sites and as such these areas have a moderate sensitivity. In areas with a moderate SEI, development activities are acceptable if followed by restoration activities.

Table 4.3: Evaluation of Site Ecological Importance (SEI) of habitat and SCC.

Habitat	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience	SEI
Coastal Dune Forest and Coastal Dune Thicket	**High**	**High**	**Low**	**Very High**
	Two Critically Endangered species, four Endangered species and three Vulnerable species with a global extent of >10km^2 have been confirmed to occur within the project area.	Large (>20 but <100 ha) of intact area with good habitat connectivity with coastal systems to the south	After mining activities, the habitat is unlikely to recover to 50% of its original species composition after a period of >15 years	
Recently cleared Machambas	High	Medium	Medium	**Moderate**
	Ormocarpum sennoides subsp. zanzibaricum (a vulnerable species) was confirmed to occur within the recently cleared machambas and as such the conservation importance is high.	>5ha but <20ha of semi-intact natural vegetation and narrow corridors of good habitat connectivity	The habitat is likely to recover slowly (more than 10 years to restore >70% of the original species composition).	

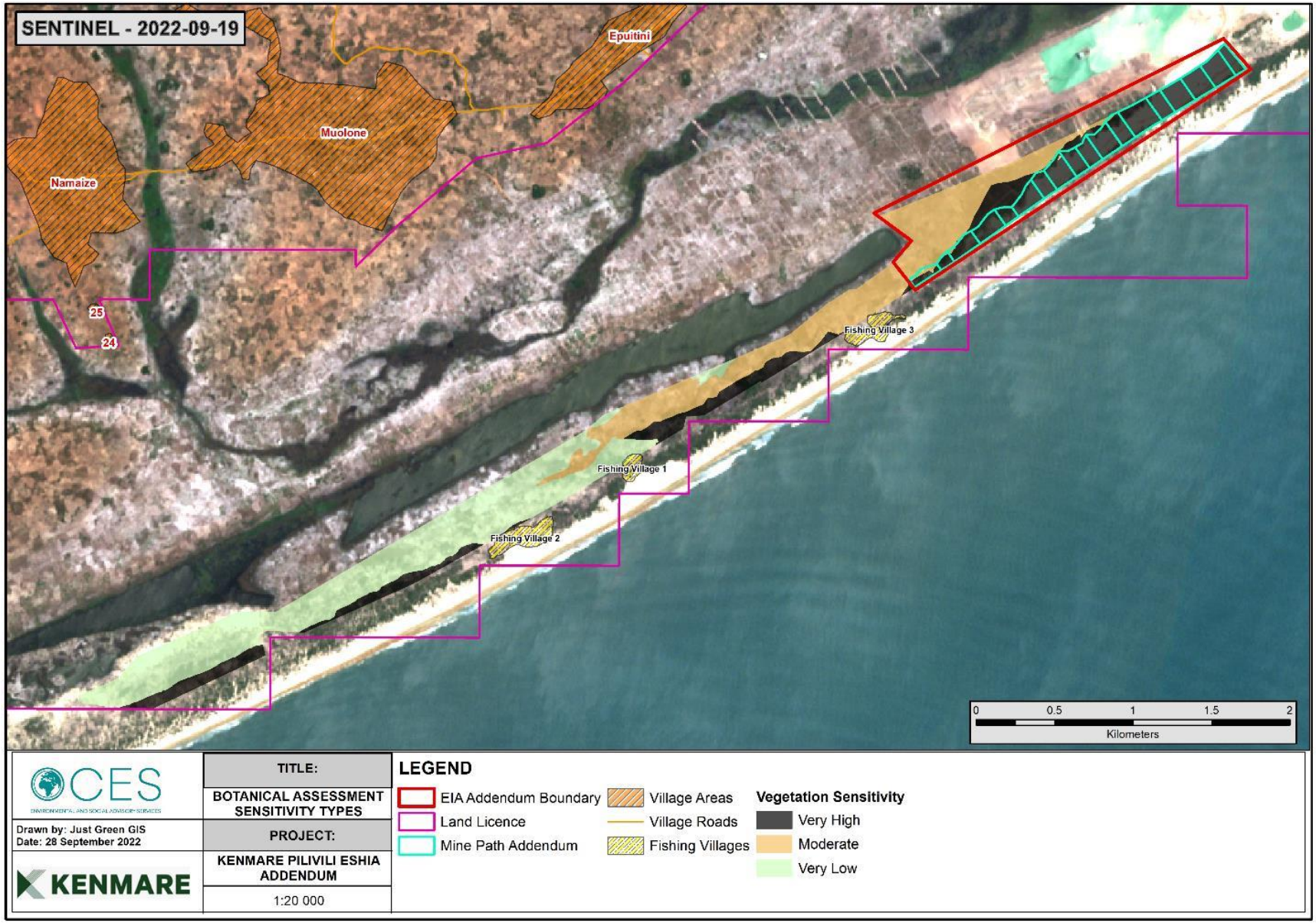


Figure 4.8: Sensitivity map of the proposed mining area.

4.6 COMMENT ON CRITICAL HABITAT

Further to the above it is probable that the site may be classified as critical habitat based on the presence of critically endangered, endangered and vulnerable species that are also range restricted endemic species. The potential triggers are listed below:

Criterion 1: Critically Endangered and Endangered Species

- Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0.5% of the global population AND ≥ 5 reproductive units GN16 of a CR or EN species).
- Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in GN72(a).
- As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.

Criterion 2: Endemic and Restricted-range Species

- For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 square kilometers (km^2).

