**MAFIA ISLAND COASTAL FOREST DIVERSITY TEAM (MICDT)**

# IDENTIFICATION OF FLORA AND FAUNA AND THEIR CONSERVATION STATUS

## A case study of Mafia Island 'Coastal Forest Mosaic'

**FINAL REPORT II**

**Submitted to Rufford Small Grants Foundation (RSG)**

**BY**

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## EXECUTIVE SUMMARY

The coastal forest of Mafia island has a number of indigenous and exotic flora and fauna species retained in the area. This study was carried to survey existing flora and fauna in the Mlola and Juani coastal forests in Mafia Island. A total of 30 sample plots were established, 25 in Mlola forest and the remaining 5 plots in Juani forest reserve. Seven transects were established in total, 4 in Mlola and 3 in Juani forest. In each plot plant species were indentified and recorded, whereas in each transect birds and insect species were identified and recorded. A total of 75 plant species and 92 animal species (39 birds and 53 insects) species were identified, The plant species identified belonged to 34 different families, of which the family Sapindaceae was more common with 8 species, then followed by Euphobiaceae (7 species), Ebenaceae (5 species), Fabaceae (5 species), Rubiaceae (5 species), Anacardiaceae (4 species), Annonaceae (4 species), Celastraceae (3 species), Tiliaceae (2 species), Moraceae (2 species), Bombacaceae (2 species), Rutaceae (2 species) Burseraceae (2 species) and the remaining families had one specie each. The 39 birds species belonged to 26 different families in which the families Columbidae, Cuculidae, and Nectariniidae were more common having 4 different species each followed by Turdidae, Pycnonotidae, Platysteiridae, Malaconotidae, Coraciidae, and Capitonidae with 2 different species each, the remaining 17 families had one species in each. The 53 insects species belonged to 21 different families in which the families Pieridae, Formicidae, Papilionidae, Nymphalidae, Blaberidae, Lycaenidae, Acrididae, Anthopioridae, Tabanidae, Thespidae, were more common having 9, 7, 6, 6, 3, 3 and 2 different species in the last families respectively, the remaining 10 families had one type of specie each. Diversity indices for flora and fauna (birds and insects) species involved Simpson's indices and the values were 0.0763, 0.0995 and 0.0245 respectively. Shannon Wiener diversity index for flora and fauna (birds and insects) species in Mafia Island FR was 3.0525, 3.4201, and 3.8259 respectively. Furthermore, fauna species (birds and insects) were categorized under IUCN red list whereby none of fauna species was instituted as endangered or near extinction but to a certain extent Vulnerable. The study recommends avoiding or mitigating all the activities that may reduce diversity of flora and fauna species in Mafia Island coastal forests.

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## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| FAO | Food and Agriculture Organisation |
| WWF | World Wide Fund |
| IUCN | International Union for Conservation of Nature |
| HESLB | High Education Students' Loans Board |
| CI | Conservation International |
| MNRT | Ministry of Natural Resources and Tourism |
| BTU | British thermal unit |
| URT | United Republic of Tanzania |
| SSC | Species Survival Commission |
| SNAL | Sokoine National Agricultural Library |
| BLI | Birdlife International |

# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 Background

The coastal forests cover a total of 333,412 ha of which 263,932 ha are Central Government Forest Reserves (79.2%) and 66,950 ha (20.0%) are under public land. In addition 2,530 ha (0.8%) are under Game Reserves/National Parks. These forests and woodlands help in supporting the livelihoods of 87% of the poor people who spend their lives in rural areas (MNRT, 2001; FAO, 2001; Milledge *et al*., 2007). However, of the total area, about 13 million ha serves as forest reserves (Malimbwi, 2001;MNRT, 2001) in which there are 621 forestry reserves of varying size from 3.0 ha–580,000 ha (Nshubemuki, 1990; Holmes, 1995; Malimbwi, 2001).

The Coastal Forests of Eastern Africa are part the biodiversity hotspots identified by Conservation International (CI), and stretches along the Eastern edge of Africa, from small patches of coastal (riverine) forest along the Jubba and Shabelle rivers in southern Somalia, south through Kenya. The hotspot stretches further south into Tanzania (where some outlying forest patches occur about 300 km inland), and along nearly the entire coast of Mozambique, ending at the Limpopo River. The hotspot also includes the offshore islands, including Pemba, Zanzibar, Mafia and the Bazarruto Archipelago of Mozambique (Burgess *et al.*, 2000).

For many years, coastal forests have played an important role in social and economic development of the coastal communities in Tanzania. Today this unique but fragile ecosystem is still the main provider of various useful products such as firewood, charcoal, poles, timber, fruits, honey and traditional medicine (Chikira, 1998). Other values include water catchments, carbon sequestration, habitats for birds, endemic plants and animals, and eco- tourism (Clarke *et al.*, 2000). It is further pointed out that, Eastern Arc and Coastal forests are centres of endemism ranked as the most important area for the conservation of endemic species in the whole of tropical Africa (Mittermeier *et al*., 1998).

Despite forest conservation and management efforts, over time conflicts between local people wishing to exploit the forest resources, commercial companies wishing to exploit the forests for profit bedevil the management of coastal forests in Tanzania. The situation has also been

exacerbated by the dwindling allocation of funding and other crucial resources to institutions charged with management of forests in Tanzania (Sumbi, 1991).

Despite the obvious importance of the coastal forests in terms of its biological value and the high levels of threat by deforestation, only 17% of the Coastal Forest hotspot is formally protected with just 4% having high levels of protection under IUCN protected area categories I-IV. The two largest protected areas in Kenya are Arabuko-Sokoke (417 sq. km) and Shimba (63 sq. km). In Tanzania areas over 37% of most important forest areas are found within government managed Forest Reserves (Malimbwi et al., 2005).

While Zanzibar has become a popular tourist resort, Mafia Island lying only 160 km south, remains virtually unknown. Previously poor communications with the mainland and being much lesser known than Zanzibar have kept Mafia 'original', although a steady trickle of visitors are unanimous in singing its praise. The Mafia Archipelago is scattered over the Indian Ocean 21 km off the Rufiji River Delta in central Tanzania (Clarke *et al.*, 2000).

### 1.2 Problem statement and justification

Among the major problems / predicaments identified in the management of coastal forest include deforestation, overexploitation and degradation, a process that leads to erosion, loss of habitats which consequently affect ecosystem integrity. Other causes might be unplanned human related activities, lack of basic information and public awareness of their values, functions and product as well as management aspect (Burgess and Hipkiss, 2002). Available scientific findings reveal that generally few studies have been done on the coastal forests including Mafia Island in Tanzania. It has been explained that these forests are of great importance as they host unique species of flora and fauna some of them being rare and endemic. However little is known about them (Burgess et al., 2000). This brings about the need for studies to establish quantitative baseline information on the status of these forests, their major threats, and management that can be used for further determination of the ecological changes in such ecosystems. This brings the necessity of this study to identify flora and fauna of the coastal Tanzania Forests in Mafia Island. The results will be useful in the preparation of appropriate management plans, and future conservation strategies and hence sustainable management of the coastal forests.

