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UTUMI
Biodiversity surveys

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LIST OF ABBREVIATIONS

BPFL	Bucket Pit Fall Line
CITES	Convention in International Trade in Endangered species of Wild Fauna and Flora
DBH	Diameter at Breast Height
EPSF	Environment Peace and Stability Fund
FR	Forest Reserve
GIS	Geographical Information System
GPS	Global Positioning System
IUCN	The World Conservation Union
PFM	Participatory Forest Management
TANRIC	Tanzania Natural Resource Information Centre
TCS	Time Constrained Search
VBFR	Village Based Forest Reserve
VES	Visual Encounter Searching
UTUMI	Utunzaji wa Misity

1. INTRODUCTION

1.1. Background - the UTUMI project

The UTUMI project - short for "Utunzaji wa Misitu" in Kiswahili - is a Participatory Forest Management (PFM) project based in Lindi Region. Southeast Tanzania. It was started in January 2001 and funded under the Environment Peace and Stability Fund (EPSF) by Danida and the Government of Tanzania.

The project aims at supporting the introduction of a sustainable utilisation of the natural resources in the Lindi Region – including the extraction of products from adjacent woodlands and coastal forests. During the first three years the project will focus its activities on four pilot sites – two in Lindi District and two in Kilwa District. The project sites are selected in such a way that they include a woodland area and a Forest Reserve in each of the two districts. These are:

Lindi District

- Woodlands at Mihima (Rondo Plateau)
- Dimba Forest Reserve

Kilwa District

- Woodlands at Kikole
- Kitope Forest Reserve

The time perspective for the entire project is 15-20 years. At a later stage of the implementation all four districts in the Lindi Region are expected to be involved.

To ensure that the planning and implementation of the PFM project is founded on proper understanding of local conditions four base line surveys were carried out in 2001-2002:

1. Detailed mapping of the vegetation in Kilwa and Lindi Districts with particular focus on coastal forests including estimation of their biological value.
2. Socio-economic surveys of the four pilot areas.
3. Biodiversity surveys of the four pilot areas.
4. Survey of the impact of human activities in the woodlands and forests of the four pilot areas.

This report presents the results of the vegetation mapping of Kilwa and Lindi Districts and the biodiversity surveys in the four pilot sites. The socio-economic studies and the surveys of the human impact at the project sites are reported separately.

1.2. Vegetation mapping and biodiversity surveys

The vegetation mapping and biodiversity surveys serve two purposes in connection with the project cycle of UTUMI:

- To prepare a vegetation map of Kilwa and Lindi Districts with the present distribution of coastal forest and an estimation of the biological value of these forests. This project component has mainly importance when future pilot sites are to be selected under UTUMI.
- To provide UTUMI with up-to-date information on the biological values of the flora and fauna in the four pilot areas.

1.3. Mapping of the forest vegetation and estimation of biodiversity values

The mapping component was designed to include the entire Lindi & Kilwa Districts because the present UTUMI activities at the four sites in Lindi and Kilwa Districts in the future will be expanded to include more woodland and forests in both districts.

The mapping aims at presenting a detailed and up to date picture of the distribution of the main vegetation types of the region with particular focus on coastal forest. The mapping was based on analyses of satellite images. When possible, boundaries of forest reserves and other background information were derived from 1:250.000 digital map layers from Tanzania Natural Resource Information Centre (TANRIC).

Subsequent field visits to woodlands and forests in Lindi and Kilwa Districts were carried out to determine if the observed spectral differences of the woodlands/forests on the satellite images belonged to the same vegetation type.

During the initial analyses of the satellite images particular emphasis was paid on localising the remaining coastal forests of the region. The coastal forests are of particular biodiversity importance as they often contain high species diversity and the presence of large numbers of endemic and near-endemic plants and animals.

In addition detailed analyses of the vegetation of the four pilot areas were carried out.

Estimation of biological values was carried out based on existing information plus brief field visits to selected sites were focus was on tree species and birds (see below).

1.4. Biodiversity studies in pilot sites

Detailed biodiversity studies were carried out at the four pilot sites. The objective was to obtain information on the biodiversity in the pilot areas. This is important in order to ensure that the planning and implementation of the project activities in the four pilot areas are based on a proper understanding of the biological values. Furthermore the aim was to assess if the areas were of particular importance for rare and endangered species.

To monitor the biodiversity of the pilot areas a number of animal groups and plants were selected. When selecting the species groups emphasis was put on groups that were believed to be representative for the general diversity of the site. Further criteria were that they should be relatively easy to collect and that they should be generally well known from the region. This last criterion is of importance when the results obtained are to be seen in a regional perspective. For these reasons the following species groups were studied: tree species, birds, reptiles and amphibians.

1.5. Implementation of base line studies & acknowledgements

Ornis Consult carried out the base line activities in co-operation with University of Dar es Salaam (Dr. Frank Mbago, Dr. Kim Howell, Dr. Charles Msuya and Mr. Boniface Mhoro). In addition, a Danish student from University of Copenhagen participated in the implementation of the activities (Mr. Anders Tøttrup). The activities in the field were carried out in close co-operation with local Forest District staff. Staffs from Lindi and Kilwa Forest Districts participated in the field surveys and were trained in baseline biodiversity assessment techniques.

2. SUMMARY AND CONCLUSIONS

The natural vegetation of coastal Tanzania mainly consists of woodland. Scattered along the coast, on hills and at the foothills of the mountains of eastern Tanzania the woodland gives way to patches of coastal forest. All the remaining natural coastal forests of eastern Tanzania is of high conservation importance because they are rich in biodiversity (in particular in plants), highly fragmented and cover a small total area. Furthermore, the coastal forests are of special conservation importance because they have so many endemic plant species – species that are found nowhere else. It is believed that the level of endemism in the Eastern African coastal forests as a whole rank as one of the top ten priority ecosystems in Africa. In a recent analyses of coastal forests of eastern Africa together with the adjacent Eastern Arc Mountains was regarded as one centre of endemism and ranked as most important for the conservation of endemic species in the whole of tropical Africa.

During this study the remaining patches of coastal forest in Kilwa and Lindi Districts have been identified from satellite images and the biodiversity value of the larger areas have been assessed from existing data and information collected during brief site visits.

In Chapter 5 it is summarised what is known about the remaining coastal forests in the two districts with particular focus on the vegetation (forest trees) and birds (which are the best known groups). From a biodiversity perspective the most important coastal forests are located in Lindi District and form the Lindi Centre of Endemism (areas where species endemism occurs in much higher concentrations than elsewhere. This centre was originally thought to comprise Rondo, Chitoa and Litipo forests. Following this study it is clear that the coastal forest of Ruawa should be included in this centre of endemism because of the number of endemic and rare species recorded in 2001.

It Chapter 6 we present the results of field surveys of the biodiversity in the four pilot sites for the UTUMI project. Two of the sites are existing Forest Reserve (Dimba and Kitope) while the other two are new Village Based Forest Reserves designated in woodland areas (Mhima and Kikole).

Both of the forest reserves selected for inclusion in the UTUMI project are situated close to the sea on isolated hills outside the main centres of coastal forest biodiversity. Kitope Forest Reserve is heavily disturbed by logging and subsequent cultivation while Dimba Forest Reserve is disturbed by human activity to a much lesser extent.

Both forest reserves have rather impoverish faunas with low diversity and only small numbers of forest dependent bird species compared to some other coastal forests. Low diversity was also recorded among reptiles and amphibians although it should be noted that the sampling period was very dry and relatively few amphibians were active. No animal species of special conservation concern was recorded in the forest reserves.

Botanical, Kitope FR appear to have few coastal forest endemic probably mainly because most of the forest is cleared and converted to different types of woodlands and grasslands. The forest community of Dimba Forest Reserve however, appears to be largely intact. During this study two new (endemic) species of trees were discovered in Dimba. Both are quite common both due to their extremely limited range special precautions must be taken to protect them for being overexploited.

The two Village Based Forest Reserves are in fact woodland areas not forests. Although topographical rather different – Mihima is rather flat while Kikole is hilly – most of the animals

and plants recorded in the two VBFR were the same. Kikole has a higher diversity of birds and large mammals than Mihima because of the proximity of Selous Game Reserve.

The vegetation of both VBFR consists of different woodland, wooded grassland and shrub communities. All the plant species recorded from the VBFRs are common and widespread species without conservation concerns. Exploitation of timber trees and other plants of human importance have undoubtedly let to significant changes in the species composition of both woodlands. In particular among valuable timber trees this is likely to have caused some species to become rare or even locally extinct.

3. INTRODUCTION TO THE BIODIVERSITY OF COASTAL TANZANIA

In this chapter the current knowledge about the biodiversity of coastal Tanzania is summarised with particular focus on lowland forests.

3.1. The natural environment of coastal Tanzania

The natural vegetation of coastal Tanzania mainly consists of woodland. Scattered along the coast, on hills and at the foothills of the mountains of eastern Tanzania the woodland gives way to patches of coastal forest. Bushland and thicket also cover some areas. In river valleys and in connection with lakes swamp vegetation occur. Finally, mangroves are found along some parts of the coast.

The different types of woodlands, bushlands and swamp vegetation and mangroves that occur in east Tanzania is found in large parts of tropical Africa. By far the majority of plant and animal species of these vegetations are widespread and common. This is in strong contrast to the flora and fauna of the coastal forests, which is often local and rare. The forests of east Tanzania belong to a vegetation type that is limited to a narrow belt along the Indian Ocean from the extreme south of Somalia to mid- Mozambique (Map 1). What separate these forests from other lowland (and montane) forests in Africa is that a large number of trees and plants have their entire distribution limited to these forest patches. In contrast to the woodlands that share many species with woodlands in for instance Zambia and Angola, many of the forests trees of east Tanzania have very limited distributions – sometimes they are found in only one or two of the forest patches. This unique situation makes the coastal forests of east Tanzania of particular biological interest and the plants and animals of these forests will therefore be the main focus of the chapter. Since the UTUMI project also includes woodlands as pilot sites, short accounts on the flora and fauna of these vegetation types are included.

3.2 The flora of east Tanzanian woodlands

Woodland refers to stands of trees reaching a height of app. 15 m with the crowns just touching to form an open canopy. In contrast to forests the ground usually has a grass cover. The woodlands of coastal Tanzania are usually deciduous or semi-deciduous but contain some evergreen species. This is an adaptation to the long and harsh dry season.

The miombo woodland – or *Brachystegia-Julbernardia* woodland – is one of the most widespread vegetation types in Africa. This vegetation includes several trees of some economic importance. The miombo woodlands cover about two-thirds of Tanzania and extend several thousand kilometres south through Zambia and Mozambique to Zimbabwe and westward to Angola. Phytogeographically, these woodlands are part of the "Zambezian Woodland Element".

The diversity of tree species differs much from place to place and there are sometimes local concentrations of one species. Generally, woodlands comprise of quite large numbers of tree species most of which are widespread and common.

Map 1. The coastal forest belt in eastern Africa. (from Burgess & Clarke 2000).

3.3 The fauna of east Tanzanian woodlands

Except for a few conspicuous animal groups such as mammals, birds and butterflies the knowledge about the fauna of the coastal woodlands is rather limited. What is known is that for many animals groups (for instance mammals and birds) the woodlands are very rich in species. Most of the woodland animal species appear to be widely distributed in woodlands of southern Africa. Only few of the woodland species are known to be endangered.

The diversity of animals also differs much from place to place. Locally, large mammals are common and include species such as lion, elephant, buffalo and several species of antelopes. The avifauna is also rich with more than 120 different species occurring at the same spot. Most of the mammals and birds occurring in woodlands are widespread and common over large parts of Africa. Many of the species – in particular among the large mammals – also live in other more open habitats such as grassland and bushlands and thickets. Much less in known about smaller animals but the trend seems to be the same as for mammals and birds, that woodlands species are normally widespread and common in a large part of Africa. From a conservation point of view plants and animals of African woodlands are not of high priority as they are normally not under serious threat.