5 IMPACT ASSESSMENT

5.1 THE CURRENT IMPACTS: "WITHOUT PROJECT SCENARIO"

To assess the potential impacts of the mining activities proposed by Kenmare, the existing impacts associated with current ecological conditions need to be described in terms of vegetation patterns, structure and composition. This baseline should be used as the comparison against which project impacts are assessed. The main issues identified with the existing impacts are discussed below:

5.1.1 Issue 1. Loss of Vegetation communities

Natural plant communities are dynamic ecosystems that provide habitats that support all forms of life. Different types of plant communities (and habitats) exist in the project area, and these occur within and around the project area. The villages in the area are reliant on natural resources found within the different plant communities and actively clear tracts of land for agricultural purposes. The current vegetation conditions in the low-lying regions of the project area can be described as mostly transformed by anthropogenic activities and are either of low or moderate ecological sensitivity as defined after the site visit in 2022. However, as described in the sections above, there has been excessive clearing within the project area and surrounds by local communities, since the site visit was conducted in early 2022. This must be factored into the baseline assessment as this clearing is unsustainable. Consequently, the current impacts on each plant community are assessed below for both the area under study during the survey work conducted in 2022 as well as post-survey (September 2022) from drone survey imagery and a site visit.

Impact 1. Loss of coastal dune forest vegetation type

Cause and comment:
This vegetation type occurs along the dune in the project area. Direct impacts on this vegetation type include clearing from local inhabitants to plant cassava (*Manihot esculenta*) and harvesting of plant materials for construction purposes.

Significance Statement:
The loss of the *coastal dune forest* is definitely occurring and is having a **severe**, permanent impact. The environmental significance of this unmitigated impact has changed from MODERATE toHIGH NEGATIVE.

Current Impacts					
Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation January 2022	Permanent	Study Area	Moderately Severe	Definite	**MODERATE-NEGATIVE**
Without Mitigation September 2022	Permanent	Study Area	Severe	Definite	**HIGH-NEGATIVE**

Impact 2: Loss of the dune thicket

Cause and comment:
During the field visit in January 2022, this vegetation type was relatively intact despite existing evidence of some clearing for machambas and the establishment of two small, temporary villages for fishermen. However, since the site visit extensive additional clearing by the local community has occurred, which must be factored into the baseline assessment, as this clearing is unsustainable. The current impacts have therefore been assessed for the two time periods: survey work conducted in 2022 as well as post-survey work (September 2022) and drone survey imagery.

Significance Statement:
The loss of the dune thicket vegetation type is definitely occurring and is having a severe**,** Long- Term impact. The environmental significance of this unmitigated impact has changed from LOW negative to is HIGH.

Current Impacts					
Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation January 2022	Medium Term	Study Area	Slight	Definite	**LOW-NEGATIVE**
Without Mitigation September 20	Long Term	Study Area	Severe	Definite	**HIGH-NEGATIVE**

5.1.2 Issue 2: Loss of Biodiversity

The Kenmare Moma expansion area consists of several habitats which include coastal dunes, agricultural areas and surrounding natural vegetation. These habitats comprise of the following vegetation types: coastal dune forest; coastal dune thicket, and scattered SCC within machamba land.

Unique habitats on the site have been shown to contain high biodiversity. For example, the coastal forest and coastal dune thicket have a high biodiversity and have species of conservation concern. The current land use is resulting in the clearance of these habitats, particularly in the coastal dune forest, reducing the areas potential to support biodiversity through habitat destruction. It should however be noted that even with extensive clearing the root stock and seedbank remains relatively intact. In addition, once cleared, SCC's remain scatted throughout areas that have been transformed into machamba land, thus helping to reduce impact significance to some extent.

Impact 3: Loss of biodiversity (in general)

Cause and comment:
The clearing of land for agriculture and probably harvesting of plant materials for construction is resulting in the loss of biodiversity in the area.

Significance Statement:
The loss of biodiversity is definitely occurring and is having a **moderate**, Long-Term impact. The environmental significance of this unmitigated impact is MODERATE NEGATIVE.

Current Impacts					
Impact	**Effect**			**Risk or Likelihood**	**Overall Significance**
	Temporal Scale	**Spatial Scale**	**Severity of Impact**		
Without Mitigation January 2022	Long Term	Study Area	Moderate	Definite	**MODERATE-NEGATIVE**
Without Mitigation September 2022	Long Term	Study Area	Moderate	Definite	**MODERATE-NEGATIVE**

5.1.3 Issue 3. Loss of species of Special Concern

Fifteen species of conservation concern *(see Table 4.2 above)* were identified at the Pilivili site and are being impacted on by the current activities.

Impact 4. Loss of Species of Conservation Concern

Cause and comment:
Current land use activities, such as clearing, and probably harvesting plants for construction, are resulting in the loss of species of conservation concern such as *Icuria dunensis*, as well as other species that are important to ecosystem functioning.

Significance Statement:
The loss of species of special concern is definitely occurring and is having a **severe**, LongTerm impact. The environmental significance of this unmitigated impact is now a HIGH NEGATIVE significance.

Current Impacts					
Impact	Effect			Risk	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation January 2022	Medium Term	Study Area	Moderate	Definite	**MODERATE-NEGATIVE**
Without Mitigation September 2022	Long Term	Study Area	Severe	Definite	**HIGH-NEGATIVE**

5.1.4 Issue 4. Disruption of Ecosystem Function and Process

The habitats that exist in the project area, together with those of the surrounding area that are linked, form part of a functional ecosystem. An ecosystem provides more than simply a 'home' for a set of organisms and is a functional system where biological and biophysical processes such as nutrient cycling, soil formation, reproduction, migration, competition, predation, succession, evolution and migration take place. Destruction or modification of habitats causes disruption of ecosystem function and threatens the interplay of processes that ensure environmental health and the survival of individual species. This issue deals with a collection of complex ecological impacts that are almost impossible to predict with certainty, but which are nonetheless important.