## 1.3 Objectives

### 1.3.1 Overall Objective

- To identify flora and fauna of Mlola and Juani forests in Mafia Island.

### 1.3.2 Specific objectives

- To determine flora and fauna species richness in Juani and Mlola forests in Mafia Island.
- To determine fauna (birds and insects) species diversity in Mlola and Juani forests in Mafia Island.
- To access fauna species and conservation status based on IUCN list.

# CHAPTER TWO

## 2.0 LITERATURE REVIEW

### 2.1 An overview of coastal forest resource

The Eastern coastal forests and related habitats is approximately 6200 $km^2$ in extent, stretching along the eastern Africa coast from southern Somalia to southern Mozambique (WWF- EARPO, 2006). It contains a large number of remnant forests and thicker patches, which are embedded within savanna woodlands, wetlands, grasslands and in farmlands. These forests are typically tiny and segmented, but contain the remarkable levels of biodiversity and exceptional high levels of localized endemism, often varying dramatically from one forest parch to the next (Clarke, 1998; Burgess *et al.,* 2000; Burgess and Clarke, 2000).

The northern boundary of these coastal forests hotspots is therefore located in the remaining small patches of coastal (riverine) forest along the Jubba and Shabbelle rivers in south Somalia (Madgwick, 1988; Clarke, 2000). Following this study, the coastal forests of Eastern Africa include the Northern and Southern Zanzibar – Inhambane Coastal Forest Mosaic Ecoregion, and the Zambezian Coastal flooded Savanna as defined by WWF (Burgess *et al.*, 2004b*).* The hotspots also include all islands lying immediately offshore, including Zanzibar, Pemba, Mafia, and the Bazarruto archipelago of Mozambique (Kaooneka, 1990).

### 2.2 IUCN Red List of Threatened Species (IUCN Red List or Red Data List),

Founded in 1963, is the world's most comprehensive inventory of the global conservation status of plant and animal species. The International Union for Conservation of Nature (IUCN) is the world's main authority on the conservation status of species. A series of Regional Red Lists are produced by countries or organizations, which assess the risk of extinction to species within a political management unit.

The IUCN Red List is set upon precise criteria to evaluate the extinction risk of species and subspecies of Mafia Island, the IUCN has categories species of Mafia Island as vulnerable, endangered near extinction, near threatened and least concern, but those indicated as endangered, near extinction, near threatened, and least concern were found in other forests

other than Mlola and Juani forests. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction.

Major species assessors include BirdLife International, the Institute of Zoology (the research division of the Zoological Society of London), the World Conservation Monitoring Centre, and many Specialist Groups within the IUCN Species Survival Commission (SSC). Collectively, assessments by these organizations and groups account for nearly half the species on the Red List.

The IUCN aims to have the category of every species re-evaluated every five years if possible, or at least every ten years. This is done in a peer reviewed manner through IUCN Species Survival Commission (SSC) Specialist Groups, which are Red List Authorities responsible for a species, group of species or specific geographic area, or in the case of BirdLife International, an entire class (Aves) (Michael, 1984; Mittermeier *et al*., 1998).

### 2.3 The main threats in the coastal forest

It has been documented that the most important threats to the world's fauna in the coastal forest are the spread of agriculture (significantly affecting 73% of Threatened bird species) and human use of biological resources, either through direct exploitation of fauna populations or from the indirect impacts on fauna populations (Kaooneka, 1990).

These threats are the main drivers behind habitat degradation and conversion which are influencing 95% of Globally Threatened fauna populations. Invasive species (especially predators) also threaten nearly a third of Globally Threatened Birds and insects increasing problems are being caused by human disturbance, incidental mortality (notably the drowning of seabirds in long line fisheries) and environmental pollution (on land, in wetlands and seas, and in the air), with human-induced climate change having serious longer term consequences for the world's coastal forest fauna (Malimbwi *et al*., 2005).

#### 2.3.1 Burning of woody plants

Burning of woody plants for charcoal production causes major habitat loss near coastal towns and alongside main roads particularly in Tanzania where importance coastal forest close to cities are in danger of being cleared for charcoal production. WWF-EAPRO, (2006)

point out that, the business of charcoal production has heavily impacted forest areas more than 200 km from Dar es Salaam and spreading even further into the bush. In the last decade the coastal forest near Dar es Salaam (Pande Game Reserve, Pugu, Kazimzumbwi, and Ruvu south forest reserves) have lost significant areas of vegetation due to charcoal burning and fuel wood harvesting (Burgess and Hipkiss, 2002).

Most of the firewood is collected from trees and bushes inside and outside protected forest areas. Charcoal production for the market, which requires large volumes of wood, is the main source of income in Eastern Tanzania and can result in severe disturbance of forests and woodlands (Luoga *et al*., 20

### 2.3.2 Forest fires

Forest fires have been a natural phenomenon in Eastern Africa over the past decades, however, majority of fires that occur today are anthropogenic in nature as fire is used as a tool to clear farmland, to drive animals, for hunting, to collect honey and to reduce tse- tse flies etc Clarke, 2000), So over time and with frequent and intense hunting, it is believed that low land coastal forest and thicker vegetation is converted to more fire adapted vegetation type similar to Miombo wood lands, dominated by *Brachystegia* and *Julbernadia* species. (WWF- EAPRO, 2006). This results in a loss of a narrowly endemic coastal forest specialist species and their replacement by wide- ranging and common species typical of the Zambezian region of the Eastern and Southern Africa (Burgess and Clarke, 2000).

### 2.3.3 Illegal logging

Illegal logging using pit-sawing techniques is also a problem in almost all coastal forests where timber trees still remain, particularly in Southern **Tanzania** and Northern Mozambique. Many forests have already been logged to exhaustion. Recently, heavy exploitation of round wood export had been reported in the coastal forests of Rufiji, Kilwa and Lindi districts of Tanzania (Millenda and Kaale, 2005). It has also been explained that although some of this logging is undertaken using licenses obtained from the relevant authorities much is believed to be illegal (Burgess and Charke, 2000).

Unsustainable harvesting for timber, poles and charcoal burning have greatly degraded many forests in Kilwa district including protective forestry reserves like Tongomba, Mbinga, Kitope, Ngarama, and Mitundumbea (Malimbwi *et al.,* 2005).

## 2.4 Aesthetic values

Trees and shrubs improve the aesthetic quality of urban areas. It is the aesthetic and recreational value of trees, forests and parks that is most directly identified by most urban dwellers, in developed and developing countries alike. Trees fulfill certain psychological, social and cultural needs of the urban dweller (Dwyer, *et al*., 1991). They play a very important social role in easing tensions and improving psychological health; people simply feel better living around trees. One study has demonstrated that hospital patients placed in rooms with windows facing trees heal faster and require shorter hospital stays (Ulrich, 1990). When appropriately selected and placed, trees are effective in screening out undesirable views and ensuring privacy while permitting free visual access to the rest of the landscape. Parks provide easily accessible recreational opportunities for people.