3.4 The flora of Eastern African Coastal Forests

From a conservation viewpoint the lowland forests of coastal Tanzania is of much higher concern. Although these forests may look similar to lowland forests in other parts of Africa such as the huge lowland forests of Central and West Africa, the plant and animal species are mostly different.

In Tanzania the coastal forests consists of small to medium size forest patches surrounded by woodlands, shrubland, grassland, cultivations etc. These forests in eastern Tanzania are not believed to have formed a continuos cover but rather consisted of distinct communities with different types of forest that have been more or less isolated for a very long time.

Coastal lowland forest patches also occur in a narrow zone in the coast of Kenya north to the extreme south of Somalia. In addition, lowland forest patches occur in northern Mozambique south to Inhambane and inland to the foothills of the mountains in southern Malawi (Map 1).

Large areas of forest must have been burnt or lost throughout history to clear land for hunting and agriculture (Hawthorne 1993). In recent decades they have been largely removed from the heavily populated coastal regions in order to provide wood and farmland.

The coastal forest patches of eastern Africa has long been recognised to contain a different flora from that further inland, yet the floristic importance of this area was only quite recently recognised by its classification as a distinct vegetation zone based on the high number of plant species limited to this area (Clarke *et al*. 2000). The distinct vegetation zone along the coastal strip of tropical Africa was first identified in the 1970ies (by White 1976) and subsequently named the “Zanzibar-Inhambane floristic region” (White 1983). Recently Clark (2000) has refined this floristic division and renamed in the “Eastern African Coastal Forests”.

Long stretches of open grassland, shrubland and different type of woodland have separated the individual forest patches but also the coastal forests from the large lowland forests of Central and West Africa. In the past coastal forest patches were more extensive that at present. In Tanzania, the coastal forests are believed to have previously covered the wetter parts of the coastal region inland to the Eastern Arc Mountains. At the foothills of these mountains the

mountainous flora of the eastern Arc Mountains mixed with the coastal lowland forest to form very complex plant communities. However, at greater height a predominantly mountainous flora that consists of other species that in the lowlands covers the Eastern Arc and the other mountains of eastern Africa.

The coastal lowland forest vegetation of Tanzania share tree species with a number of other African forest/woodland blocks. The most important are the lowland forests of West and Central Africa, the Afromontane Forests of the Eastern Africa and the Zambezian Woodland Element. However, what make the coastal forests unique and of immense conservation importance is the fact that very large numbers of the tree species are endemic – that is occur no where else.

Inventories from 13 coastal forests in Tanzania found one third of the vascular plant species to be restricted to the "Eastern African Coastal Forest" block (Burgess & Clarke 2000). It has also been found that these restricted range species may account for more than half of individual trees in the coastal forests (Burgess & Clarke 2000). The number of tree species restricted to the lowland forests along the eastern African coastal strip total at least 1356 endemic species and at least 33 endemic genera (Burgess and Clarke 2000).

The coastal forests of eastern Tanzania differ considerably from place to place because they are made up of different plant communities. This again reflects difference in soil, annual rain, and length of dry season and so forth. In coastal Tanzania south of the Rufiji River the following lowland forest communities have are recognised (Clarke 2000):

- Eastern African Coastal Dry Forest
- Eastern African Coastal Scrub Forest
- Eastern African Coastal *Brachystegia* Forest
- Eastern African Coastal Riverine/Groundwater/Swamp Forest

In particular Eastern African Coastal Dry Forest and Eastern African Coastal Scrub Forest are very complex vegetations that could be further sub-divided. Furthermore, it should be noted that although the vegetation of the forest patches can usually be referred to one of the forest communities listed above, the actual composition of tree species of a particular site is often unique.

In Chapter 5 maps will be presented with descriptions of the remaining coastal forest patches in Kilwa and Lindi Districts.

3.5 The fauna of the Eastern African coastal forests

The distinct fauna related to the coastal forests of eastern Africa was firstly recognised for birds by Moreau (1966). He demonstrated that although some species of birds associated with lowland forest was found in both the coastal forests of East Africa and the large lowland forest of Central and West Africa a considerable number of species (and subspecies) were endemic to the strip of coastal forest he named the "East Africa coastal forests" (Moreau 1966).

Although much sampling of animals has been carried out in recent decades much of the collected specimens have still not been worked. Relatively little is therefore known about the animals of the coastal forests except for a few specific groups. The best studied so far appear to be birds, amphibians, reptiles and certain groups of mammals. Based on this limited knowledge it appears that the fauna of the coastal forests share some of the biogeographical patterns of the

plants, although the degree of endemism is lower. However, this could well change when less mobile animals groups such as invertebrates become better studied.

The birds of East African coastal forests

As birds is probably the best known animal group of the East African coastal forests their occurrence in these forests can be used to illustrate what is generally believed to be a common biogeographical pattern among animal groups of these forests. To simplify the discussion in the following the discussion will be focused on the birds of Tanzanian coastal forests south of the Rufiji River.

Initially, it is important (1) to define what is a "forest bird" in contrast to birds of more open habitats and (2) to outline what is a lowland species as opposed to a montane species.

Forest birds – or Forest Dependent bird species – are typical of the forest interior and likely to disappear when the forest is modified.

Lowland forest birds are defined as bird species that in coastal Tanzania have their entire or almost the whole of the breeding population in forests below 900 m (further inland the limit is usually set at 1,500 m).

Species richness

At least 130 species of birds have been recorded from coastal forests in Southeast Tanzania.

However, following the definition above only 13 Forest Dependent species occur in the forest patches south of the Rufiji River. 12 of these also occur in the montane forests which means that Reichenow´s Batis *Batis reichenowi* is the only strictly lowland Forest Dependent bird species that occur in southeast Tanzania. In fact, this bird is endemic to the lowland forest patches of coastal Tanzania south of the Rufiji River.

In addition to the strict forest species large numbers of species occur that live inside the forest but also occur in dense woodlands and other more open habitats. For this reason the typical number of bird species recorded in a coastal forest in Southeast Tanzania is 50-70.

Biogeographical relationships

Few of the forest species or partly forest dependent species in the coastal forests are also found in the vast lowland forests of Central and West Africa. One example is the Red-tailed Ant-thrush *Neocossyphus rufus*, which in fact is not a strict forest species in East Africa as it also occurs in dense woodlands.

The coastal forest avifauna of Tanzania has most in common with that of the Eastern Arc Mountains with several species endemic to these two forest types. The close affinities between the bird fauna of the coastal forests and the Eastern Arc mountain forests is seen in the fact that the majority of forest dependent species of south-eastern lowland forests also occur in mountain forests further inland. As mentioned above, only one Forest Dependent species (Reichenows Batis) occur is restricted to lowland forest.

Species endemism

Coastal Forest endemics

Five bird species are endemic to the East African coastal forest. Only one of these occur in the forests of southeast Tanzania: Reichnow`s Batis *Batis reichenowi*. This bird has so far only been recorded from Tanzanian coastal forests south of the Rufiji.

The Green Barbet *Stactolaema olivacea* occurs only in coastal forests of eastern Africa and South Africa, and locally in mountain forests of eastern Africa. The subspecies "*hylophona"* of this species is endemic to the Rondo Plateau and Ngarama North and South FRs. During this study Green Barbets that almost certainly belonged to this subspecies were also observed in Mitundumbea FR. This species is also found in other habitats than coastal forests such as dense woodland.

Birds listed on BirdLife International Saving Species Index (June 2002)

The following bird species which occur in coastal forest in SE Tanzania are listed by BirdLife International as either Endangered, Vulnerable or Near-threatened:

Endangered bird species

The Spotted Ground Thrush *Turdus fisheri* is a rare and local inhabitant of coastal forests that migrate between forest in Southeast Tanzania where the only known breeding place is Rondo Forest Reserve and non-breeding areas in coastal forests in Kenya. This species also has a small and declining population in coastal forests in Natal and there are few scattered records from other areas in tropical Africa. This is considered one of the rarest birds in Africa and is listed as an Endangered Species by IUCN (2002).

Vulnerable bird species

The little elusive thrush East Coast Akalat *Sheppardia gunningi* is an extremely local forest bird from Kenya, Tanzania, Malawi and Mozambique. In Tanzania it was known only from Pugu Hills near Dar es Salaam and 3 coastal forests in Lindi District (Rondo, Litipo & Chitoa FR). A fourth site was added when a population of this rare bird was discovered in Ruawa FR during this study.

Near-threatened bird species of coastal forests in Lindi region

Southern Banded Snake Eagle *Circaetus fasciolatus* occurs in coastal forests and adjacent woodlands from Somalia to South Africa. Although coastal forests are declining it is still widespread and in no immediate danger.

Plain-backed Sunbird *Anthreptes reichenowi* which occur in coastal forests and adjacent woodlands. It is common in places.

Migratory birds

The coastal lowland forests of Tanzania are not only important for resident species. Migrants from other parts – including rare and threatened species - occur in the forest patches of Lindi region in certain parts of the year. The number of migratory birds spending the northern winter

in coastal forests of Tanzania is very low – most occur in more open habitats. However, a small number of very interesting species regularly move between different forests of East Africa.

Inter-African migration

In addition to the Spotted Ground Thrush mentioned above which move between different coastal forests some montane forest dependent species move into the adjacent lowland forest during the dry season. The small thrush Starred Forest Robin *Pogonocichla stellata* moves into coastal forests far from the mountains where it breed. Barred Long-tailed Cuckoo *Cercococcyx montanus* is another example of a bird species that regularly move between montane forest and lowland forests and coastal woodlands. This species migrate from montane forest to lowland forest to breed during the rains. It appears to be a common a widespread bird in coastal forests in Lindi Region during the rainy season and was recorded several times during this study.

Other animal groups

Shrews, bats, galagoes and elephant shrews are key mammal groups of the Coastal Forests of Southeast Tanzania. This is because the coastal forest supports several endemic or near-endemic species of these groups. For instance one or two species of Galagoes may be endemic to a few forest patches in Lindi District (Bearder et al. 1994). The coastal forests are also regarded as the most important area in the world for elephant-shrews, closely followed by the Eastern Arc forests (Nicoll and Rathbun 1990).

94 species of reptiles are known from the East African Coastal Forests and 47 of these are believed to be Forest Dependent (Broadley and Howell 2000). Of these, 24 species are endemic to the coastal forests, and a further 13 species are otherwise found only in the forests of the Eastern Arc Mountains (Howell 1993). It is probable that further exploitation would increase this number. The list includes mainly geckoes, chameleons, worm snakes and snakes.

Fourteen species of amphibians are considered to be Coastal forest species at least to the extent that they are not known to breed in open situations, and have at least one record from a Coastal Forest (Poynton 2000).

3.6 Centres of endemism

As outlined above coastal lowland forests possess large numbers of endemic or threatened species. This applies to all the biological groups that have been studied so far.

Some of the species are endemic to the Eastern African Coastal Forest block while others has an even more limited distribution and are found only in a single or a few coastal forests. Such areas where species endemism occurs in much higher concentrations than elsewhere are often called centres of endemism. Areas with more than 100 endemic species (plants and animals together) are defined as local centres of endemism (*sensu* White 1993).

According to this definition there are two local centres of endemism along the East African coast (Map 2). One such centre is the Usambara-Kwala local centre of endemism, which includes the lowland forests of the Usambara Mountains and neighbouring forests in Kenya. The other is the Lindi local centre of endemism. This is a group of forest patches between the Lukuledi and Mbemkuru rivers.

The "Lindi" local centre of endemism

The Lindi local centre of endemism is defined as the lowland forests between the Lukuledi and Mbemkuru rivers to within 75 km inland (due west) of Lindi (Clarke in prep.). Most of the plants and animals endemic to this area are known from the Rondo, Litipo, Chitoa and Noto forests that have a total area of app. 100 square kilometre.