Impact 5: Fragmentation of vegetation and edge effects

Cause and comment:
Fragmentation is one of the most important impacts on vegetation, especially when this 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 large areas are cleared for agriculture, or to establish crops. Fragmentation results in the isolation of functional ecosystems, and results in reduced biodiversity and reduced movement due to the absence of ecological corridors (Plate 4.4).

Significance Statement:
The fragmentation of vegetation is definitely occurring and is having a severe, long term impact. The environmental significance of this unmitigated impact is HIGH NEGATIVE.

Current Impacts					
Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation January	Long Term	Study Area	Moderately Severe	Definite	**MODERATE-NEGATIVE**
Without Mitigation September	Long Term	Study Area	Severe	Definite	**HIGH-NEGATIVE**

5.2 IMPACT OF EXPANSION PROJECT: OPERATIONAL PHASE

5.2.1 Issue 1: Loss of Vegetation communities

Natural plant communities are dynamic ecosystems that provide habitats that support all forms of life. Different types of communities (and habitats) exist in the project area, and these occur within and around the project area. The Kenmare Moma expansion area will result in the clearance of natural vegetation, resulting in the further loss of plant communities.

Impact 1. Loss of coastal dune forest

Cause and comment:
Coastal Dune Forest occurs along the second dune ridge and dune depressions in the project area. Direct impacts on this vegetation type include clearing of the habitat for mining, although only a relatively small area (5 ha of Coastal Dune Forest and 3 ha of Icuri Forest)) will be lost (Figure 3.1).

Significance Statement:
The loss of the *coastal dune forest* will definitely occur and will have a **severe**, permanent impact without mitigation. As these vegetation types are 1) under threat; 2) contain range restricted SCC, the loss of which could impact on their long-term survival due as the clearance of mature trees will result in a decrease in the reproductive ability of the various SCC; 3) the site occurs within a protected area, the spatial extent of the impact will be felt nationally, and possibly international for very range restricted species like *Icuria dunensis*. The environmental significance of this unmitigated impact is VERY HIGH NEGATIVE. With mitigation measures

and the restoration strategy proposed in the Supplementary Rehabilitation Plan for the Dry Mining Areas within the Coastal Dune System (CES, 2022) the impact can be reduced to HIGH NEGATIVE, and the success of the rehabilitation will determine if the rating can be reduced further in the long-term if the restoration of areas is very successful. However, the impact rating after mitigation remains HIGH as climax communities like this are difficult to rehabilitate, even in the long term.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Permanent	Regional	Severe	Definite	VERYHIGH-NEGATIVE
With Mitigation	Long-term	Regional	Severe	Definite	HIGH-NEGATIVE

Mitigation and Management:

The following mitigation actions are suggested:

- Ensure that the restoration of disturbed areas, outlined in the CES report "Supplementary Rehabilitation Plan for the Dry Mining Areas within the Coastal Dune System" (the Rehabilitation Plan) are implemented to achieve the end goal of ecological restoration.
- Implement all the recommendations presented in Chapters 3 and 4 of this report.

Impact 2: Loss of the dune thicket

Cause and comment:

This vegetation type occurs within the dune system, seaward of the coastal forest and up to the inland edge of the foredunes. Two critically endangered, four endangered and two vulnerable species, that are endemic and range restricted, were recorded within this vegetation type. Approximately 27 ha of this vegetation type will be lost. The loss of this vegetation will have a regional, and possibly global impact as the loss of these species could impact on their survival. Given that they are range restricted, this would be of global significance.

Significance Statement:

The impact will definitely occur and have a very severe, permanent impact on the 27 ha area of dune thicket (see Figure 3.1) to be cleared for mining. The environmental significance of this unmitigated impact is VERY HIGH NEGATIVE.

Based on the current layout, although no associated infrastructure will impact this vegetation type, it falls within the mine path and will therefore be cleared. The loss of dune thicket will definitely occur and the severity of the impact is rated as very severe and permanent, as restoration will take a very long time (>50 years) and might never be achieved. With mitigation measures as outlined for dune forest above, this might be reduced to a HIGH NEGATIVE in the long term, but only if additional action focusing on reducing local community clearing of the rehabilitating dune thicket are implemented.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Permanent	Global	Very severe	Definite	VERY HIGH
With Mitigation	Long-term	Global	Very severe	Definite	HIGH

Mitigation and Management:

The same mitigation measures as outlined for impact 1 above applies.

5.2.2 Issue 2: Loss of Biodiversity

The Pilivili concession area consists of Coastal Dune Forest, Coastal Dune Thicket, and machambas which still contain isolated individuals of the various SCC . These habitats have high biodiversity and host several species of special concern. The current land use is resulting in the rapid clearance of these habitats, particularly in the Coastal Dune Thicket, reducing the areas potential to support biodiversity. Mining will further compound this situation.

Impact 3: Loss of biodiversity (in general)

Cause and comment:
Mining activities and the associated infrastructure will result in the removal of 36 ha of vegetation, resulting in the loss of biodiversity as 35 ha is natural vegetation. In addition, areas that have been cleared for machambas also still have remnant elements of natural vegetation and scattered SCC throughout, increasing the sensitivity of these transformed areas (please refer to Figure 3.1).