Health Parks and green areas provide opportunities for healthy physical activity (Kuchelmeister, 1991). Enjoyment of green areas may help people to relax or may give them fresh energy. In addition, the passive benefit to physical and mental health of an urban landscape with trees has been documented in industrialized countries (Clarke et al. 2000).

## 2.5. Microclimate, air quality improvement and carbon dioxide reduction

Trees, shrubs and other vegetation help to control temperature extremes in built up environments by modifying solar radiation. The shade of one large tree may reduce the temperature of a given building to the same extent as would 15 air conditioners at 4000 British thermal units (BTU), i.e. 4220 kJ, in a similar but unshaded building. In addition, energy saving through tree-planting around houses ranges from 10 to 50 percent for cooling and from 4 to 22 percent for heating (NAA/ISA, 1991). Trees of coastal forest help to improve the air quality by cooling and cleaning the air. Landscaping involving strategic tree planting can conserve energy and maintain comfort without air conditioning (Kuchelmeister & Braatz, 1993). Coastal forests are utilized as an effective approach for reducing air pollution. Trees mitigate pollution by reducing energy use, carbon dioxide emissions and ground-level ozone. Some urban forestry projects, in several cities in the United States for example, have been financed by carbon sequestration projects (Akbari *et al.*, 1992; McPherson and Rowntree, 1993)

## 2.6 Species diversity in coastal forests

The flora and fauna of the coastal forests are recognized as being of global importance due to high levels of biodiversity and endemism found within the small, fragmented and highly threatened patches of forests. The closed canopy coastal forests retain high numbers of endemic plant and animal species (Luoga, 2000). It has been explained that these forests constitute 554 plants, 43 birds, 3 mammals, 24 reptiles, five amphibians, 86 molluscs and 75 insects. The mosaic of habitats within the Hotspot, including forest, woodland and thickets, contain a greater total number of endemic species inlcuding 1,750 plants, 11 birds, 11 mammals, 53 reptiles, six amphibians and 32 freshwater fishes. Out of these, include 333 globally threatened (IUCN Red list) species, with 105 species being represented in Kenya and 307 in Tanzania (Michael, 1984; Mittermeier *et al*., 1998).

## CHAPTER THREE

# 3.0 METHODOLOGY

## 3.1 Study area description

Mafia is a district of the Coast Province, which is one of the provinces of mainland Tanzania Clarke, 2000).


Source: Tanzania Natural Resource Information Centre (TANRIC)

**Figure 1: A map showing Mafia Island Forest Reserves**

### 3.1.1. Geographical location

The Mafia Archipelago is scattered over the Indian Ocean 21 km off the Rufiji River Delta in central Tanzania. The largest of a score of islands, atolls and tidal sandbars, Mafia itself is

approximately 50 km long by 15km across, and is located between Latitude $7.85^0$S and Longitude $39.783^0$ E surrounded by a barrier reef teeming with marine life (Clarke, 2000).

### 3.1.2 Climate

Temperatures are mild, even when we speak of the "hot" season, as the temperature in Mafia rarely exceeds 30°C. Mafia has a relatively dry tropical climate with approximately 1,800 mm of rain each year divided into two seasons of "long" rains in late March-May and "short" rains in November-early December. Mafia Island lies across the trade winds and experiences the north-east and south-east seasons (Clarke, 2000).

### 3.1.3 Population and Economic Activities

The population of Mafia Island is around 40, 801 people living in 24 villages scattered throughout the main island, Jibondo, Juani and Chole islands. According to 2002 poulation census the population was found to be 40,816 (URT, 2002). The peoples' livelihood mainly depends on rustic fishing and farming. The main farming activities are mainly coconut plantation, and very few cases maize, cassava and banana. However previous studies indicated that due to extended land clearance, succeeding years will be accompanied by great expansion of agriculture, fishing activities, apart from these activities there is also livestock keeping (Clarke, 1999).

### 3.1.4 Vegetation

Natural vegetation on Mafia ranges from tidal mangrove thickets and scrubby coastal moorlands to palm-wooden grassland and lowland rainforest. Magnificent baobabs are prominent along with the native *Albizia*. Patches of coastal high forest remain in localities all over Mafia; one of the most picturesque, the Chunguruma Forest, is a dense tree canopy interlaced with palms, lianes and epiphytes and has an abundant floor covering of ferns (Clarke, 2000).

### 3.1.5 Fauna

The closed canopy coastal forests retain high numbers of endemic plant and animal species (Luoga, 2000). It has been explained that these forests constitute, 43 birds, 3 mammals, 24 reptiles, five amphibians, 86 molluscs and 75 insects (Clarke, 2000).

## 3.2 Data collection

### 3.2.1 Sampling design

The study involved the use of concentric plots of 0.071 ha, i.e. 15 m radius that was laid systematically in the two selected forests. The plots were subdivided in three diameter classes (Section 3.2.2). A total of 30 plots were laid, 25 in Mlola FR and 5 in Juani Island FR (Nduwamungu, 1996; Luoga, 2000). The circular plots were sub-divided into 3 sub-circles as follows;

(a) The inner most circle with radius 5m in which all trees and shrubs with DBH $\geq$ 4cm were identified and recorded.
(b) In the mid circle plot, with radius 10m in which all trees and shrubs with DBH $\geq$ 10cm were identified and recorded.
(c) The outer most circle plot with radius 15m, in which all trees and shrubs with DBH $\geq$ 15cm were identified and recorded (Nduwamungu, 1996).