At least 90 species of plants are endemic to the forests of this centre of endemism. A particular concentration of endemic species known only from a single site or a very limited area occurs on the Rondo Plateau (*c. 60* species of trees) and Litipo forests (16 species).

Some animal species are also restricted to this area: One undescribed Galago is endemic (Rondo Galago – *Galagoides rondoensis*) to the forest patches on the seaward rim of the Rondo Plateau (Kingdon 1997).

3 species of forest reptiles are endemic: the skink *Scolecoseps litipoensis* endemic to Litipo Forest and Rondo Limbless Skink *Melanoseps rondoensis,* and Rondo Blind-snake *Typhlops rondoensis* known only from Rondo Forest Reserve.

In addition Rondo round-headed Worm Lizard *Chirindia rondoensis* is known only from woodlands of Rondo and Mahonde plateau.

It should also be mentioned that the forests of Rondo Plateau is the only known breeding area for the East African population of the endangered Spotted Ground Thrush.

The invertebrates have not been well studied, but for butterflies there are two endemic species.

Dimba Forest Reserve lies with the geographical boundaries of the Lindi Centre of endemism as defined by Clarke (2000) but rather isolated from the forest patches with the riches biodiversity and highest number of endemic species (Rondo, Litipo and Chitoa forests). Until recently one endemic tree was known from Dimba area (*Cynometra gillmanii*) but during the field work in connection with this study this tree was discovered in Mitundumbea Forest Reserve in Kilwa District. However, also in connection with this study what appear to be two new endemic species of trees were discovered in Dimba Forest Reserve. The fauna of Dimba Forest Reserve has no known endemic animals. The diversity of animal species – such as birds – is also lower in Dimba than in the core forests of Lindi centre of endemism.

In addition to the local centres of endemism 7 forest areas have been defined as minor centres of endemism (Burgess 2000). One of these – the Matumbi and Kischi Hills are situated in southeast Tanzania.

The Matumbi and Kichi Hills "minor centre of endemism"

This area of high land just south of the Rufiji river is rather poorly studied, but has been shown to be important. So far known are an undescribed species of shrew *Crocidura sp.* recorded in Tong`omba, at least three endemic species of plants, an endemic butterfly, and at least 16 undescribed species of millipedes (Burgess & Clarke 2000).

3.7 Conservation importance

Most of the natural coastal vegetation of Tanzania has been cleared or modified by man. The clearing of the coastal forests is a process that has been going on over thousands of years.

All the remaining natural coastal forests of eastern Tanzania is of high conservation importance because they are so highly fragmented and cover a small total area. However, some forest patches and/or forest areas are more important than others.

From conservation point of view forest dependent species are of particular interest since they will disappear when the forest is modified to any great extent. Forest dependent species that are also endemic to the coastal forests are of even higher conservation importance as they may go instinct if the forest area(s) where they occur is disturbed.

It is believed that the level of endemism in the Eastern African coastal forests as a whole rank as one of the top ten priority ecosystems in Africa (Burgess 2000). In a recent analyses for the World Bank the Eastern Arc and the Eastern Coastal forests was regarded as one centre of endemism and ranked as most important for the conservation of endemic species in the whole of tropical Africa (Mittermeir et al. 1998 cited in Burgess 2000).

Assessing the importance of the coastal forests of Tanzania south of the Rufiji River the two centres of endemism the “Lindi “ centre and the Matumbi-Kischi” centre are the most important (Burgess 2000). In particular the forest patches comprising the “Lindi centre” is of outstanding biodiversity value as it also has the highest species richness among plants, birds, mammals and reptiles and probably also among many other groups of animals of the coastal forests of south-east Tanzania.

Map 2. Centres of endemism within the eastern African Coastal Forests of Kenya and Tanzania (from Burgess and Clarke 2000).

4. METHOD

4.1 Introduction

This chapter describes the methods used for collection new information on the flora and fauna of Kilwa and Lindi Districts for the UTUMI project.

4.2. Mapping of coastal forest using remote sensing

The vegetation in Lindi & Kilwa Districts was identified and classified from Landsat ETM+ satellite images. Digital data was geo-rectified to the national UTM maps (either digital or paper) and corrected by the use of GIS. Field maps were produced by special digital enhancement of coastal forest classes spectral signatures. When possible, boundaries of forest reserves and other background information were derived from 1:250.000 digital map layers from Tanzania Natural Resource Information Centre (TANRIC). The position of the forest reserves on these maps often proved to be incorrect and adjustmade had to be made from GPS at reserve corner stones and by the use of co-ordinated from the literature. Matpwe Forest Reserve seems to be misplaced in all official maps

Field visits were made to forest and woodland in Lindi and Kilwa Districts to relate the observed spectral differences on the satellite images to the vegetation types. Based on this field verification, a supervised digital classification was made on the Landsat data that highlight the distribution and extent of coastal forests and woodlands in the two districts (Map 3).

The vegetation classes used in the satellite image analyses are mostly the ones defined by Clarke in Burgess and Clarke (2000). However, the satellite image analyses showed that for some vegetation classes there is a large variation in the spectral propoerties indicating that the vegetation class infact consist of several sub-groups with different domination of tree species. For this reason the vegetation classifivcation of this report has two types of legume dominated dry forest types, four types of dry forest and 8 scrub forest types.

The total area of the different vegetation classes appear high compared to information published previously. However, a large number of field visits to the different parts and vegetations in the two districts confirmed the remote sensing predictions.

4.3. Botanical studies

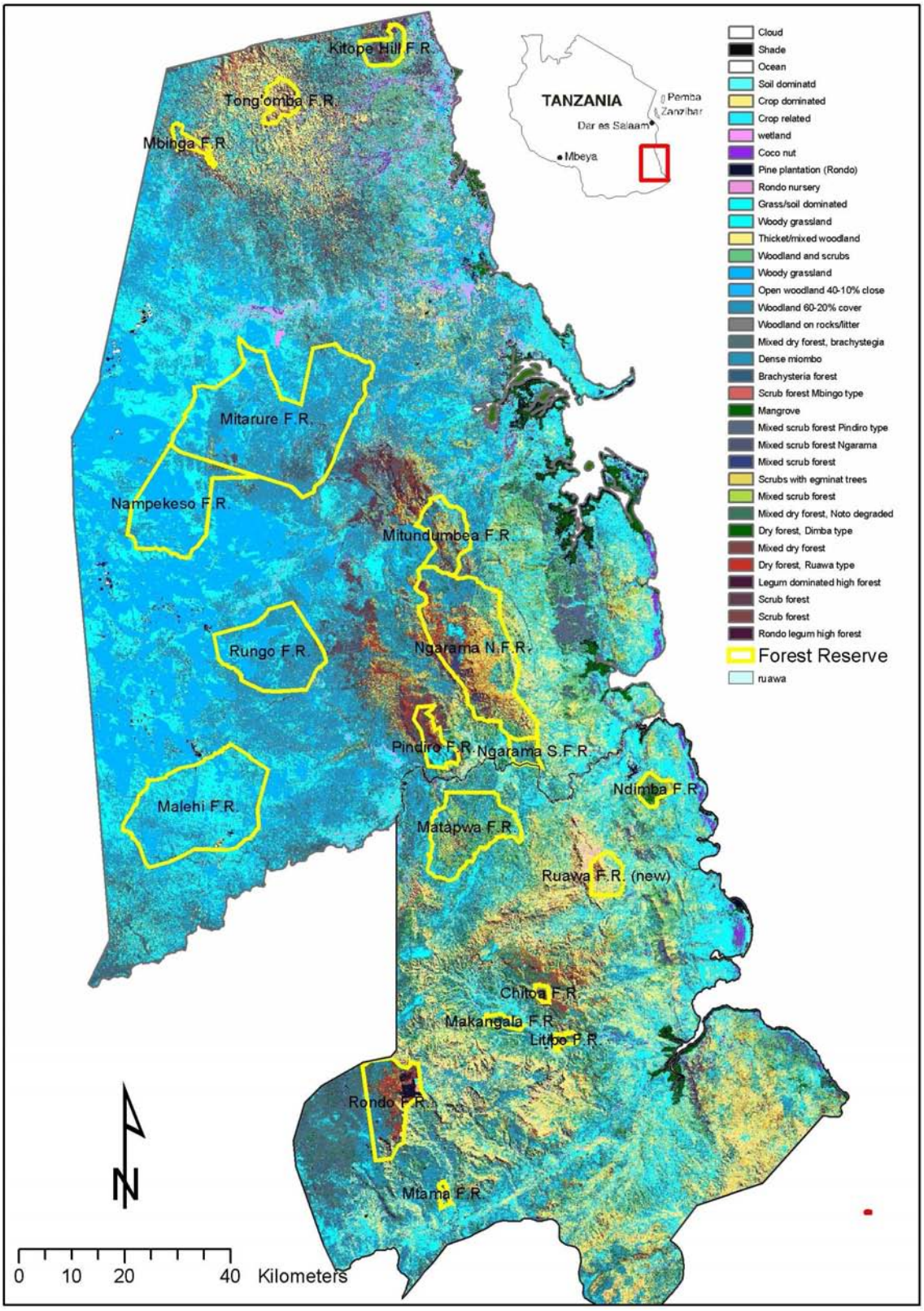
The flora survey was based on a combination of two methodologies:

The first was a qualitative method, which employed ground survey by car and on foot on each study site. This method was used for the classification of the vegetation types, collection of plant specimens and general identification of plant species occurring in the study area. Also it provided information to determine the status of particular forest patches as primary or secondary as well as to assess the exploitation timber and poles.

The second method was quantitative using a standardised method with sample plots of 60 m x 5 m for structural determination of the vegetation type. Most sample plots were carried out at sites

identified from satellite images. The exact position of these sites was subsequently found using a Global Positioning System (GPS). Other sample plots were established according to uniqueness of the vegetation types in the areas. In each established sample plot, all trees with a Diameter at Breast Height (DBH) of over 10cm had their DBH, Height and crown cover measured. Most of the trees were identified in the field. Unknown species had herbarium specimens collected, which were pressed and dried, in the field for further identification at the herbarium.

All specimens were collected in three sets. One set was for the herbarium of the University of Dar es Salaam, Tanzania, other set were for Kew Garden herbarium, UK and the Botanical Museum in Copenhagen Denmark for further identification and preservation for future references.



Map 3. The vegetation in Kilwa and Lindi Districts.

Instruments used in the field includes a Garmin 12 GPS for marking position of the transacts and locating marked position on satellite images map.

A tape measure of 50m was used to establish 60m x 5m sample and canopy cover of trees plot while a DBH tape were used to measure the DBH of trees. A Sunto hypsometer was used to measure the tree height.

A pair of plant presses with newspaper as bloating paper was used to press the specimens. Kerosene stove with woody plant drier was used for drying the plant specimens in the field. A pair of secateures were used for collecting fertile plant specimens.

The identification of some of the plant specimens will have to be confirmed by staff at the Botanical Museum in Copenhagen or Royal Botanic Gardens, Kew, UK.

4.4. Ornithological studies

Survey of the forest avifauna was carried out alongside the botanical work. During this study 6 coastal forests were studied. The bird surveys lasted 3 to 7 days at each place. The usefulness of forest birds as indicators for the general forest biodiversity is described in chapter 1.5.

The bird surveys were designed to determine which species of forest birds that occur in a particular coastal forest plot. These provide an estimate of the species richness and verify if endemic, rare or threatened bird species occur. In addition to the species list the fieldwork was designed to estimated the relative abundance of the patrticular species.