Mitigation and Management:
The following mitigation actions are suggested:

- Prevent mining employees from clearing vegetation in the demarcated set-aside area. ;
- Identify areas within the set-aside area that must be rehabilitated, with restoration as the end goal.
- Increase the densities of SCC through a concerted restoration programme that focusses on propagating and re-establishing between 50 to 75% of the original species composition. The size and locations within the set-aside area and the desired increase in the area of occupancy of identified SCC must be determined prior to operational activities taking placand must form part of the rehabilitation programme.
- These areas must be cordoned off and protected jointly by Kenmare, MTA and ANACto prevent ongoing vegetation clearing by the local community.
- Seeds of SCC must be collected now and on an ongoing basis as there is currently no information on when these species produce seeds. It is important to ensure that viable seeds are available in order to achieve the overall goal of ecological restoration. Seeds

must be planted out in the nursery and records kept of propagations attempts.

- Should the above mitigation measures prove to be unsuccessful then it is recommended that biodiversity offsets are considered for this project.
- Design and implement a Rehabilitation Plan for the project.

Significance Statement:

The mining activities will definitely result in the further loss of biodiversity, and this will have a **severe** permanent impact. The environmental significance of this unmitigated impact would be HIGH NEGATIVE. Mitigation measures could possibly reduce this to a MODERATE NEGATIVE impact.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase					
Without Mitigation	Permanent	Study Area	Severe	Definite	**HIGH -NEGATIVE**
With Mitigation	Long Term	Study Area	Moderate	Definite	**MODERATE-NEGATIVE**

5.2.3 Issue 3: Loss of Species of Conservation Concern

Fifteen species of conservation concern were identified within the expansion area and will be negatively impacted by mining activities. The impacts at a larger spatial scale will only be important in the case of species that have a globally restricted range or are otherwise in need of protection. In these cases, the mining process may significantly reduce the *area of occupancy* of the species. A reduction of the area of occupancy in turn may threaten the chances of survival for these plant species of concern. However, the significance of an impact differs depending on our knowledge of the distribution of these plant species.

Impact 4: Loss of Species of Special Concern

Cause and comment:

Mining activities will result in the loss of two critically endangered and four endangered endemic and range restricted species as well as other species that are important to ecosystem functioning. A number of these species are known from less than 10 locations and have small EOO and AOO (refer to Section 4.4). The further loss of such species will be of regional and possibly global significance.

Mitigation and Management:

The following mitigation actions are suggested:

- Identify set aside areas that host key representative portions of each vegetation type as conservation or offset areas as close as possible to the mining area;
- Implement a ecological restoration programme that focuses on the re-establishment and ongoing conservation of all the SCC, but especially the critically endangered and endangered species

- If possible, maintain an ecological corridor within the mining area;
- Collect seeds from established trees and where feasible relocate saplings of species of special concern.

Significance Statement:
The mining activities will definitely result in the loss of Species of Special Concern and will have a permanent, **very severe** impact in the long term. The environmental significance of this unmitigated impact would be VERY HIGH NEGATIVE. While mitigation measures could reduce the spatial and temporal scale of the impact, they are unlikely to be very effective and the impact will remain HIGH NEGATIVE in the Long-term, unless further work indicates that a biodiversity offset programme will reduce significance. if implemented.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Permanent	Global	Very severe	Definite	VERY HIGH-NEGATIVE
With Mitigation	Long-term	Global	Very severe	Definite	HIGH-NEGATIVE

5.2.4 Issue 4: Disruption of Ecosystem Function and Process

The habitats that exist in the project area, together with those of the surrounding area that are linked, form part of a functional ecosystem. An ecosystem provides more than simply a 'home' for a set of organisms and is a functional system where biological and biophysical processes such as nutrient cycling, soil formation, reproduction, migration, competition, predation, succession, evolution and migration take place. Destruction or modification of habitats causes disruption of ecosystem function, and threatens the interplay of processes that ensure environmental health and the survival of individual species. This issue deals with a collection of complex ecological impacts that are almost impossible to predict with certainty, but which are nonetheless important.

Impact 5: Fragmentation of vegetation and edge effects

Cause and comment:
Fragmentation is one of the most important impacts on vegetation, especially when this 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 large areas are cleared for agriculture or to establish crops. Fragmentation results in the isolation of functional ecosystems, and results in reduced biodiversity and reduced movement due to the absence of ecological corridors. Although the project area already has large areas cleared for agriculture, mining processes and associated infrastructure such as roads and pipelines will severely increase fragmentation within the project area.

Mitigation and Management:
The following mitigation actions are suggested:

- Implement all the recommendations outlined in Section 5.2.2 above.
- Use existing access roads where feasible;
- Align roads and pipelines within a single corridor and keep this as narrow as feasible; and
- Avoid locating linear infrastructure (such as roads and pipelines) through areas of high and moderate sensitivity.

Significance Statement:
The mining activities will definitely result in habitat fragmentation and will have a **severe,** permanent impact. The environmental significance of this unmitigated impact would be HIGH NEGATIVE. With mitigation, this will be reduced to a MODERATE NEGATIVE impact.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Permanent	Study Area	Severe	Definite	**HIGH-NEGATIVE**
With Mitigation	Long Term	Study Area	Moderate	Probable	**MODERATE-NEGATIVE**

Impact 6: Disruption of ecological systems and functions

Cause and Comment:
Some dust may be generated as a result of mining activities and, in particular, where there is exposed ground. Specific activities that may contribute to the release of fugitive dust include vegetation clearing, excavation of dune sand and loading into heavy vehicles and offloading into hoppers. The generation of dust may be higher during windy, dry periods. Dust may result in the smothering of vegetation located adjacent to these areas reducing light penetration and, subsequently stunting or inhibiting development and growth.