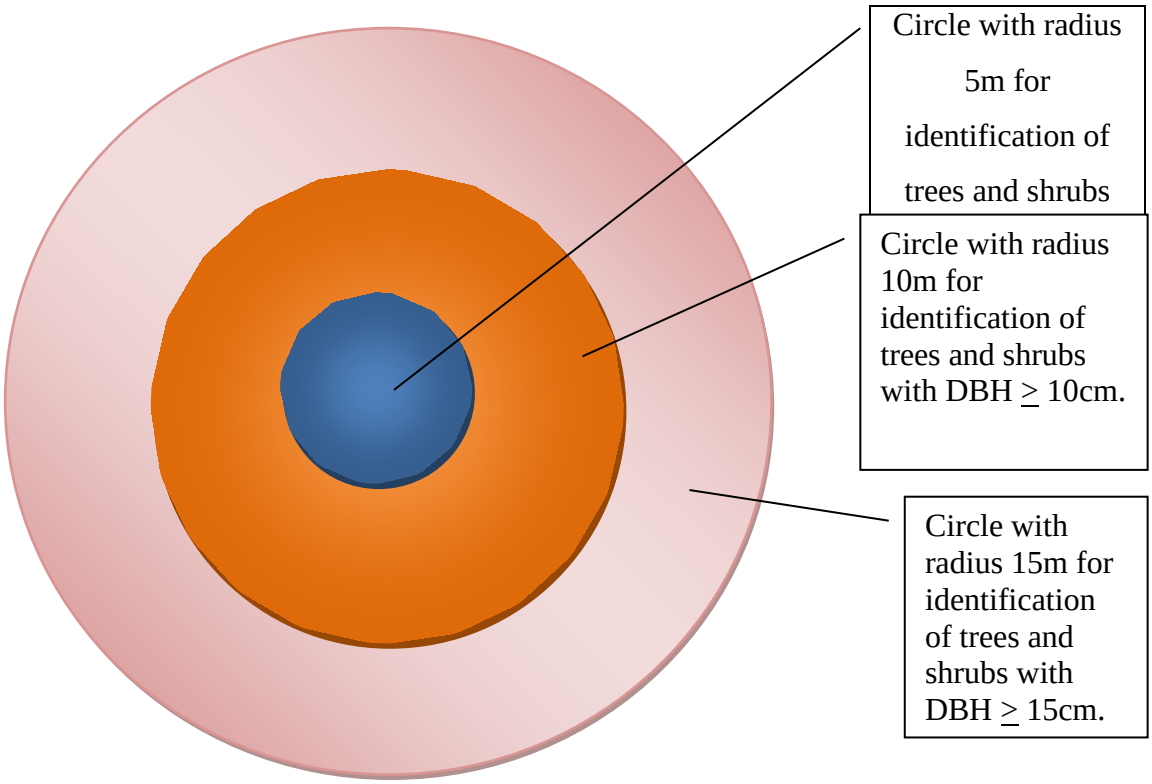


**Figure 2: Illustration showing structure of the concentric plot**

### 3.2.2 Primary data

Primary data collection involved identification of tree and shrub species in Mlola and Juani Island FR's. This was mainly achieved through field observation method where in each study plot all trees and shrub species were visited and identified using both local and scientific names. For unknown species, voucher specimens (plant parts as flowers, fruits and leaves) were collected for further identification and/ or verification by a botanist (Misra, 1989).

### 3.2.3 Methods for fauna data collection

Birds and insects survey was conducted in the two coastal FRs, i.e., Mlola and Juani through Rapid Assessmant Methods in which together with systematic observation sound, seine and sight enabled noting down all bird species seen or heard along each transect visited.

### 3.3 Data analysis

The data collected were interpreted and presented in the tabular forms from which total species richness of flora and fauna (birds and insects) were obtained. Simpson's (D) and Shannon wiener (H') indices were used to determine flora and fauna species diversity.

# CHAPTER FOUR

## 4.0 RESULTS AND DISCUSSION

### 4.1 Results

#### 4.1.1 Species richness

##### 4.1.1.1 Flora species richness of coastal forest of Mafia Island

A total of 75 flora species were identified from the study area (Table1) of which the dominant flora species were *Sorindeia madagascariensis*.which were 58, *Diospyros natalensis* which were 57, *Mimusops fruticosa* which were 41 and *Maytenus sp which* were 38 found in Mlola forest, In Juani Forest the dominant flora species were *Diospyros natalensis* which were 25, *Sorindeia madagascariensis* which were 21, *Trichilia emetica* which were 19, The mentioned species were found to have large frequency of occurrence in the two forests (Mlola and Juani) than any other species. These plant species identified belonged to 34 different families, of which the family Sapindaceae was more common with 8 species, then followed by Euphobiaceae (7 species), Ebenaceae (5 species), Fabaceae (5 species), Rubiaceae (5 species), Anacardiaceae (4 species), Annonaceae (4 species), Celastraceae (3 species), Tiliaceae (2 species), Moraceae (2 species), Bombacaceae (2 species), Rutaceae (2 species),) Burseraceae (2 species), and the families Apocynaceae, Araceae, Flacourtiaceae, Leguminosea, Liliaceae, Loganiaceae, Meliaceae, Myrtaceceae, Olacaceae, Bignoniaceae, Boraginaceae, Capparaceae, Clusiaceae, Cyperaceae, Poaceae, Rhamnaceae, Steraculiceae, Ulmaceae, Verbenaceae and Violaceae had one specie each.

The 73 flora species belonged to 7 different plant life forms in which the life form tree was more represented with 62 different species.

**Table 1: Flora species richness of coastal forest of Mafia Island**

| Latin name | Family |
|---|---|
| ***Acacia sp*** | Fabaceae |
| ***Adansonia digitata* L.** | Bombacaceae |
| ***Albizia versicolor* Welw. ex Oliv.** | Fabaceae |
| ***Alchornea sp*** | Euphobiaceae |
| ***Andropogon sp*** | Poaceae |
| ***Annona senegalensis* Pers.** | Annonaceae |
| ***Baphia kirkii* Afzel. ex Lodd.** | Fabaceae |
| ***Blighia unijugata* Baker.** | Sapindaceae |
| ***Bombax glabra* L.** | Bombacaceae |
| ***Bridelia cathartica* G.Bertol.** | Euphobiaceae |
| ***Bridelia micrantha* Baill.** | Burseraceae |
| ***Cammiphora africana* Engl.** | Burseraceae |
| ***Canthium zanzibarensis* Lam.** | Rubiaceae |
| ***Capparis tomentosa* Lam.** | Capparaceae |
| ***Cassia sp*** | Fabaceae |
| ***Catha edulis* Forssk. ex Endl.** | Celastraceae |
| ***Celtis sp*** | Ulmaceae |
| ***Cissus sp*** | Vitaceae |
| ***Cola sp*** | Sapindaceae |
| ***Commiphora africana* Engl.** | Burseraceae |
| ***Cremaspora triflora* K. Schum.** | Rubiaceae |
| ***Cussonia sp*** | Araceae |
| ***Cyperus sp*** | Cyperacea |
| ***Deinbollia berbonia* Radlk** | Sapindaceae |
| ***Dichrostachys cinerea* A. DC.** | Fabaceae |
| ***Diospyros mafiensis* F. White.** | Ebenaceae |
| ***Diospyros mespiliformis* Hochst. ex A. DC.** | Ebenaceae |
| ***Diospyros natalensis* L.** | Ebenaceae |
| ***Diospyros squarrosa* Klotzsch.** | Ebenaceae |
| ***Drypetes natalensis* Hutch.** | Euphobiaceae |
| ***Ehretia bakeri* P. Browne** | Boraginaceae |
| ***Erythrophloeum sp*** | Leguminoseae |
| ***Euclea natalensis* A. DC.** | Ebenaceae |
| ***Euphobia candelabrum* Kotschy.** | Euphobiaceae |
| ***Fadogia sp*** | Rubiaceae |
| ***Ficus sp*** | Moracea |
| ***Ficus sur* Fossk.** | Moracea |