Two methods of data collection were used: mist netting and systematic observations:

Mist-netting. This method was used primarily to register ground dwelling species and other shy species that are difficult to record during the visual observations. Mist nets of 10 x 2 m were used. During the day when the nets were open they were visited approximately every hour. The birds caught in the nets were identified, measured, marked (by cutting the tip of one or two of the tail-feathers to know if a bird was a recapture) and released. The nets were closed at nigh and in the rare event of rain.

Systematic observations on foot. The purpose of this activity was to supplement the data from the mist netting in order to determine which species are found in a particular coastal forest. The observations were done using the “Fjeldså – list method”(1999) which again is based on the “MacKinnon - list method” (Mackinnon & Phillipps 1993): The observer slowly walks along natural paths and tracks and writes down all bird species seen and/or heard. Only species associated with the forest are listed. These observations are done within a specific study site of 1½-2 square kilometre in order to make the observations specifically associated with a particular area (vegetation). Collecting data this way makes it possible to evaluate to what extent the total number of forest birds have been recorded and to calculate the frequency a specific bird species was recorded.

4.5. Reptile and amphibian studies

Standard survey methods employed in other coastal and Eastern Arc forests were used in this survey. Pitfall traps and drift fences were used in an array termed a Bucket Pit Fall Line (BPFL). Each BPFL consisted of eleven 20 litre plastic buckets dug into the ground in such a way that they did not protrude, but allowed smaller amphibians and reptiles to fall into them. Each bucket had a number of small holes in the bottom to prevent rainwater from being trapped.

These buckets were arranged in a straight line, and over the middle of each was stretched a 0.5 m height plastic sheet stapled to vertical wooden support stakes. The “drift fence” was buried into the soil in such a way that any small herptile would be unable to pass under it. It was high enough to prevent smaller animals from climbing or jumping over it.

Such BPFLs have been shown to be extremely effective in sampling small forest amphibians, reptiles and mammals such as shrews and small rodents in coastal and Eastern Arc forests and often reveal the presence of species which otherwise would go unnoticed using traditional detection techniques such as visual encounter searching (VES) or plot sampling. BPFLs also offer an easy method to quantifying trap effort and catch.

Experience in trapping small mammals, amphibians and reptiles in coastal and Eastern Arc forests suggests that a ten night trapping effort is optimal. This is especially true in a species-rich environment; on occasion, it is the last or last but one night on trapping on which a species is recorded. If traps had not been set on that last night a species would have gone undetected. However, due to financial and time restrictions, we were not able to conduct such intensive sampling.

Although BPFL sampling is effective for small vertebrates of the forest floor, or burrowing forms, it is not effective in sampling animals which climb, or do not spend most of their time on the lower substratum. Therefore, a Time Constrained Search (TCS) method was also used to sample herptiles. Using this method, an observer or observers spend a fixed amount of time, and, it is assumed, a fixed effort, sampling a habitat. This includes not only recording animals simply observed on a path or moving in front of the observer, but also those which were detected under cover, such as logs, bark and rocks. The results of Time Constrained Search also permits the quantifying of search effort and result observations.

5. THE STATUS FOR THE COASTAL FORESTS IN KILWA AND LINDI DISTRICTS

5.1. Introduction

In this chapter the present status of lowland coastal forests in Kilwa and Lindi Districts is summarised. The summary includes information on the distribution and size of the remaining lowland forests, the forest types and knowledge about their biological value, human impacts and conservation status. Information on tree species, birds, mammals, amphibians and reptiles is presented when available.

Information on biodiversity and conservation issues was at first obtained from the literature – in particular Clarke (1995). In addition field visits were carried out to 16 forest areas during September – December 2001 to supplement the existing data. During these surveys information was collected on the forest vegetation (primarily the species of trees) and the avifauna. In the two coastal forests included in the UTUMI project a study of the amphibians and reptiles were also carried out.

The mapping of lowland forests was based on satellite images that were subsequently verified through ground visits to key area.

Coastal Forests in Kilwa-Lindi Districts – and overview

Table 1 present the total area of the major land cover classes (including coastal forest and other vegetations) identified in Kilwa and Lindi Districts. The area calculations of based on data from the satellite image shown in Map 3. The large segments of coastal forest appear in different orange and reddish colours (and sometimes in dark green).

Table 2 show the area of the different vegetation classes inside the existing Forest Reserve in Kilwa and Lindi Districts.

Kilwa District

It is clear that the large forest reserves in Kilwa District (Mahali, Mitarure, Nampekse and Rungo) has no significant coastal forests and are primarely covered with different types of woodland. Mbinga, Tomgomba and Kitope have little forest left. Mgarama South and Mitundumbea still contain small patches of rich coastal forest while the cosatal forests in Ngarama has a much larger extend. Pindiro also has quite large areas with different types of coastal forest.

On the northern part of Mitumdumbea Plateau (between Mitundumbea and Mitarure Forest Reserves is a large area of scrub forest with patches of more developed coastal forest. This is probably the larges groundwater forest in the Lindi Region. A large area with the same type of scrub forest also occur on the Mbwalawala Plateau to the north of Pindiro FR.

Lindi

Mtama and Mkangala FRs does not include coastal forest but are entirely covered by woodland. Similarly, Matapwa FR has no coastal forest but includes only scrub forest. Dimba and Ruawa FR which were previously undescirbed in botanical terms still include much coastal forest of different types.

On Noto Plateau quite large areas of coastal forest is still present. On Chitoa Plateau a small but almost intact patch of coastal forest was located outside forest reserves.

	KILWA	LINDI
Cloud	4.5	0.1
Sea	5.7	12.8
Shade	173.9	54.9
Soil dominated	71.8	10.6
Crop dominated	456.6	1169.9
Crop related	513.9	959.2
Wetland	275.2	35.7
Coco nut palms	133.6	50.1
Grass/soil dominated	1231.0	417.4
Woody grassland	1002.4	0.3
Thicket/mixed woodland	469.8	226.5
Woodland and scrubs	723.9	856.6
Woody grassland	2012.7	0.3
Open woodland 40-10% close	375.6	2.5
Woodland 60-20% cover	1477.6	1243.3
Woodland on rocks/litter	345.2	4.4
Mixed dry forest, brachystegia	384.2	114.3
Dense miombo	1586.1	33.9
Brachysteria forest	510.2	190.7
Scrub forest Mbingo type	23.3	0.0
Mangrove	166.9	52.1
Scrub forest I	145.2	1.8
Scrub forest II	28.0	0.1
Mixed scrub forest Pindiro type	188.2	228.9
Mixed scrub forest Ngarama	59.6	0.9
Mixed scrub forest	138.4	100.8
Scrubs with egminat trees	150.5	264.2
Mixed scrub forest	139.1	126.2
Mixed dry forest, Noto degraded	30.0	171.8
Legum forest/woodland	112.1	0.1
Dry forest, Dimba type	93.5	228.4
Mixed dry forest	100.5	41.2
Dry forest, Ruawa type	145.6	157.4
Legum dominated high forest	18.0	72.9

Table 1. *Total area (km ^{2}) of the major land cover and vegetation classes in Kilwa and Lindi Districts based on a satellite image analyses.*

	KITOPE	MALEHI	MBINGA	MITUNDUMBE	MTAMA	NGARAMA	NGARAMA	PINDIRO	RUAWA	RUNGO	TONG'OMBA	DIMBA	MATAPWA	CHITOA	MAKANGALA	LITIPO	RONDO	NAMPEKES	MITARURE
Cloud	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ocean	0	39	0	0	0	17	2	2	2	0	0	0	4	2	0	2	124	0	0
Shade	0	149	0	0	0	0	0	0	0	27	0	0	3	0	0	0	0	55	7
Soil dominated	0	105	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	19	268
Crop dominated	13	527	128	94	22	1740	61	28	1456	128	222	11	950	12	9	39	553	20	229
Crop related	0	0	0	59	39	1002	245	164	508	0	0	2	1301	3	44	1	51	0	0
Wetland	78	190	18	77	0	38	0	1	112	71	11	0	3	0	0	0	25	36	780
Coco nut	137	13	1	50	0	75	7	1	10	6	5	1	16	1	0	0	2	1	24
Pine plantation (Rondo)/evergr. scrub	0	0	0	4	1	171	6	3	18	0	0	0	12	12	1	29	1078	0	0
Rondo nursery/regrowt	0	0	0	7	0	180	1	0	46	0	0	1	8	2	0	1	116	0	0
Grass/soil dominated	83	0	154	550	12	788	41	742	85	403	72	0	437	0	35	0	87	319	4168
Woody grassland	0	5806	0	64	0	50	0	1	0	2537	0	0	0	0	0	0	0	5730	5135
Thicket/mixed woodland	215	93	438	346	0	852	5	21	464	81	1735	1	81	3	1	10	199	29	900
Woodland and scrubs	1227	76	18	373	16	4412	645	103	364	70	6	1395	6115	109	127	232	356	139	743
Woody grassland	26	7737	1	131	0	79	0	0	0	4795	0	0	0	0	0	0	0	0	9112
Open woodland 40-10% close	4	3425	1	147	0	172	0	7	0	712	0	0	0	0	0	0	0	391	5122
Woodland 60-20% cover	46	3590	14	771	252	2431	673	299	199	7057	5	5	3727	10	558	32	2487	4372	0
Woodland on rocks/litter	167	226	90	678	0	210	0	21	0	48	15	0	0	0	0	0	0	106	1157
Mixed dry forest, *Brachystegia*	190	319	69	302	0	681	0	169	0	494	9	0	0	0	0	0	135	63	1329
Dense miombo	436	6457	34	1500	0	2673	0	172	0	6211	0	0	0	0	0	0	1	865	0
Brachysteria forest	366	467	334	414	108	690	39	187	2	292	338	1	233	2	29	7	930	269	2983
Scrub forest	527	13	13	111	0	287	0	63	0	2	10	0	0	0	0	0	34	87	190
Scrub forest	97	0	4	8	0	30	0	1	0	0	10	0	0	0	0	0	0	1	2
Scrub forest Mbingo type	0	0	332	0	0	0	0	1	0	0	340	0	0	0	0	0	0	0	0
Mixed evergr. scrub forest Pindiro type	0	0	0	347	130	1206	264	177	12	0	0	26	793	4	97	50	593	0	0
Mixed scrub forest Pindiro/Ngarama	30	0	123	7	0	40	0	127	0	0	411	0	0	0	0	0	9	0	4
Mixed scrub forest	122	3	3	373	8	2443	90	443	24	0	9	160	878	10	17	56	144	0	4
Scrubs with egminat trees	0	0	0	755	0	4790	84	149	416	0	0	129	746	27	2	54	285	0	0
Mixed scrub forest	0	0	0	637	0	3952	62	133	127	0	0	122	338	36	1	20	356	0	0
Legum forest/woodland	274	0	54	249	0	109	0	166	0	3	416	0	0	0	0	0	0	2	14
Mixed dry forest, Noto degraded	0	0	0	169	4	785	17	128	25	0	0	96	416	154	12	125	2162	0	0
Dry forest, Dimba type	0	0	0	213	33	1046	255	147	19	0	0	617	1421	26	268	82	302	0	0
Mixed dry forest	57	0	115	119	0	1005	0	603	47	1	288	0	7	82	0	14	1394	1	7
Dry forest, Ruawa type	0	0	0	567	0	5285	61	469	173	0	0	159	552	153	2	46	1648	0	0
Legum dominated high forest	0	0	0	102	4	668	4	145	42	0	0	0	67	58	1	70	1051	0	0

Table 2 *Total area of vegetation classes (hectares) in Forest Reserves in Lindi and Kilwa Districts. (Based upon digital supervised classification of Landsat data).*