Mitigation and Management:

- Employ dust suppression measures such as wetting of the project area during dry, windy periods.
- Limit the height of stockpiles as per the requirements outlined in the rehabilitation report.
- Enforce speed limits for vehicles associated with mining.

Significance Statement:
The impact to terrestrial systems associated with any dust produced during mining will probably be a *short term*, **moderate impact**. The overall significance would be MODERATE NEGATIVE. This can be reduced to LOW NEGATIVE mitigation measures.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Short Term	Study Area	Moderate	Definite	**MODERATE-NEGATIVE**
With Mitigation	Short Term	localized	Low	Probable	**LOW-NEGATIVE**

Impact 7: Invasion of alien species

Cause and comment:

The removal of existing vegetation also creates 'open' habitats that will inevitably be colonised by pioneer plant species. While this is part of a natural process of regeneration, which would ultimately lead to the re-establishment of a secondary vegetation cover, it also favours the establishment of undesirable species in the area, such as the locally occurring species *Opuntia monocantha*. These species are introduced along transport lines, and by human and animal movements in the area. Once established, these species are typically very difficult to eradicate and may then invade, posing a threat to the neighboring ecosystem. This impact is likely to be exacerbated by careless management of the site and its facilities, e.g. seed dispersal via inappropriate organic waste disposal and inadequate monitoring.

Mitigation and management:

The following mitigation actions are suggested:

- Update the Alien Management Plan
- Eradicate alien plants as they appear;
- Put in place environmentally acceptable procedures for waste management;
- Do not use exotic species that are known to be invasive for rehabilitation purposes but rather use indigenous species and exotic species that are not invasive; and
- Monitor the project area for any new invasive plants.

Significance Statement:

Mining activities associated with the operational phase will probably result in the invasion of alien species into the project area and will have a **severe,** permanent effect. The environmental significance of this unmitigated impact would be HIGH NEGATIVE. Taking remedial action will reduce the impact to a LOW NEGATIVE.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Permanent	Regional	Severe	Probably	HIGH-NEGATIVE
With Mitigation	Short Term	Localised	Moderate	Probable	LOW-NEGATIVE

5.2.5 Issue 5: Loss of Ecosystem Services

Ecosystem Services refers to the benefits derived by humans from ecosystems and biodiversity. Loss of ecosystem services through the removal of vegetation communities during the mining process will result in the potential loss of ecosystem services associated with each habitat and vegetation type. This is especially relevant since the local communities are reliant on these areas as a source of food and medication, for construction materials and fuel wood.

Impact 8*:* Loss of ecosystem services provided by the plant communities identified in the project area

Cause and comment:
Loss of ecosystems services through the removal of vegetation communities due to mining activities will result in the loss of ecosystem services associated with each habitat and vegetation type. This is especially relevant since the local communities are heavily reliant on these areas as a source of food and medication, for construction materials and fuel wood.

Mitigation and Management:
The following mitigation actions are suggested:

- Work jointly with Kenmare' Social Department to determine alternatives to current ecological goods and services, such as improving health care facilities, establishing woodlots for charcoaling to offset the loss of ecosystem service to the affected communities.
- Setting aside key representative portions of each vegetation type that will provide adequate ecosystem services to the communities within the project area.

Significance Statement:
The mining activities will definitely result in the loss of ecosystem services provided by the plant communities and will have a **severe,** permanent impact. The environmental significance of this unmitigated impact would be HIGH NEGATIVE. With mitigation, this will be reduced to a MODERATE NEGATIVE impact.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Permanent	Study Area	Severe	Definite	HIGH-NEGATIVE
With Mitigation	Long Term	Study Area	Moderate	Probable	MODERATE-NEGATIVE

5.3 IMPACTS OF THE MINE: DECOMMISSIONING PHASE

The decommissioning of the project could have a high positive impact on the natural vegetation if the areas of high sensitivity are restored to their natural state and areas of moderate and low sensitivity are appropriately rehabilitated to a near-natural state. However, detailed baseline monitoring will be required to refine the alpha diversity and indicator species, as well as to confirm and augment the list of SSCs. It will also be necessary to establish nurseries to determine which of the naturally occurring plant species can be successfully propagated for rehabilitating areas disturbed by mining activities.

Small residual impacts as a result of the decommissioning phase will be similar to those listed for the construction phase and will include:

- Increased dust levels
- Increased access (along the haul road)
- Loss of ecosystem services as a result of increased access

5.4 CONCLUSION OF THE IMPACT ASSESSMENT

Eight impacts were identified within the project site. Before mitigation three impacts are rated as Very High, four as High and one as Moderate. This is due to the sensitive nature of the project site. All of the very high impacts can be mitigated to high, resulting in the following residual impacts after mitigation:

3 high
3 moderate
2 low

6 CONCLUSION AND RECOMMENDATIONS

The botanical assessment has determined the following:

- Fifteen SCC were identified to occur within the project area. Of these, nine are considered to be threatened species (CR, EN or VU).
- Based on the sensitivity analysis for the project site, the coastal dune forest and coastal dune thicket was determined to be very high. This is based on the presence of nine threatened SCC.

In addition, the approximately 36 ha of vegetation to be affected has a very high species richness and is a floristically important area, although this diversity and richness has been severely compromised due to unregulated clearing by local communities. This compounds the situation, as much of the area in its present state is unsuitable as an ecological set-aside area. Several key recommendations are required to mitigate the impacts of both mining and community activities on the Coastal Dune Forest and Thicket, the SCC's and the ecological functioning of this important coastal dune system. Furthermore, this clearing presents further challenges to Kenmare's objective of achieving no net loss of biodiversity, and preferably a net gain in biodiversity.