| | |
|---|---|
| ***Garcinia sp*** | Clusiaceae |
| ***Gloriosa superba* L.** | Liliaceae |
| ***Grewia similis* Baker f.** | Tiliaceae |
| ***Grewia sp*** | Tiliaceae |
| ***Haplocoelum inoploeum* R.** | Sapindaceae |
| ***Landolphia kirkii* Dyer. ex Hook.** | Apocynaceae |
| ***Lannea sp*** | Anacardiaceae |
| ***Ludia mauritianum* Scop.** | Flacourtiaceae |
| ***Manilkara sulcata* A.** | Sapotaceae |
| ***Markhamia sp*** | Bignoniaceae |
| ***Maytenus sp*** | Celastraceae |
| ***Milicia excelsa* C. C. Berg** | Moracea |
| ***Mimusops fruticosa* L.** | Sapotaceae |
| ***Mkilua fragrans* Schltr.** | Annonaceae |
| ***Olax dissitiflora* Oliv.** | Olacaceae |
| ***Ozoroa mucronata* Delile.** | Anacardiaceae |
| ***Pavetta sp*** | Rubiaceae |
| ***Phyllanthus sp*** | Euphobiaceae |
| ***Rhiocissus sp*** | Vitaceae |
| ***Rhoicissus sp*** | Vitaceae |
| ***Rhus sp*** | Anacardiaceae |
| ***Rinorea ilicifolia* Welw. ex Oliv.** | Violaceae |
| ***Salacia sp*** | Celastraceae |
| ***Sapindus saponaria* Radlk.** | Sapindaceae |
| ***Sapindus spongia* Radlk.** | Sapindaceae |
| ***Sorindeia madagascariensis* Thouars.** | Anacardiaceae |
| ***Sterculia africana* Lour.** | Steraculiceae |
| ***Strychnos sp*** | Loganiacea |
| ***Suregada zanzibariensis* Baill.** | Euphobiaceae |
| ***Syzygium cumminii* Gaertn.** | Myrtaceceae |
| ***Tricalysia sp*** | Rubiaceae |
| ***Trichilia emetica* Vahl.** | Meliaceae |
| ***Uvaria acuminata* Oliv.** | Annonaceae |
| ***Vepris sp* Comm. ex A. Juss** | Rutaceae |
| ***Vepris stolzii* I. Verd.** | Rutaceae |
| ***Vitex sp*** | Verbenaceae |
| ***Xylopia sp*** | Annonaceae |
| ***Ziziphus mucronata* Willd.** | Rhamnaceae |
| **TOTAL** | **75** |

#### 4.1.1.2 Fauna species richness of coastal forest of Mafia Island

##### 4.1.1.2.1 Bird's species richness

A total of 39 birds species were identified from the study area (Table2). The dominant birds species were *Camaroptera branchyura and Turtur chalcospilos* which were 6 in each followed by *Dryoscopus cubla* which were 5, *Andropadus importunus* and *Pogoniulus bilineatus* which were 4 in each, *Pycnonotus barbatus, Haliacetus vociffer* and *Cinnyris venusta* which were 3 in each, *Centropus supercihosus, Lamprotornis Corruscus, Lanius isabellinus, Merops persicus,*and *Terpsiphone viridis* which were 2 in each. The mentioned bird's species were found to have large frequency of occurrence in the two forests (Mlola and Juani) than other bird's species. The 39 birds species belonged to 26 different families in which the families Columbidae, Cuculidae, and Nectariniidae were more common having 4 different species in each followed by Turdidae, Pycnonotidae, Platysteiridae, Malaconotidae, Coraciidae, and Capitonidae with 2 different species in each, the remaining 17 families had one type of specie in each.

**Table 2: Bird's species richness**

| Scientific name | Family | Order |
|---|---|---|
| ***Andropadus importunus*** | Pycnonotidae | Passseriformes |
| ***Apus apus*** | Apodidae | Passseriformes |
| ***Bostrychia hagedash*** | Threski - ornithidae | Passseriformes |
| ***Bradomis palliclus*** | Muscicapidae | Passseriformes |
| ***Bubulcus ibis*** | Ardeidae | Passseriformes |
| ***Bubulcus ibis*** | Ardeidae | Passseriformes |
| ***Camaroptera branchyura*** | Sylviidae | Falconiformes |
| ***Centropus supercihosus*** | Cuculidae | Falconiformes |
| ***Chrysococcyx*** | Cuculidae | Passseriformes |
| ***Chrysococcyx klaas*** | Cuculidae | Passseriformes |
| ***Cichladusa arquata*** | Turdidae | Passseriformes |
| ***Cichladusa guttata*** | Turdidae | Passseriformes |
| ***Cinnyris bifasciata*** | Nectariniidae | Passseriformes |
| ***Cinnyris venusta*** | Nectariniidae | Passseriformes |
| ***Coracias caudata*** | Coraciidae | Passseriformes |
| ***Cuculus solitarius*** | Cuculidae | Passseriformes |
| ***Dryoscopus cubla*** | Malaconotidae | Passseriformes |

| | | |
|---|---|---|
| ***Eurystomus glauculus*** | Coraciidae | Passseriformes |
| ***Haliacetus vociffer*** | Accipoitridae | Falconiformes |
| ***Hedydipna collaris*** | Nectariniidae | Passseriformes |
| ***Lamprotornis Corruscus*** | Sturnidae | Passseriformes |
| ***Lanius isabellinus*** | Laniidae | Passseriformes |
| ***Lonchura cuculata*** | Emberizidae | Passseriformes |
| ***Merops apiaster*** | Meropidae | Passseriformes |
| ***Merops persicus*** | Meropidae | Passseriformes |
| ***Nectarinia amethystina*** | Nectariniidae | Passseriformes |
| ***Numida meleagris*** | Numididae | Passseriformes |
| ***Oeria capensis*** | Columbidae | Passseriformes |
| ***Passer griseus*** | Passeridae | Passseriformes |
| ***Platysteira cyanea*** | Platysteiridae | Passseriformes |
| ***Platysteira peltata*** | Platysteiridae | Passseriformes |
| ***Pogoniulus bilineatus*** | Capitonidae | Passseriformes |
| ***Pogoniulus bilineatus*** | Capitonidae | Passseriformes |
| ***Pycnonotus barbatus*** | Pycnonotidae | Passseriformes |
| ***Streptopelia capicola*** | Columbidae | Passseriformes |
| ***Terpsiphone viridis*** | Monorshidae | Passseriformes |
| ***Trepsiphone viridis*** | Monorchidae | Passseriformes |
| ***Turtur chalcospilo*** | Columbidae | Passseriformes |
| ***Turtur tympanistria*** | Columbidae | Passseriformes |
| **TOTAL** | **39** | |

#### 4.1.1.2.2 Insect species richness

A total of 53 insect's species were identified from the study area (Table3). The dominant insects species were *Plafypteura capensis* and *Colotis euippe* which were 4 in each, *Crematogaster peringueyi*, *Euphaedra neophron,* and *Papilio aphidiciphalus* which were 3 in each, *Tetraponera sp, Philoliche rostrata, Leptosia alcestainalcesta, Graphium antheus,*and *Anopheles cinereus* which were 2 in each.The mentioned species were found to have large frequency of occurrence in the two forests (Mlola and Juani). The 53 insects species belonged to 21 different families in which the families Pieridae, Formicidae, Papilionidae, Nymphalidae, Blaberidae, Lycaenidae,Acrididae, Anthopioridae, Tabanidae, Thespidae, were more common having 9,7,6,6,3,3 and 2 different species in the last families respectively, the remaining 10 families had one type of specie in each.