5.2 The coastal forests in Kilwa Districts

Introduction

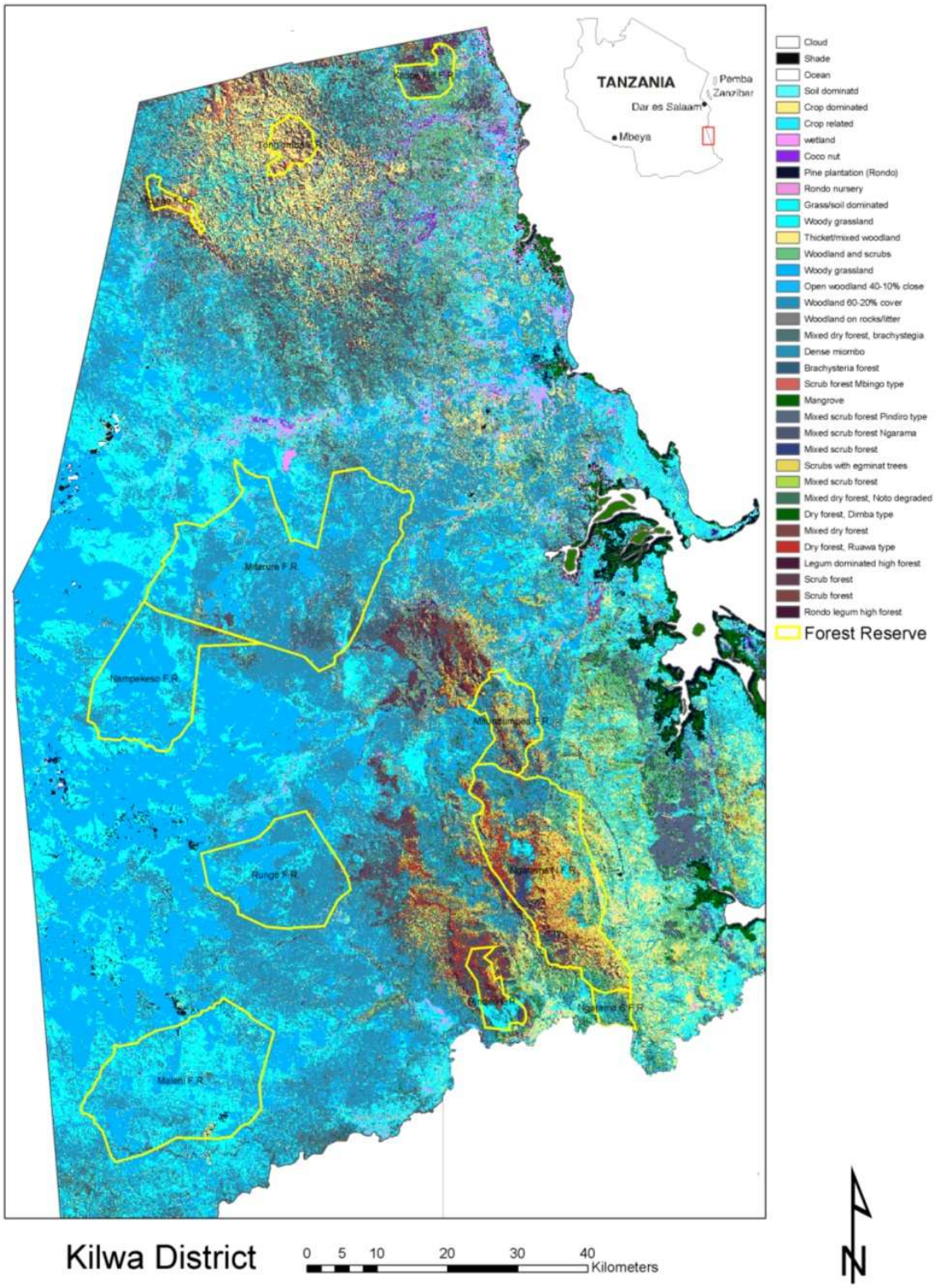
Initially we will give an overview of the distribution of vegetation classes of the district based on analyses of satellite images. Subsequently more detailed descriptions will be provided of each of the major forested areas in the district. For each of these areas we present the existing knowledge about the flora and fauna of the forests including data from the studies carried out under this project.

General description of the vegetation

The major vegetation classes in Kilwa district is shown on Map 4. Human transformed land covers most of the district with large areas of cashew nut plantations and various stages of secondary vegetation.

The typology of the woody vegetation in Kilwa District has a general east – westward orientation. Progressing from the inland towards the coast the vegetation density increases from open woodland (mainly miombo) through denser miombo, over **Eastern Africa Brachystegia forest** (sensu Clark 2000) – a miombo type dominated by shrubs in the sub-strata to patches of coastal forest.

Approximate fifty-kilometre inland from the coast is a discontinuous band of plateaux and hills, which runs almost parallel to the coastline. This band of high ground, about 20 kilometre wide, is were most of the **Eastern African Coastal forest** in Kilwa District grows.



Map 4. *The vegetation in Kilwa District.*

The vegetation on the high ground shows a typical transition from coastal **Brachystegia Forest** through **mixed scrub forest** to different types of Eastern African Coastal Forests vegetations as one approach the sea.

On the seaside of the plateaux smaller pockets of coastal forest occurs i.e. on Kitope Hill.

Location of Coastal Forest types in Kilwa and their relative importance

Today coastal forests in Kilwa District are mainly located on the row of large upland plateaux that runs through the hinterland of Tanzania south of the Rufiji River and on a number of isolated hills close to the sea.

Matumbi Hills situated in the northern part of Kilwa District have been populated for centuries and still holds a high population. This has resulted in a degradation of the much of the natural coastal forest vegetation that once is believed to have covered these hills. Analysis of satellite images indicates that the forest reservation even in the two forest reserve of this area (Tong`omba Forest Reserve and Mbinga Forest Reserve) is severely degraded with nearly all large trees removed leaving only a coastal **Shrub Forest.** On the southern slopes small pockets of more developed coastal forest may still exist. Although heavily logged Tong`omba Forest Reserve still contain parts of high forest of **Legume Dry Forest**.

Further east and close to the sea is Kitope Hill, which also has small patches of coastal forest in particular, the **Shrub forest** type.

The large Mitundumbea Plateau and its southern extension the Ruwawa Plateau holds most of the remaining coastal forests in Kilwa District. A large area of coastal forest is situated north of Mitundumbea Forest Reserve and appears to be previously un-described. Its biological importance still has to be determined but initial studies indicate that large patches of different types of coastal forests of high biological importance occur.

South of Mitundumbea Plateau lies the large Ruwawa Plateau which includes two forest reserves: Ngarama North and South FR. Many patches of coastal forest still occur on this plateau especially on the northwestern part. This includes a area of app. 20 km^2 of high coastal forest (**Mixed Evergreen Dry Forest**) in the western part of Ngarama North FR observed on satellite images and subsequently visited as part of this project. Its biodiversity importance still has to be determined, however, during the brief field visit a possible new species of tree was discovered.

West of Ruwawa Plateau is Mbwalawala plateau. This plateau also has patches of lowland forest, which seems rather similar to the ones on Ruwawa Plateau. Part of the forest vegetation is included in Pindiro Forest reserve, but large tracts of forest vegetation are present north and east of the reserve.

Below the forests on the separate plateau's and hills are described. For the purpose of this publication the lowland forest patches described under the following headings:

- Kitope Hill a small isolated hill close to the sea in the extreme north-east corner of the district where small forest patches still occur
- Matumbi Hill in the northernmost part of the district. The remaining forest patches are partly found inside Mbinga and Tong`omba Forest Reserves.
- Mitundumbea Plateau just north of Ruwawa Plateau is covered by a mix of scrub forest and woodland. In places, patches of more developed forest occur such as the impressive riverine forest that occur in the canyon of the Mavuji River. The southeastern part of this area is included in Mitundumbea Forest Reserve.

- Ruwawa Plateau where several large forest patches occur mainly inside Ngarama North Forest Reserve and Ngarama South Forest Reserve.
- Mbwalawala plateau with patches of coastal forests – including Swamp and riverine forest – partly inside Pindiro Forest Reserve.

Coastal forests on Kitope Hill

General description

This isolated hill in the northeast corner of Kilwa District is situated close to the Indian Ocean. Most of Kitope Hill is believed previously to have been covered with coastal forest. Today most of the forest is cleared and the vegetation of the southern slopes and the land that surrounds Kitope Hill is converted to different types of woodlands and grasslands. Small patches of forest remain in the deep valleys on the north side along streams and in a few places on the southern slopes. The grass and scrub vegetation of the lower parts of Kitope Hill appears to be repeatedly burnt.

Forest vegetation

At the highest part of Kitope Hill is a low and dense **Mixed Scrub Forest** occur which also covers most the ridges on the central-northern slopes. At the bottom of the steep ravines north of hilltop grows an impressive **Riverine Forest.** This forest follows the watercourses from just beneath the hilltop and app. 1½ km to the north.

Species of forest trees

The **Riverine forest** on Kitope Hills has been found to include the following trees: *Antidesma vernosum, Afzelia quanzensis, Kigelia africana* and *Sorindeia madagascariensis*

Common trees of the **Mixed scrub forest** are: *Rothmannia urceliformis, Vitex doniana, Erythroxylum fischeri, Grewia conocarpa, Millettia stuhlmanii* and *Pteleopsis myrtifolia*

Birds

During a 6 days survey of the avifauna of Kitope Forest Reserve 77 species were recorded (Annex B). The majority were bird species associated with secondary forest, forest edges or dense woodland.

Five Forest Dependent species were recorded: Crowned Eagle *Stephanoaetus coronatus*, African Broadbill *Smithornis capensis*, Square-tailed Drongo *Dicrurus ludwigii*, Yellow-streaked Greenbul *Phyllastrephus flavostriatus*, Tiny Greenbul *P. debilis* and Reichenows Batis *Batis reichenowi.* Among these, Tiny Greenbul is also a Restricted Range species endemic to the coastal forests of Kenya to Natal while Reichenow`s Batis is a Coastal Forest Endemic restricted to SE Tanzania.

Other bird species of conservation concern are Fishers Greenbul *Phyllastrephus fisheri* - a Coastal Forest Endemic (not entirely restricted to forest but which also occur in other dense vegetation) and Uluguru Violet-backed Sunbird *Anthreptes neglectus*- a restricted range species limited to coastal forests and dense woodlands along the Eastern African coast.

Mammals

Six species of mammals were recorded from Kitope Forest Reserve. The observation of Zanj Elephant Shrew *Rynchocyon petersi* is an extension of its known range which was thought limited to the coastal area between Mombassa in Kenya and Rufiji River (and Zanzibar & Mafia Islands)(Kingdon 1997). This species is listed Rare by IUCN.

Small herds of elephants occur in the most closed parts of the reserve. These animals probably leave the area during the rains.

Reptiles

12 species of reptiles were recorded (see Annex A for a species list). All are common and widespread species, many of which are mainly associated with woodland habitats.

Amphibians

Nine species of frogs and toads were recorded in Kitope Forest Reserve (Annex A). The number of species would probably have been higher if the fieldwork was done under less dry conditions.

All the amphibians recorded are common of widespread species. Most of them are in fact not associated with forest but usually occur in woodlands and other open habitats. This reflects the poor condition of the forest vegetation in most of the reserve.

Human impact

Only a very small part of the natural forest which once is believed to have covered Kitope Hill remain in a natural or semi-natural condition. Most of the large trees have been cut and some pit sawing (inside Kitope Forest Reserve) still occur. In particular on the southern slope of the hill most of the large trees have been cut. Scattered large trees still remain but they are so few that they form park-like vegetation rather than a forest. At the foot of Kitope Hill the vegetation has in some places cleared for agriculture.

Forest protection

Most if not all the remaining coastal forest on Kitope Hill is located inside Kitope Forest Reserve.

Biodiversity value

The coastal forest on Kitope Hill does not include any known endemic species. The forest flora and fauna consist of a mix of widespread species and species that are restricted to the coastal zone of eastern Africa. This includes a number of mammal species with has a limited distribution and a rated rare by IUCN (such as the Zanj Elephant Shrew).