The key recommendation for this project is ***to restore and protect existing and remaining degraded Coastal Dune Forest and Thicket, and to protect the coastal dune system so it can function adequately enough to continue providing protection from coastal processes***.

The recommendations presented in the "Supplementary Rehabilitation Plan for the Dry Mining Areas within the Coastal Dune System" must be implemented. In addition, the following is required:

- Determine whether there are other populations of the threatened species along the coastline. If this is the case, the species present within the dune system may fall below the thresholds for critical habitat. A more detailed survey aimed specifically at *Brachystegia oblonga* and *Warneckea sessilicarpa* (Critically Endangered) and *Scorodophloeus torrei*, *Ochna beirensis* and *Blepharis dunensis* (Endangered) should be conducted to determine whether the populations within the region (Nampula and Zambézia Province) meet the threshold for critical habitat
- The study must include Ilhas Primeiras e Segundas that are part of KBA number 11. Additional information on terrestrial biodiversity would assist with conservation in the region. As the islands are largely uninhabited, a study of these species on the adjacent islands to determine their occurrence might be a good starting point and will strengthen the argument for their conservation.
- Prepare an Alien Management and Monitoring Plan
- Prevent the introduction of alien plant species

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APPENDIX 1

Table A.1: Potential species for ecological rehabilitation process.

Family	Species	Methods
Poaceae	*Sporobolus virginicus* (L.) Kunth	Vegetative
Poaceae	*Stenotaphrum secundatum* (Walter) Kuntze	seeds and vegetative
Poaceae	*Cynodon dactylon* (L.) Pers.	Vegetative
Fabaceae	*Canavalia rosea* (Sw.) DC.	Seeds
Convolvulaceae	*Ipomoea pes caprae* (L.) R.Br.	vegetative
Fabaceae	*Acacia nilotica* (L.) Wild. Ex Delile	seeds
Fabaceae	*Acacia karoo* Hayne	seeds
Cucurbitaceae	*Momordica balsamina* L.	seeds
Fabaceae	*Senna petersiana* (Bolle) Lock	Seeds
Apocynaceae	*Carissa macrocarpa* (Eckl.) A. DC.	Vegetative and seeds
Fabaceae	*Cassia afrofistula* Brenan	Seeds
Convolvulaceae	*Merremia tridentata* (L.) Hallier f.	Seeds
Fabaceae	*Indigofera spp.*	Seeds
Fabaceae	*Afzelia quazensis* Welw.	Seeds
Fabaceae	*Hymenaea verrucosa* Gaertn.	Seeds

Table A.2: Vegetation habitats in where the samplings was carried out.

Latitude	Longitude	Transect number
-16.67252785	39.48633101	T2
-16.67503096	39.48211209	T3
-16.6770214	39.47846831	T4
-16.6782426	39.4762238	T5
-16.67658032	39.48082485	T6
-16.67843742	39.47775763	T7
-16.67925037	39.47331824	T8
-16.68056151	39.47418828	T9
-16.68188188	39.46954014	T10
-16.68828244	39.45550858	T11
-16.68970322	39.45667096	T12
-16.6873814	39.45763332	T13
-16.68677901	39.45952952	T14
-16.68997611	39.45200184	T15
-16.69072021	39.45370732	T16
-16.69315993	39.44828159	T17
-16.69453002	39.44492531	T18
-16.68319286	39.46815142	T19
-16.66647285	39.4965139	T20

Latitude	Longitude	Transect number
-16.66484458	39.49887509	T21
-16.66313151	39.5014061	T22

Table A.3: GPS points recorded in transects and in the project area (Pilivili).

Family	Species	Latitude	Longitude
Melastomataceae	*Warneckea sessilicarpa*	-16.70459	39.40484
Melastomataceae	*Warneckea sessilicarpa*	-16.70464	39.42476
Melastomataceae	*Warneckea sessilicarpa*	-16.70364	39.42464
Melastomataceae	*Warneckea sessilicarpa*	-16.69765	39.42045
Polygalaceae	*Carpolobia suaveolens*	-16.70464	39.42476
Polygalaceae	*Carpolobia suaveolens*	-16.70364	39.42464
Polygalaceae	*Carpolobia suaveolens*	-16.7031	39.42406
Polygalaceae	*Carpolobia suaveolens*	-16.69765	39.42045
Polygalaceae	*Carpolobia suaveolens*	-16.68316	39.46745
Fabaceae	*Brachystegia oblonga*	-16.6982	39.42106
Fabaceae	*Brachystegia oblonga*	-16.69765	39.42045
Fabaceae	*Brachystegia oblonga*	-16.68001	39.43204
Fabaceae	*Brachystegia oblonga*	-16.67944	39.47286
Annonaceae	*Hexalobus mossambicensis*	-16.69765	39.42045
Annonaceae	*Hexalobus mossambicensis*	-16.68316	39.46745
Annonaceae	*Hexalobus mossambicensis*	-16.67944	39.47286
Menispermaceae	*Albertisia delagoensis*	-16.68824	39.43982
Acanthaceae	*Blepharis dunensis*	-16.68001	39.43204
Acanthaceae	*Blepharis dunensis*	-16.70464	39.42476
Acanthaceae	*Blepharis dunensis*	-16.70364	39.42464
Acanthaceae	*Blepharis dunensis*	-16.7031	39.42406
Acanthaceae	*Blepharis dunensis*	-16.69765	39.42045
Acanthaceae	*Blepharis dunensis*	-16.68316	39.46745
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.65338	39.5132
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.65826	39.50499
Fabaceae	*Scorodophloeus torrei*	-16.68316	39.46745
Fabaceae	*Scorodophloeus torrei*	-16.65323	39.51409
Fabaceae	*Scorodophloeus torrei*	-16.65614	39.50933
Fabaceae	*Scorodophloeus torrei*	-16.65323	39.51407
Fabaceae	*Icuria dunensis*	-16.65614	39.50933
Fabaceae	*Icuria dunensis*	-16.66522	39.49551
Fabaceae	*Icuria dunensis*	-16.65329	39.51398
Fabaceae	*Icuria dunensis*	-16.65339	39.51369
Fabaceae	*Scorodophloeus torrei*	-16.66108	39.50166
Fabaceae	*Scorodophloeus torrei*	-16.67482	39.48174
Fabaceae	*Scorodophloeus torrei*	-16.67447	39.4822
Fabaceae	*Scorodophloeus torrei*	-16.67498	39.48167