**Table 3: Insect's species richness**

| Scientific name | Family | Order |
|---|---|---|
| ***Acrae oncaea*** | Nymphalidae | Lepidoptera |
| ***Acrae petraea*** | Nymphalidae | Lepidoptera |
| ***Ammophila ferrugineipes*** | Sphecidae | Orthoptera |
| ***Anopheles cinereus*** | Culicidae | Diptera |
| ***Apis mellifera*** | Apidae | Hymenoptera |
| ***Belenois creona severina*** | Pieridae | Lepidoptera |
| ***Belonogaster dubia*** | Vespidae | Hymenoptera |
| ***Blepharoclera discoidalis*** | Blaberidae | Blattodea |
| ***Catopsilia florella*** | Pieridae | Lepidoptera |
| ***Cenaeus carnifes*** | Alydidae | Hemiptera |
| ***Colotis euippe*** | Pieridae | Lepidoptera |
| ***Crematogaster peringueyi*** | Acrididae | Orthoptera |
| ***Crematogaster peringueyi*** | Formicidae | Hymenoptera |
| ***Cymothae coranus*** | Nymphalidae | Lepidoptera |
| ***Dixeia doxo parva*** | Pieridae | Lepidoptera |
| ***Doxoscopa laurentia laurentia*** | Pieridae | Lepidoptera |
| ***Euphaedra neophron*** | Pieridae | Lepidoptera |
| ***Eurema brigitta*** | Pieridae | Lepidoptera |
| ***Graphium antheus*** | Papilionidae | Lepidoptera |
| ***Graphium p.policenes*** | Papilionidae | Lepidoptera |
| ***Graphium p.porthaon*** | Papilionidae | Lepidoptera |
| ***Heraclia sp*** | Agaristidae | Lepidoptera |
| ***Hoplocoryphella grandis*** | Thespidae | Mantodea |
| ***Hostilia carinata*** | Blaberidae | Blattodea |
| ***Hostilia sp*** | Blaberidae | Blattodea |
| ***Hylites encedon encedon*** | Nymphalidae | Lepidoptera |
| ***Hypolycaena c.caeculus*** | Lycaenidae | Lepidoptera |
| ***Junonia archesia*** | Pieridae | Lepidoptera |
| ***Junonia n. Natalica*** | Nymphalidae | Lepidoptera |
| ***Leptosia alcestainalcesta*** | Pieridae | Lepidoptera |
| ***Lofaus nasisii*** | Lycaenidae | Lepidoptera |
| ***Lolaus s. Silarus*** | Lycaenidae | Lepidoptera |
| ***Microcerotermes sp*** | Termitidae | Isoptera |
| ***Microsflum sp*** | Asilidae | Diptera |
| ***Mylothris rueppellii haemus*** | Thespidae | Lepidoptera |
| ***Myrmicaria natalensis*** | Formicidae | Hymenoptera |
| ***Palmipenna aeoleoptera*** | Nemopteridae | Neuroptera |

| | | |
|---|---|---|
| ***Papilio aphidiciphalus*** | Papilionidae | Lepidoptera |
| ***Papilio d.demodocus*** | Papilionidae | Lepidoptera |
| ***Papilio dardanus cenea*** | Papilionidae | Lepidoptera |
| ***Phalanta e.eurytus*** | Nymphalidae | Lepidoptera |
| ***Philoliche rostrata*** | Tabanidae | Diptera |
| ***Philoliche rostrata*** | Tabanidae | Diptera |
| ***Plafypteura capensis*** | Cicadidae | Hemiptera |
| ***Pochycondyla tarsata*** | Formicidae | Hymenoptera |
| ***Polyrhachis gagates*** | Formicidae | Hymenoptera |
| ***Sphingonotus scabriculus*** | Acrididae | Orthoptera |
| ***Streblognathus aethiopicus*** | Formicidae | Hymenoptera |
| ***Tetraponera sp*** | Formicidae | Hymenoptera |
| ***Tetremorium capense*** | Formicidae | Hymenoptera |
| ***Tivia termes*** | Polyphagidae | Blattodea |
| ***Trichoplusia orichalcea*** | Noctuidae | Lepidoptera |
| ***Xylocopa caffora*** | Anthopioridae | Hymenoptera |
| ***Total*** | **53** | |

### 4.1.2 Species diversity

#### 4.1.2.1 Species diversity of fauna in coastal forest of Mafia Island

##### 4.1.2.1.1 Species diversity of birds

The diversity of bird's species is shown in Table 4. The bird's diversity of the whole forest was 0.0995 by using Simpson's Index (D), the same diversity was 3.4201 by using Shannon Index (H).

##### 4.1.2.1.2 Species diversity of insects

The diversity of insect's species is shown in Table 4. The insect's diversity of the whole forest was 0.0245 by using Simpson's Index (D), the same diversity was 3.8259 by using Shannon Index (H).

**Table 4: Species diversity of fauna (birds and insect) species of Mafia Island FR's**

| Type of species | Species rishness | Diversity Indices | |
|---|---|---|---|
| | | Simpson's Index (D) | Shannon Index (H') |
| Birds | 39 | 0.0995 | 3.4201 |
| Insects | 53 | 0.0245 | 3.8259 |

### 4.1.3 Fauna species and conservation status based on IUCN list.

The International Union for Conservation of Nature (IUCN) is the world's main authority on the conservation status of species. IUCN of 2010 has categorized fauna species of Mafia Island as vulnerable, so far none of the specie was found in the risk of extinction. (Appendix1).

## 4.2 DISCUSION

### 4.2.1 Species richness

Species richness is the total number of species found in a particular area or within a habitat or community. Species richness is used to measure the level of diversity. Species richness may be disturbed by human activities such as Burning of woody plants, Forest fires, Illegal logging, etc. Species richness of the two species (flora and fatuna) and the occurrence of high populations of several species indicate less disturbances on the two forests (Mlola and Juani) All coastal forests known to be to birds and other fauna are Forest Reserves and were recently designated as Important Birds Areas and other fauna (Clarke, 1999). In spite of this, an increased conservation initiative in these two forests is urgently needed because in reality the forests are poorly protected from illegal cutting, charcoal exploitation and subsistence farming.