During the dry season small numbers of African Elephants move into the forest on Kitope Hills to feed on the rich vegetation and stay near the waterholes and streams.

Coastal Forests on the Matumbi Hill

Mitumbi Hill at the northern border of Kilwa District is almost continuos with Kichi Hill just south of Rufiji River. The natural and semi-natural vegetation's of Matumbi Hill is believed to be mostly woodland and coastal forest. Today different types of woodland as well as cultivation occupy most of the hills.

Almost all the remaining coastal forest on this hill are found inside Tong`omba Forest Reserve and Mbinga Forest Reserve which comprises series of forested ridges and steep sided, narrow valleys.

Forest vegetation

The main forest types of Matumbi Hills are **Coastal dry forest, Coastal *Brachystegia* Forest** and **Riverine Forest.**

Coastal Dry Forest: App. 9 square km of this forest type is found about the Kisangi, Likubantandya, and Tong`omba Hills with a very diverse range of forest assemblages (Clarke 1995). On the southern scarp edge of the Matumbi Hill about 6 square km of secondary evergreen thicket and low forest with scattered *Milicia excelsa* in the north (Clark 1995). App. 1 square km of **Coastal *Brachystegia* Forest** occupies the top of some of the ridges, particularly along part of the former Kipatimu to Somanga road (Clarke 1995). **Riverine Forest**: App. 2 square km of riverine and moist valley bottom forest is developed along many streams within the reserve.

Species of forest trees

Coastal Dry Forest. On the south side of Tong`omba Hill *Scorodophloeus fisheri* and *Cynometra* sp. are co-dominants (Clarke 1995). On the hills to the south of the Nanyangu River *Hymenaea verrucosa* and *Dialium holtzii* become more frequent (Clarke 1995). During a field visit to Matumbi Hills in September 2001 the following trees were identified as dominating in the Coastal Dry Forest: *Afzelia quanzensis, Newtonia paucijuga, Sorindeia madagascarienses* and *Drypetes natalense*.

Coastal *Brachystegia* Forest: *Brachystegia microphylla* strongly dominates this vegetation type, forming a continuous 16 m high canopy over an 8 m subcanopy with a diverse tree assemblage including *Baikiaea ghesquiereana, Hymenaea verrucosa, Diospyros kabuyeana* and *Croton sylvaticus* (Clarke 1995). Grasses are absent (Clarke 1995).

Riverine Forest on Matumbi Hills has been found to contain characteristic riverine tree species of Eastern Africa such as *Sorindeia madagascariensis, Ficus* spp.*, Milicia excelsa, Khaya anthotheca* and *Barringtonia racemosa* (Clarke 1995). Along the rockier courses *Scorodophloeus fischeri* dominated the small tree layer (Clarke 1995).

In addition to the different forests types diverse woodland types are found in the reserve including *Brachystegia spp., Pseudobersama mossambicensis, Cassia petersiana, Erythrina sp. Kigelia africana, Cassia abrevaiata* and *Pterocarpus angolensis* (Clarke 1995). It is not known whether these woodland types are semi-natural or whether they have regenerated from areas that were cultivated prior to the gazettement of the reserve during the German administration (Clarke 1995). 8 m high cassava plant *Manihot glaziovii* is areas of semi-natural woodland may date from earlier cultivation, or may have seeded from the wild (Clarke 1995).

Mammals

Mammals have been studied in Tong`omba Forest Reserve where 26 species have been recorded (Clarke 1995). These include a possible Matumbi Hills endemic shrew (*Crocidura* sp. nov.*)* (Clarke 1995).

Two Coastal Forest endemic bats have been recorded. Wolly Bat *Kerivoula africana* is known from just one other Coastal Forest, and the Horseshoe Bat (*Rhinolophus deckeni*) is known from just three other Coastal Forests (Clarke 1995).

One Coastal Forest/Eastern Arc endemic has also been recorded: the East African Collared Fruit Bat (*Myonycteris relicta*) which is known only from 8 other localities (Clarke 1995).

A number of mammals listed as rare or threatened by CITES/IUCN has also been recorded form this reserve (Clarke 1995):

African Elephant *Loxodonta africana* Cites Appendix 1 / 2, IUCN Vulnerable

Leopard *Panthera pardus* CITES Appendix 1; IUCN Threatened

Zanj Elephant Shrew Rynchocyon *petersi* Coastal Forest endemic; IUCN Rare

Zanzibar Galago *Galagoides zanzibaricus* IUCN Vulnerable

Reptiles

10 Forest dependent species have been recorded (plus 7 non-forest species)(Clarke 1995). These include (from Clarke 1995):

Coastal Forest Endemic: Dwarf Gecko *Lygodactylus viscatus* – known from only 7 Tanzanian Coastal Forests

Coastal Forest/Eastern Arc Endemics: Uzungwa Forest Gecko *Cnemaspis uzungwae* known only from the Udzungwe mountains and the Matumbi Hills.

Bearded Pygmy-Chameleon *Rhampholeon brevicaudatus* – known from only the Eastern Arc and 6 Tanzanian Coastal Forests.

Amphibians

7 species have been recorded (Clarke 1995), including:

Coastal Forest Endemic: Leaf-litter toad *Stephopaedes loveridgei* known only from 8 sites in SE Tanzania, probably all coastal forests.

The treefrog *Leptopelis flavomaculatus.*

Human impact

Clear sign for heavy exploitation of timber species, pole cutting and charcoal production was observed.

Forest protection

Most if not all the remaining coastal forest of Matumbi Hills are inside either Tong`omba Forest Reserve or Mbinga Forest Reserve.

Biodiversity importance

From the present knowledge the coastal forests of Matumbi Hills have more endemic and near-endemic species that other forested areas in Kilwa District. For this reason Matumbi Hills together with the neighbouring Kichi Hills have been listed as a "sub-centre of endemism within the eastern African Coastal Forests of Kenya and Tanzania" (Burgess & Clarke 2000). In addition to the endemic shrew, at least three endemic species of plants, an endemic butterfly and at least 16 undescribed species of millipedes occur (Burgess & Clarke 2000). So far only two sub-centres of endemism have been identified in the Kilwa-Lindi area, the other being the Lindi Centre, (which include the forests of Rondo, Noto, Chitoa, Litipo and Ruawa).

One species of tree appear to be endemic to Matumbi Hills while a number of other trees are near-endemic known only from one or two other areas:

Baikaea gesquiereana is a Matumbi Hills endemic known only from Kibata/Tong`omba and Namakutwa-Nyamuete (Clarke 1995).

Peponium leucanthum is a Coastal Forest endemic known only from Tong`omba and Rondo/Litipo (Clarke 1995).

Cynometra sp. aff. *Longipedicellata* is another Coastal Forest endemic known only from the East Usambara Mountains and possible also Pugu Hills (Clarke 1995).

Some groups of mammals as well as reptiles and amphibians have been studies from the eastern slopes of Matumbi Hills at Tong`omba Forest Reserve. A possible endemic species of shrew was discovered together with several restricted range and coastal forest endemics.

Mitundumbea Plateau

General description

This large plateau constitutes the northern extension of the Ruwawa plateau but has vegetation, which is different from the one on Ruwawa. The vegetation of Mitundumbea plateau shows strong resemblance with the one on the northern part of the Mbwalawala Plateau. Most of the coastal forest on this plateau is situated north and northwest of Mitundumbea Forest Reserve (Map 5).

Before this study very little was known about the flora and fauna of the coastal forest patches of this area. Mitundumbea Forest Reserve was enumerated by the 1961 Southern Province Enumeration Project and was found to contain miombo woodland with mninga *Pterocarpus angolensis* as well as "thicket patches" containing a few mvulu "*Milicia excelca*" (Clarke 1995). These "thicket patches" may be a type of scrub forest similar to that on Ngarama North Forest Reserve (Clarke 1995).

During this study an area just north of Mitundumbea Forest Reserve was visited briefly in September 2001 and more extensively December 2001. These studies were focused on the forest vegetation and forest avifauna. The satellite images and the subsequent field survey has confirmed the occurrence of a surprisingly large area with a mosiac of coastal forest types (app. 100 km^2).

Forest vegetation

Almost unknown as very little survey work has been done. During this project an area close to the northern border of Mitundumbea Forest Reserve was surveyed for 4 days.

Along River Mavuji at the northern end of the reserve a **riverine forest** 100-400 meter wide was found. On the slopes bordering the river valley the forest gives way to more dry vegetation consisting of woodland with patches of **mixed dry forest**. The plateau that surrounded the river valley was mainly covered by woodland but with pockets of mixed scrub forest and **legume dominated forest.**

Forest tree species

The following species of threes were identified on the Mitumbea Plateau during the field survey in 2001:

Riverine forest: *Pteryogota sp. nov., Sorindeia madagascariensis ,Milicia excelsa, Lettowianthus stellastus,Barringtonia racemosa, Newtonia paucijuga,Parkia filicoides, Khaya anthotheca* and *Pouteria alnifolia.* The climbers included *Adenia rumicifolia* and *Saba comorensis var. florida.* On the slopes of the River Mavuji a large area was covered by the rare Cycard *Encephalartos hildebrandtii* which is covered by the CITES.

Mixed scrub forest: Dominant tree species: *Strychnos henningsii,Drypetes arguta, Makhamia lutea, Haplocoelium inopleum, Pteleospis myrtifolia* and *Bombax rhodognaphalon*

Legume dominated forest: Dominant tree species: *Cynometra gillmanii, C. greenwayi, Erythrina schliebenii, .Scorodophloeus fischeri* and *Codyala africana.*

Forest Birds

During the four days bird survey in December 2001 at the northern border of Mitundumbea Forest Reserve 68 birds species were recorded (Annex B). The majority was species associated with woodlands and secondary growth but 7 Forest Dependent bird species were found. These are Crowned Eagle *Stephanoaetus coronatus,* Green Barbet *Bucanodon olivaceum* (subspecies probably *hylophona*), African Broadbill *Smithornis capenses*, Square-tailed Drongo *Dicrurus ludwigii*, Yellow-streaked Greenbul *Phyllastrephus flavostriatus*, Tiny Greenbul *Phyllastrephus debilis* and Reichenow`s Batis *Batis reichenowi* (Coastal Forest Endemic with a very restricted range). In addition, two African Pittas *Pitta angolensis* were observed from the woodlands. This is an inter-African migrant that had probably arrived to breed on the Ruawa Plateau.

The "near-threatened" Uluguru Violet-backed Sunbird *Anthreptes neglectus* was also recorded in small numbers in the riverine forest as well as Fishers Greenbul *Phyllastrephus fisheri* (Coastal Forest Endemic) and Plain-backed Sunbird *Anthreptes reichenowi* (near-threatened species).

Mammals

The following species of mammals were observed or tracks were seen during the field survey:

Chequed Elephant Shrew	*Rhynchocyon cirnei*
Slender Mongoose	*Herpestes sanguineus*
Hippopotamus	*Hippopotamus amphibius*
African Buffalo	*Syncercus caffer*
Leopard	*Panthera pardus*
African Elephant	*Loxodonta africana*

Human impact

The forest at River Majvuji appeared to be relatively intact with only a few signs of selective cutting and pit sawing. The forest on the plateau seemed more or less undisturbed.