Family	Species	Latitude	Longitude
Fabaceae	*Scorodophloeus torrei*	-16.67844	39.47454
Fabaceae	*Scorodophloeus torrei*	-16.67511	39.47994
Fabaceae	*Scorodophloeus torrei*	-16.67228	39.48637
Fabaceae	*Scorodophloeus torrei*	-16.67414	39.48253
Fabaceae	*Scorodophloeus torrei*	-16.67431	39.48243
Fabaceae	*Scorodophloeus torrei*	-16.67462	39.48217
Fabaceae	*Scorodophloeus torrei*	-16.67483	39.48224
Fabaceae	*Scorodophloeus torrei*	-16.67643	39.47791
Fabaceae	*Scorodophloeus torrei*	-16.67706	39.47676
Fabaceae	*Scorodophloeus torrei*	-16.68107	39.46977
Fabaceae	*Scorodophloeus torrei*	-16.65698	39.50687
Fabaceae	*Scorodophloeus torrei*	-16.65705	39.5068
Fabaceae	*Scorodophloeus torrei*	-16.65717	39.50665
Fabaceae	*Scorodophloeus torrei*	-16.68582	39.45999
Fabaceae	*Scorodophloeus torrei*	-16.68602	39.45998
Fabaceae	*Scorodophloeus torrei*	-16.68668	39.45942
Fabaceae	*Scorodophloeus torrei*	-16.68686	39.45935
Fabaceae	*Scorodophloeus torrei*	-16.68683	39.4593
Fabaceae	*Scorodophloeus torrei*	-16.68663	39.45925
Fabaceae	*Scorodophloeus torrei*	-16.68787	39.45572
Fabaceae	*Scorodophloeus torrei*	-16.68725	39.45713
Fabaceae	*Scorodophloeus torrei*	-16.68723	39.45734
Fabaceae	*Scorodophloeus torrei*	-16.65523	39.51081
Fabaceae	*Scorodophloeus torrei*	-16.6551	39.51078
Fabaceae	*Scorodophloeus torrei*	-16.65535	39.51067
Fabaceae	*Scorodophloeus torrei*	-16.66504	39.49511
Fabaceae	*Scorodophloeus torrei*	-16.66612	39.49485
Fabaceae	*Scorodophloeus torrei*	-16.69009	39.44938
Fabaceae	*Scorodophloeus torrei*	-16.66663	39.47438
Fabaceae	*Scorodophloeus torrei*	-16.67186	39.47311
Polygalaceae	*Carpolobia suaveolens*	-16.663132	39.50141
Polygalaceae	*Carpolobia suaveolens*	-16.6629	39.50149
Polygalaceae	*Carpolobia suaveolens*	-16.664845	39.49888
Polygalaceae	*Carpolobia suaveolens*	-16.666473	39.49651
Polygalaceae	*Carpolobia suaveolens*	-16.67658	39.48082
Polygalaceae	*Carpolobia suaveolens*	-16.678243	39.47622
Polygalaceae	*Carpolobia suaveolens*	-16.67268	39.48677
Polygalaceae	*Carpolobia suaveolens*	-16.675031	39.48211
Polygalaceae	*Carpolobia suaveolens*	-16.680562	39.47419
Polygalaceae	*Carpolobia suaveolens*	-16.688282	39.45551
Polygalaceae	*Carpolobia suaveolens*	-16.675031	39.48211
Polygalaceae	*Carpolobia suaveolens*	-16.689703	39.45667
Polygalaceae	*Carpolobia suaveolens*	-16.689976	39.452