### 4.1.2 Species diversity

#### 4.1.2.1 Simpson's index (D)

Simpson's index (D) is the measurements of species diversity, Simpson's index (D) of the flora and fauna (birds and insects) species in the whole forest of Mafia Island were 0.0763, 0.0995 and 0.0245 respectively. A large number of Simpson's index close to one means a high level of dominance but poor species diversity on other hand a low number of Simpson's index (near to zero) indicates a low level of dominance, but high species diversity (Luoga, 2000). Therefore the Simpson's index (0.0763, 0.0995, and 0.0245) from the data analysed

implies that there is more diverse of flora,bird and insect species in the coastal forest of Mafia Island.

#### 4.1.2.2 The Shannon wiener index (H)

Shannon wiener index (H) is also the measurements of species diversity. shannon wiener index of the flora and fauna (birds and insects) species in the whole forest of Mafia Island were 3.0525, 3.4201, and 3.8259 respectively. The value of shannon wiener index (H) of diversity is normally found to fall between 1.5 and 3.5 and 4.5 at rare cases, if the value is close to five it implies high diverse of particula species (Michael, 1984; Mittermeier *et al*., 1998). Therefore the Shannon wiener index (3.0525, 3.4201, and 3.8259) from the data analysed implies that there is more diverse of flora, bird and insect species in the coastal forest of Mafia Island.

### 4.1.3 Fauna species and conservation status based on IUCN list

The International Union for Conservation of Nature (IUCN) is the world's main authority on the conservation status of species. A series of Regional Red Lists are produced by countries or organizations, which assess the risk of extinction to species within a political management unit, if the species are not in the red list of endangered, near extinction, and threatened, then such species have not or less been disturbed (IUCN,2010). So far none of the specie was found in the risk of extinction. In spite of this, an increased conservation initiative in this forest is urgently needed inorder to enhance overall conservation activities in this area.

# CHAPTER FIVE

## 5.0 CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

The results obtained for flora and fauna of coastal forest reserves of Mafia Island indicate that this forests are not very much affected by the immediate communities hence results from diversity indices i.e., Simpson's (D) and Shannon wiener index illustrate that there is high species diversity in the forest reserves, also high species richness and the occurrence of high populations of several species indicate less disturbances on the coastal forests, on the other hand none of the species was found in the risk of extinction under IUCN red list of 2010 but rather vulnerable, this proves that the fauna species are not susceptible to contiguous anthropogenic actions. In spite of this, an increased conservation initiatives in this forest is urgently needed inorder to ensure sustainable conservation of species diversity in the area.

### 5.2 Recommendations

In order to meet the need/ intention of retaining flora and fauna species in the coastal forest of Mafia island and to enhance sustainable conservation of fauna diversity, we recommend that Mlola Forest Reserve and Juani Forest Reserves receive additional ornithological investigations, identifying and promoting better management practices for use of coastal forest natural resources (especially for non-wood products), identifying and promoting alternatives for meeting resource-based livelihoods needs outside natural forests (especially for wood products), such as establishing plantations for fuel wood, environmental education and awareness regarding longer-term trends in natural resources and the impacts of extractive activities, and more effective regulations and enforcement against unsustainable use, also further studies of these little-known areas will provide important information to help preserve some of the last-remaining viable stands of coastal forests in Tanzania.

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## LIST OF APPENDICES

### Appendix 1: Conservation status of fauna species as categorized by IUCN red list of 2010

| Common Name(s) | Scientific name | IUCN |
|---|---|---|
| Emerald spotted wood dove | *Turtur chalcospilos* | Vulnerable |
| African fish eagle | *Haliacetus vociffer* | Vulnerable |
| White broused coacal | *Centropus supercihosus* | Vulnerable |
| Grey backed camaroptera | *Camaroptera branchyura* | Vulnerable |
| Black backed puff back | *Dryoscopus cubla* | Vulnerable |
| Grey headed sparrow | *Passer griseus* | Vulnerable |
| Variable Sunbird | *Cinnyris venusta* | Vulnerable |
| Pale Flycatcher | *Bradomis palliclus* | Vulnerable |
| Yellow Rumptedtinker bird | *Pogoniulus bilineatus* | Vulnerable |
| Yellow vented bulbul | *Pycnonotus barbatus* | Vulnerable |
| Isabeline Shrike | *Lanius isabellinus* | Vulnerable |
| Collared palm – Thrush | *Cichladusa guttata* | Vulnerable |
| Black Bellied Starling | *Lamprotornis Corruscus* | Vulnerable |
| African paradiseflycatcher | *Terpsiphone viridis* | Vulnerable |
| Sombre Green bull | *Andropadus importunus* | Vulnerable |
| Hadada ibis | *Bostrychia hagedash* | Vulnerable |
| Yellow Rumptedtinker bird | *Pogoniulus bilineatus* | Vulnerable |
| Collared palm – Thrush | *Cichladusa arquata* | Vulnerable |
| Grey backed camaroptera | *Camaroptera branchyura* | Vulnerable |
| Black backed puff back | *Dryoscopus cubla* | Vulnerable |
| African fish eagle | *Haliacetus vociffer* | Vulnerable |
| Variable Sunbird | *Cinnyris venusta* | Vulnerable |
| Yellow vented bulbul | *Pycnonotus barbatus* | Vulnerable |
| Grey backed camaroptera | *Camaroptera branchyura* | Vulnerable |
| Emerald spotted wood dove | *Turtur chalcospilos* | Vulnerable |
| White broused coacal | *Centropus supercihosus* | Vulnerable |
| Sombre Green bull | *Andropadus importunus* | Vulnerable |
| Variable Sunbird | *Cinnyris venusta* | Vulnerable |
| Black backed puff back | *Dryoscopus cubla* | Vulnerable |
| Namaqua dove | *Oeria capensis* | Vulnerable |
| Isabeline Shrike | *Lanius Isabellinus* | Vulnerable |
| Bronze mankinn | *Lonchura cuculata* | Vulnerable |
| Purple - banded sunbird | *Cinnyris bifasciata* | Vulnerable |
| Black Bellied Starling | *Lamprotornis Corruscus* | Vulnerable |
| Black throated wattle – eye | *Platysteira cyanea* | Vulnerable |
| Ring necked dove | *Streptopelia capicola* | Vulnerable |
| Cattle agret | *Bubulcus ibis* | Vulnerable |
| Red chested cuckoo | *Cuculus solitarius* | Vulnerable |
| Eurasian swift | *Apus apus* | Vulnerable |
| Diederik cuckoo | *Chrysococcyx* | Vulnerable |