Biodiversity importance

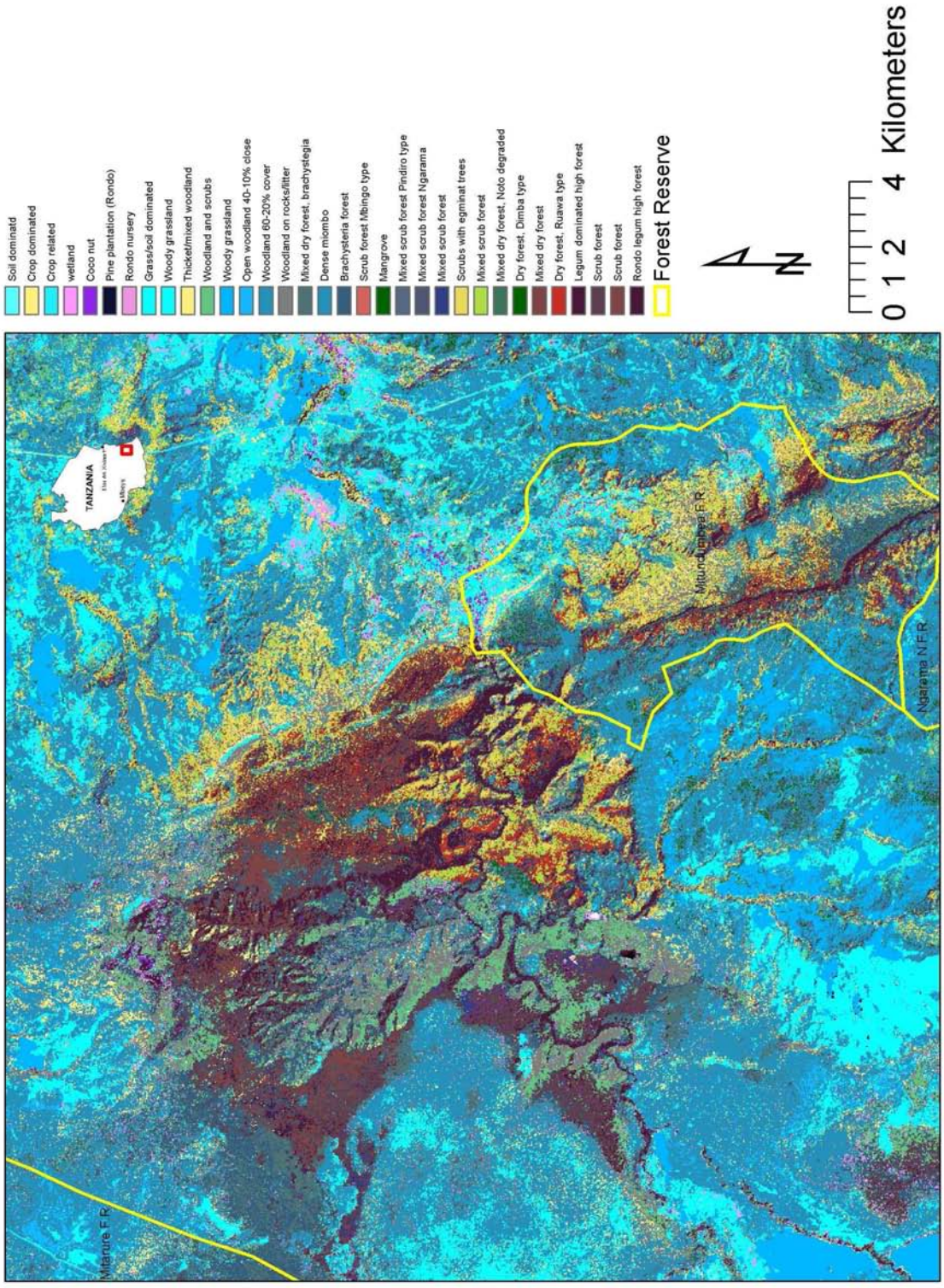
Because so little is known about this area its biodiversity importance is difficult to assess. From the satellite images it is clear that this plateau hold one of the largest areas with coastal forest in Kilwa District. Importantly it seems to be generally little disturbed. Among the plants collected during the four day visit to the area were several on biodiversity importance:

Cynometra gillmanii is an Eastern African Coastal Forest endemic, which was preciously known only from a site just north of Dimba Forest Reserve. In connection with fieldwork in December 2001 this rare and local trees was also discovered on the Mitundumbea plateau.

C. greenwayi and *Erythrina schliebenii* are endemic to the Lindi area. *Pteryogota sp. nov.*- is a new species and possible endemic to this plateau.

Codyala africana(Mnidu), *Khaya anthotheca*(Mkangazi/Mahogani)and *Milicia excelsa* (Mvule) are vulnerable timber species.

The avifauna is rich but a relatively high number of Forest dependent species. One bird species endemic to coastal Tanzania (Reichenows Batis) and one very local subspecies of bird (Green Barbet) occur in this area together with two near threatened species of sunbirds (Uluguru Violet-backed Sunbird & Plain-backed Sunbird).



Map 5. *Coastal forest north and northwest of Mitundumbea Forest Reserve.*

Ruwawa Plateau

General description

The vegetation of the Ruwawa Plateau consists mainly of dense woodland but large partches of dry forest is found in the north-western part of the area. This large area with dry forest on the NW part of the plateau seems not previously to have been documented. The Ngarama North FR and Ngarama South FR cover part of the plateau.

Forest vegetation

Most of the Ruwawa Plateau is covered with different types of scrub forest. Along some of the watercourses **Riverine forest** occurs. On the lower parts more dry vegetation, consisting of woodland. On the plateau the dominant vegetation is **mixed scrub forest** and to the north **mixed scrub forest, legume dominated forest** and **Eastern Africa *Brachystegia* forest** with open woodland on the lower parts. In total app. 80 km^2 of **mixed scrub forest** and 80 km^2 of scrup forest occur.

On the western boundary of the Ngarama South Forest Reserve patches of closed forest exist with riverine forest growing along the rivers (Eriksen *et al.* 1994). The vegetation of the Ngarama Sorth FR varies from open to dense woodland with patches of a low closed lowland forest type. A narrow strip of **Riverine Forest** is found along Kikandi River on the western boundary of the reserve (Eriksen *et al.* 1994) but these are very small and as such there is not much forest left in Ngarama South Forest Reserve.

A small remnant patch of forest also occur on the eastern edge of Ngarama South FR with 25 high canopy of *Hymenaea verrucosa* together with smaller trees including *Scorodophloeus fisheri, Stychnos henningii, Diospyros* sp. and *Synaptolepis kirkii* (Clarke 1995). This forest patch also contains the rare tree *Karomia gigas,* which was previously thought to be extinct (Clarke 1995).

Except for the northwestern portion of the plateau most of the area is included in Ngarama North and Ngara South Forest Reserve.

Forest tree species

I connection with a visit to the western edge of the Ngarama North Forest Reserve in September 2001 the following species were found to be dominating in the four Eastern African coastal forest types located:

Legume dominated dry forest: Dominant tree species: *Guibortia schliebenii, Scorodophloeus fischeri,Hymanaea, Afezlia quanzensis* and *Dialium holstii*

Mixed scrub forest: Dominant tree species**:** *Hymenocardia ulmoides,Pteleopsis myrtifolia, Nersogodonia holstii, Bombax rhodognaphalon* and *Drypetes arguta.*

Mixed dry forest: Dominant tree species: *Hymanaea verucosa,Hymenocardia ulmoides, Diospyros shimbaensis,Pteleospis apetala* and *Nersogodonia holstii.*

Eastern Africa *Brachystegia* forest. Dominant tree species :*Brachystegia spiciformis, B.longifolia ,Pseudolachnostylis maprouneifolia, Xeroderris stuhlmannii* and *Pterocarpus angolenis*

In addition, **Riverine Forest** occur along Kihimbwi River with the following trees being common: *Bombax rhodognaphalon, Bridelia micrantha, Celtis philippensis, Drypetes natalensis, Garcinia livingstonei, Khaya anthotheca, Milicia excelsa, Sorindeia madagascariensis* and *Terminalia sambesiaca*. This forest is characterised by few shrubs and young trees, the presence of many epiphytic lichens, an open forest floor with few herbs and mostly bare soil (Eriksen et al. 1994).

The only description of forest vegetation from southern part of Ruawa Plateau refers to a "low closed lowland forest" in the northeastern corner of the Ngarama South Forest Reserve app. 5 km west of Kiranjeranje village. This forest was mostly 10-15 m high but with single trees more than 20 m. The trees species included: *Markhamia, Milicia excelsa, Pteleopsis myrtifolia* and *Zanthoxylum* (Eriksen et al. 1994). Based on this information this forest should probably be characterised as **Mixed dry forest** sensu Clarke and Robertson 2000.

Forest birds

The avifauna of Ngarama North and Ngarama South Forest Reserves were studied by a Danish expedition in 1993. In connection with the present study the forest birds were studied in the central-eastern part of Ngarama north F.R.

71 species of birds have been recorded from the coastal forests of this plateau (Annex B). This is mostly species that occur in both forest and woodland but also include seven Forest Dependent species.

These are Crowned Eagle *Stephanoaetus coronatus*, African Broadbill *Smithornis capensis*, Square-tailed Drongo *Dicrurus ludwigii*, Green Barbet *Stactolaema olivacea,* Tiny Greenbul *Phyllastrephus delilis*, Yellow-streaked Greenbul *P. flavostriatus* and Reichenow´s Batis, *Batis reichenowi* and Green-backed Twinspot *Mandingoa nitidula.*

The subspecies of Green Barbet that was recorded from this reserve *S. o. hylophona* is endemic to southeast Tanzania. So far it has only been recorded (with certainty) from the two Ngarama forest reserves and Rondo FR although Green Barbets observed in Mitundumbea Forest Reserve in December 2001 most likely also belonged to this subspecies.

Other birds of conservation concern recorded in Ngarama North FR are Uluguru Violet-backed Sunbird which is a Restricted-range Species and Plain-backed Sunbird which is a Near-threatened Species according to the BirdLife International Saving Species Index. Fisher's Greenbul, which is common in this area, is a Coastal Forest Endemic.

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Mammals

The following mammals are recorded for Ruwawa Plateaux:

Chequered elephant shrew *Rhynchocyon cirnei*

Garnett`s Galago *Otolemus garnettii*

Zanzibar Galago *Galagoides zanzibaricus*

Slender Mongoose *Herpestes sanguineus*

Blue Monkey

Hippopotamus *Hippopotamus amphibius*

Bushbuck *Syncerus caffer*

African Buffalo *Syncerus caffer*

Spotted Hyaena *Crocuta crocuta*

Lion *Panthera leo*

Leopard *Panthera pardus*

African Wild Cat *Felis sylvestris*

African Elephant *Loxodonta africana*

Suni *Neotragus moschatus*

Human impact

In the area west of the Ngarama South reserve boundary to Kikundi village and beyond extensive clearing of the public woodland has taken place in the last few years (Eriksen et al. 1994). Many people from Kiranjeranje and Makangaga Ujamaa villages have moved into this area, sometimes returning to the areas where they originally lived (Eriksen *et al.* 1994).

In 1993 logging and pit-sawing of Mvule was observed in the Riverine Forest at Kihimbwi River. There were also indications of illegal hunting inside the reserve and snares for birds and small mammals were observed.

In 2001 it was observed that poaching takes place at two settlements between Ngarama North and Pindiro FR. Snares for large mammals were also observed in this area.

In the high forest in the north-western part of Ngarama North FR extensive selective cutting of trees appear to take place.

Protected areas

Ngarama North Forest Reserve covers the central parts of the Ruwawa Plateau while its southern extension Ngarama South Forest Reserve include part of the southern portion of the plateau.

Biodiversity value

Surprisingly little is known about the fauna of Ruwawa Plateau. So far only the bird fauna has been studies in some detail. A number of Forest Dependent species typical for the coastal forests of southeastern Tanzania have been recorded from forest patches in both the northern, central and southern part of the plateau. The avifauna also includes some restricted range species, near threatened or coastal forest endemics. Small numbers of Green Barbet has been recorded from forest patches in the northern, central and southern of the plateau. This population belongs to a subspecies endemic to Ruwawa and Rondo plateaux.