Family	Species	Latitude	Longitude
Annonaceae	*Hexalobus mossambicensis*	-16.664845	39.49888
Annonaceae	*Hexalobus mossambicensis*	-16.666473	39.49651
Annonaceae	*Hexalobus mossambicensis*	-16.67615	39.48108
Annonaceae	*Hexalobus mossambicensis*	-16.677021	39.47847
Annonaceae	*Hexalobus mossambicensis*	-16.67268	39.48677
Annonaceae	*Hexalobus mossambicensis*	-16.675031	39.48211
Annonaceae	*Hexalobus mossambicensis*	-16.681882	39.46954
Annonaceae	*Hexalobus mossambicensis*	-16.686779	39.45953
Annonaceae	*Hexalobus mossambicensis*	-16.687381	39.45763
Annonaceae	*Hexalobus mossambicensis*	-16.689703	39.45667
Annonaceae	*Hexalobus mossambicensis*	-16.69072	39.45371
Annonaceae	*Hexalobus mossambicensis*	-16.689976	39.452
Thymelaeaceae	*Synaptolepis oliveriana*	-16.663132	39.50141
Thymelaeaceae	*Synaptolepis oliveriana*	-16.666473	39.49651
Thymelaeaceae	*Synaptolepis oliveriana*	-16.67658	39.48082
Thymelaeaceae	*Synaptolepis oliveriana*	-16.677021	39.47847
Thymelaeaceae	*Synaptolepis oliveriana*	-16.67268	39.48677
Thymelaeaceae	*Synaptolepis oliveriana*	-16.686779	39.45953
Thymelaeaceae	*Synaptolepis oliveriana*	-16.689703	39.45667
Fabaceae	*Brachystegia oblonga*	-16.67658	39.48082
Fabaceae	*Brachystegia oblonga*	-16.67695	39.48014
Fabaceae	*Brachystegia oblonga*	-16.677021	39.47847
Fabaceae	*Brachystegia oblonga*	-16.678437	39.47776
Fabaceae	*Brachystegia oblonga*	-16.67925	39.47332
Fabaceae	*Brachystegia oblonga*	-16.67268	39.48677
Fabaceae	*Brachystegia oblonga*	-16.686779	39.45953
Fabaceae	*Brachystegia oblonga*	-16.688282	39.45551
Fabaceae	*Brachystegia oblonga*	-16.687381	39.45763
Fabaceae	*Brachystegia oblonga*	-16.69072	39.45371
Fabaceae	*Brachystegia oblonga*	-16.689976	39.452
Fabaceae	*Afzelia quazensis*	-16.67658	39.48082
Fabaceae	*Afzelia quazensis*	-16.67695	39.48014
Fabaceae	*Icuria dunensis*	-16.67695	39.48014
Fabaceae	*Icuria dunensis*	-16.67268	39.48677
Fabaceae	*Icuria dunensis*	-16.67442	39.48223
Fabaceae	*Icuria dunensis*	-16.675031	39.48211
Acanthaceae	*Blepharis dunensis*	-16.69453	39.44493
Acanthaceae	*Blepharis dunensis*	-16.683193	39.46815
Acanthaceae	*Blepharis dunensis*	-16.687381	39.45763
Acanthaceae	*Blepharis dunensis*	-16.672528	39.48633
Acanthaceae	*Blepharis dunensis*	-16.675031	39.48211
Acanthaceae	*Blepharis dunensis*	-16.677021	39.47847
Acanthaceae	*Blepharis dunensis*	-16.678243	39.47622

Family	Species	Latitude	Longitude
Acanthaceae	*Blepharis dunensis*	-16.67658	39.48082
Acanthaceae	*Blepharis dunensis*	-16.678437	39.47776
Acanthaceae	*Blepharis dunensis*	-16.67925	39.47332
Acanthaceae	*Blepharis dunensis*	-16.680562	39.47419
Acanthaceae	*Blepharis dunensis*	-16.681882	39.46954
Acanthaceae	*Blepharis dunensis*	-16.688282	39.45551
Acanthaceae	*Blepharis dunensis*	-16.689703	39.45667
Acanthaceae	*Blepharis dunensis*	-16.686779	39.45953
Acanthaceae	*Blepharis dunensis*	-16.689976	39.452
Acanthaceae	*Blepharis dunensis*	-16.69072	39.45371
Acanthaceae	*Blepharis dunensis*	-16.666473	39.49651
Acanthaceae	*Blepharis dunensis*	-16.664845	39.49888
Acanthaceae	*Blepharis dunensis*	-16.663132	39.50141
Euphorbiaceae	Cf. *Croton sp.* Or *Alchornea sp.*	-16.66075	39.50018
Euphorbiaceae	Cf. *Croton sp.* Or *Alchornea sp.*	-16.66288	39.49822
Euphorbiaceae	Cf. *Croton sp.* Or *Alchornea sp.*	-16.66326	39.48507
Melastomataceae	*Warneckea sessilicarpa*	-16.60781	39.5424
Ochnaceae	*Ochna cf. beirensis.*	-16.67658	39.48082
Ochnaceae	*Ochna cf. beirensis.*	-16.69072	39.45371
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.66502	39.49092
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.65857	39.50423
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.66096	39.49924
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.66518	39.49495
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.67344	39.47407
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.67618	39.46513
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.67934	39.47972
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.68443	39.44896
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.67073	39.47951
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.62147	39.52444
Fabaceae	*Ormocarpum sennoides subsp. zanzibaricum*	-16.6213	39.42462
Sapotaceae	cf. *Mimusops sp.*	-16.68021	39.4473

A short list of some species of special concern, only species that were flowering or fruiting were included in the list.

1- Family: Euphorbiaceae
Specie: Cf. *Croton sp*. Or *Alchornea sp*.
IUCN status
Observation: Probably a new specie or new record for Mozambique

2- Family: Lamiaceae
Specie: *Premna hans-joachimii*
IUCN status: Vulnerable

3- Family: Fabaceae
Specie: *Scorodophloeus torrei*
IUCN status: Endemic and Endangered

4- Family: cf. Sapotaceae
Specie: Cf. *Mimusops sp*.
IUCN status:
Observation: Probably new or new record for Mozambique

5- Family: Melastomataceae
Specie: *Warneckea sessilicarpa*
IUCN status: Endemic and Critically Endangered

6- Family: Polygalaceae
Specie: *Carpolobia suaveolens*
IUCN status: Endemic

7- Family: Fabaceae
Specie: *Brachystegia oblonga*
IUCN status: Endemic and Critically Endangered

8- Family: Annonaceae
Specie: *Hexalobus mossambicensis*
IUCN status: Endemic and Vulnerable

8- Family: Lamiaceae
Specie: *Premna hans-joachimii*
IUCN status: Vulnerable