| | | |
|---|---|---|
| Blue cheecked bee – eater | *Merops persicus* | Vulnerable |
| Blue cheecked bee – eater | *Merops Persicus* | Vulnerable |
| Black backed puff back | *Dryoscopus cubla* | Vulnerable |
| Grey backed camaroptera | *Camaroptera branchyura* | Vulnerable |
| Sombre Green bull | *Andropadus importunus* | Vulnerable |
| Black throated wattle – eye | *Platysteira peltata* | Vulnerable |
| Lilac brested rollar | *Coracias caudata* | Vulnerable |
| Broad billed roller | *Eurystomus glauculus* | Vulnerable |
| Eurasian bee – eater | *Merops apiaster* | Vulnerable |
| collared sunbird | *Hedydipna collaris* | Vulnerable |
| Tambourine dove | *Turtur tympanistria* | Vulnerable |
| Helmeted guinea fowl | *Numida meleagris* | Vulnerable |
| Black backed puff back | *Dryoscopus cubla* | Vulnerable |
| Yellow Rumptedtinker bird | *Pogoniulus bilineatus* | Vulnerable |
| Tambourine dove | *Turtur tympanistria* | Vulnerable |
| Grey backed camaroptera | *Camaroptera branchyura* | Vulnerable |
| African fish eagle | *Haliacetus vociffer* | Vulnerable |
| Yellow vented bulbul | *Pycnonotus barbatus* | Vulnerable |
| Emerald spotted wood dove | *Turtur chalcospilos* | Vulnerable |
| Grey backed camaroptera | *Camaroptera branchyura* | Vulnerable |
| Klaass cuckoo | *Chrysococcyx klaas* | Vulnerable |
| Yellow Rumptedtinker bird | *Pogoniulus bilineatus* | Vulnerable |
| African paradiseflycatcher | *Trepsiphone viridis* | Vulnerable |
| Amethyst sunbird | *Nectarinia amethystina* | Vulnerable |
| Sombre Green bull | *Andropadus importunus* | Vulnerable |
| Azure hair streak butterfly | *Hypolycaena c.caeculus* | Vulnerable |
| Cream striped swod tail | *Graphium p.porthaon* | Vulnerable |
| Forest leopard butterfly bado | *Phalanta e.eurytus* | Vulnerable |
| Smoky orange tip butterfly | *Colotis euippe* | Vulnerable |
| Straight - line sapphire buterfly | *Lolaus s. silarus* | Vulnerable |
| African migrant butterfly | *Catopsilia florella* | Vulnerable |
| Black veined white butterfly | *Dixeia doxo parva* | Vulnerable |
| Superb false tiger moth | *Heraclia sp* | Vulnerable |
| Needle - nose fly | *Philoliche rostrata* | Vulnerable |
| African honey bees | *Apis mellifera* | Vulnerable |
| Capenter bees | *Xylocopa caffora* | Vulnerable |
| Tetremorium_ Copense ants | *Tetremorium capense* | Vulnerable |
| African Stict ants | *Pochycondyla tarsata* | Vulnerable |
| Streblognathus aethiopicus ants | *Streblognathus aethiopicus* | Vulnerable |
| Slender ants | *Tetraponera sp* | Vulnerable |
| Blue - wing grasshopper | *Sphingonotus scabriculus* | Vulnerable |
| Cocktail ants | *Crematogaster peringueyi* | Vulnerable |
| Thread - Waisted wasps | *Ammophila ferrugineipes* | Vulnerable |
| Carton nest termites | *Microcerotermes sp* | Vulnerable |

| | | |
|---|---|---|
| Microsfylum flies | *Microsflum sp* | Vulnerable |
| Rock spoon - wing anthons | *Palmipenna aeoleoptera* | Vulnerable |
| Orange - wing bugs | *Plafypteura capensis* | Vulnerable |
| Large striped sword tail butterfly | *Graphium antheus* | Vulnerable |
| Smoky orange tip butterfly | *Colotis euippe* | Vulnerable |
| Broad - bordened grass - yellow butterfly | *Eurema brigitta* | Vulnerable |
| Cocktail ants | *Crematogaster peringueyi* | Vulnerable |
| Droptail ants | *Myrmicaria natalensis* | Vulnerable |
| Malaria mosquito | *Anopheles cinereus* | Vulnerable |
| Slender ants | *Tetraponera sp* | Vulnerable |
| Needle - nose fly | *Philoliche rostrata* | Vulnerable |
| Hostilia Sp - cockroach | *(Hostilia carinata)* | Vulnerable |
| Twin dotted boarder butterfly | *Mylothris rueppellii haemus* | Vulnerable |
| Gold banded forester butterfly | *Euphaedra neophron* | Vulnerable |
| Smoky orange tip butterfly | *Colotis euippe* | Vulnerable |
| Golden plusia moth | *Trichoplusia orichalcea* | Vulnerable |
| Zimbabwe yellow- banded | *Lofaus nasisii* | Vulnerable |
| Sapphire butterfly | *Doxoscopa laurentia laurentia)* | Vulnerable |
| Blond glider butterfly | *Cymothae coranus* | Vulnerable |
| Brown pansy butterfly | *Junonia n. natalica* | Vulnerable |
| African wood white butterfly | *Leptosia alcestainalcesta* | Vulnerable |
| Small striped sword tail butterfly | *Graphium p.policenes* | Vulnerable |
| Malaria mosquito | *Anopheles cinereus* | Vulnerable |
| Hoplocoryphella grandis mantid | *Hoplocoryphella grandis* | Vulnerable |
| Orang - wing bugs | *Platypteura capensis* | Vulnerable |
| Spider | *Pepsin hemipepsis* | Vulnerable |
| Trivia termescockroach | *Tivia termes* | Vulnerable |
| Hostilia Sp – cockroach | *Hostilia sp* | Vulnerable |
| Burrowing cockroach | *Blepharoclera discoidalis* | Vulnerable |
| Blood red Acraea butterfly | *Acrae petraea* | Vulnerable |
| Smoky orange tip butterfly | *Colotis euippe* | Vulnerable |
| Millipedes | *Archispirostreptus gigas)* | Vulnerable |
| Belonogaster dubia waps | *Belonogaster dubia* | Vulnerable |
| Cenaieus carnifex bugs | *Cenaeus carnifes* | Vulnerable |
| Orange - wing bugs | *Platypteura capensis* | Vulnerable |
| Unknown | *Polyrhachis gagates* | Vulnerable |
| White barred Acraea butterfly | *Hylites encedon encedon* | Vulnerable |
| Forest leopard butterfly | *Phalanta e.eurytus* | Vulnerable |
| Window Acraea butterfly | *Acrae oncaea* | Vulnerable |
| Garden inspecta butterfly | *Junonia archesia* | Vulnerable |
| Gold banded forester butterfly | *Euphaedra neophron* | Vulnerable |
| Large striped sword tail butterfly | *Graphium antheus* | Vulnerable |

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|---|---|---|
| Citrus swallotail butterfly | *Papilio d.demodocus* | Vulnerable |
| Gold banded forester butterfly | *Euphaedra neophron* | Vulnerable |
| Emperor swallowtail butterfly | *Papilio aphidiciphalus* | Vulnerable |
| African common white butterfly | *Belenois creona severina* | Vulnerable |
| Orang - wing bugs | *Platypteura capensis* | Vulnerable |
| Cocktail ants | *Crematogaster peringueyi* | Vulnerable |
| African wood white butterfly | *Leptosia alcestainalcesta* | Vulnerable |
| Mocker swallowtail butterfly | *Papilio dardanus cenea* | Vulnerable |