The trees *Baphia cf. keniensis* and *Leptactina cf. oxyloba* which were collected Ngarama North FR in autumn 2001 may represent new plant species endemic to the Ruwawa plateau. Other biological important species of trees are**:** *Guibortia schliebenii*, *Peleopsis apetala* and *Vismia pauciflora* which are Lindi area endemic and *Diospyros shimbaensis*-endemic to coastal forests

of East Africa. These species were all collected in the upper North-western part of Ngarama North FR.

The biodiversity value of the coastal forests of Ruwawa plateau is difficult to assess because so little collection has been made in this huge area. The flora and fauna appear mainly to consist of species that occur in most of the coastal forests of Tanzania. However, important exceptions are the two newly discovered plants in Ngarama North FR, which may prove to be endemic to the plateau.

Coastal forest on Mbwalawala Plateau

General description

This large upland area is situated inland of the even larger Ruwawa Plateau. Most of Mbwalawala Plateau is covered with woodlands and coastal forest only occur in parches. The forest patches are mainly located on the central and southern part of the plateau. Part of the plateau is included in Pindiro Forest Reserve.

The flora and fauna of this area has only been little studied. A Danish expedition visited Mbwalawala Plateau in March and June-July 1993. The main purpose was to study the birds. In addition the vegetation was studies and notes were made on the larger mammals observed.

Forest vegetation

Most of Mbwalawala Plateau is covered by different types of coastal forest: **Mixed Scrub Forest** and to the north **Mixed Dry Forest** and **Legume Dominated Forest** and **Eastern African Brachystegia Forest** with open woodlands in the lower parts of the plateau. In the southern section of the plateau large areas are covered by woodland dominated by *Brachystegia microphylla*.

A closed lowland forest type is patchy distributed in particularly on the west facing slopes in the west-central part of Pindiro Forest Reserve (Eriksen *et al.* 1994). The forest vegetation is composed of 15-25 tall tress that include species such as *Milicia excelsa* (Eriksen *et al.* 1994). This vegetation has a dense crown cover, very open forest floor without grasses and very few herbs (Eriksen *et al.* 1994). A lower crown layer (c. 2 – 10 m) is composed of species such as *Caloncoba welwitschii, Alchornea laxiflora* and *Olax pentandra* (Eriksen *et al.* 1994). This forest should probably be referred to as **Mixed dry forest** sensu Clarke and Robertson 2000.

A 15 ha **Swamp Forest** was located in the central-eastern part of the reserve where also a narrow strip of **Riverine Forest** is found nearby.

North of Pindiro FR is about 20 km^2 of coastal forest, dominated by **Mixed Scrup Forest**. Adjacent to this an additional 60 km^2 of **Mixed Scrub Forest** andf further north another 30 km^2 of **Mixed Scrub Forest** and **Legume Dominated Forest** (see Map 4).

Forest Birds

A 5 days survey of the birds of this reserve was carried out in 1993 (Eriksen *et al*. 1994). The forest patches of the reserve hold population of a number of Forest Dependent species typical for the coastal forests of southeastern Tanzania. These are Southern Banded Snake Eagle, Crowned Eagle *Stephanoaetus coronatus*, African Broadbill *Smithornis capensis*, Square-tailed Drongo *Dicrurus ludwigii*, Tiny Greenbul, *Phyllastrephus debilis*, Yellow-streaked Greenbul *P. flavostriatus*, Reichenow`s Batis *Batis reichenowi*, and Green-backed Twinspot *Mandingoa nitidula*.

Among these Southern Banded Snake Eagle is a Near-threatened Species according to the BirdLife International Saving Species Index. Reichenow`s Batis is a Coastal Forest Endemic with a very restricted range limited to southeast Tanzania.

Other birds of conservation concern recorded in Pindiro FR are Uluguru Violet-backed Sunbird which is a Restricted-range Species and Plain-backed Sunbird which is a Near-threatened

Species according to the BirdLife International Saving Species Index and Fishers Greenbul which is an Coastal Forest Endemic.

Mammals

The following mammals (forest and non-forest species) were recorded during the field survey in 1993 (Eriksen *et al.* 1994):

Chequered elephant shrew *Rhynchocyon cirnei*

Garnett`s Galago *Otolemus garnettii*

Zanzibar Galago *Galagoides zanzibaricus*

South African Crested Porcupine *Hystrix africae-australis*

Spotted Hyena *Crocuta crocuta*

African Elephant *Loxodonta africana*

Bush Pig *Potamochoerus porcus*

Bushbuck *Tragelaphus scriptus*

Suni *Neotragus moschatus*

Human impact

The area south of the Pindiro Forest Reserve is quite densely populated and intensively farmed (Eriksen *et al.* 1994). People from these settlements seem to move regularly into the reserve to cut poles for construction purposes (Eriksen et al. 1994). Pole cutting was particularly common in the riverine forest where signs of smallscale logging were observed (Eriksen *et al.* 1994).

Snares for birds and small mammals were found even far inside the reserve (Eriksen *et al.* 1994).

Protected areas

The costal forests of Mbwalawala Plateau is partly included in Pindiro Forest Reserve, which covers the southeastern part of the plateau (Map 4).

Biodiversity importance

Little is known about the fauna of the coastal forests of this plateau except for the birds. The forest patches have populations of a number of Forest Dependent species typical for the coastal forests of southeastern Tanzania. Several of these are of conservation concern since they are either restricted range species, near threatened or coastal forest endemics.

The coastal forests of Mbwalawala are not known to hold endemic species of plants or animals. The flora and fauna seems to be quite similar to the one on the neighbouring Ruwawa Plateau. The diversity of birds seems to be lower on Mbwalawala than on Ruwawa Plateau. For instance some east coast endemic forest species appear to be missing such as the Green Barbet which has a subspecies endemic to the Mbwalawala, Ruwawa and Rondo Plateaus.

5.3 The coastal forests in Lindi District

General description

The coastal forests in Lindi District are primarily situated on a number of smaller plateaus in the south-western part of the district with only Dimba Hill being an isolated forested area (Map 6). It is generally believed that coastal forests previously had a greater extend on the plateaus of Lindi District and several of the forest patches probably formed continuous forests. In particular this applies to the forest patches on Chitoa and Noto plateaus.

In the western part of the district

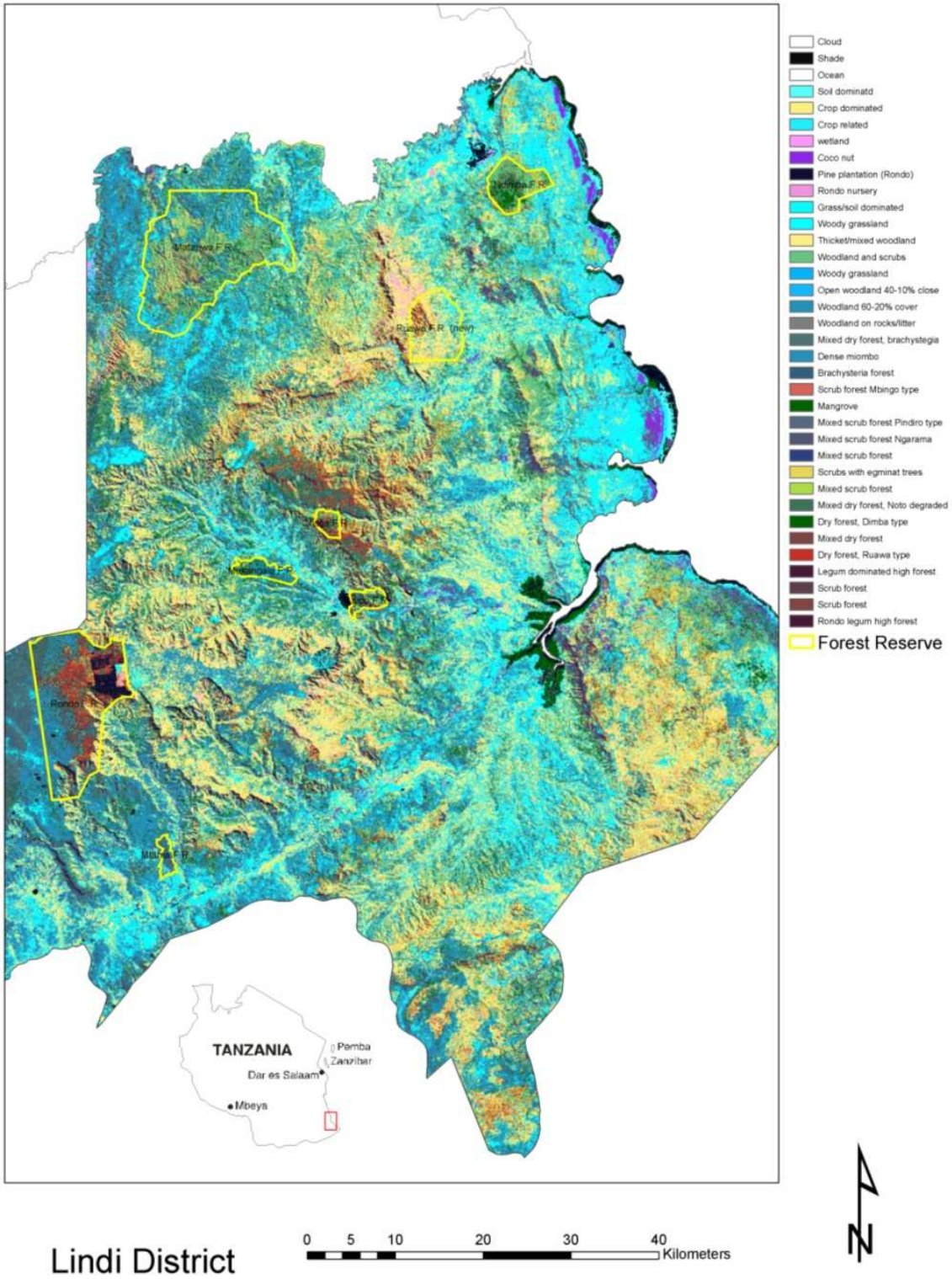
Location of Coastal Forest types in Lindi District

Only app. 5 km from the coast lies Dimba hill. Most of this low hill is included in a forest reserve and is still covered with **Mixed dry** and **Legum dominated forest**

In the same line of plateaus as Mitumdumbea and Ruwawa and approximately 20 km inland is the Ruawa plateau. The remaining forest on this plateau is only covers some 9 km2, with high land use intensity in the surrounding areas. The remaining forest is standing on surface near coral rag on rather steep hills intersected by deep and narrow valleys containing **ground water forest**. On the hill and flatter upper parts the forest is mainly **Mixed dry** and **Legume dominated forest** with a high diversity of coastal endemic and probably new species.

Approximately 25 km to the North East of Rondo Plateau are the Chitoa and Noto Plateaus. These two plateau still hold considerably amount of coastal forest of the types **Legume dominated, Mixed dry forest and Mixed scrub forest** in particular inside the small Chitoa Forest Reserve and Litipo FR. Especially on the southern rim in Chitoa F.R. a tiny patch of very rich high **Legume dominated forest** occurs, containing nearly all of the known endemic legume species. In the south-western part of the plateau are patches or a mix of **Mixed dry forest** and **Mixed scrub forest**. This forested area still has a considerable size. An immediate threat to the forests on Chitoa Plateau seems to be shifting cultivation spreading over the plateau from the south-east. Noto plateau also contains waste amount of **mixed dry forest** and **mixed scrub forest.** This plateau is mainly covered by patches of **Mixed dry forest mixed** within **the mixed scrub forest**. This plateau probably holds many coastal endemics. This area is now exposed to extensive and organised selective timber logging and on the northern part of the plateau larger areas have recently been cleared due to shifting conservation. Between Chitoa and Rondo plateau is Matangala F.R. placed. This reserve is mostly covered by miombo woodland, with more dense of **Brachystegia forest** types in the western part.

The large Rondo Plateau in the south-western part of the district has the largest remaining coastal forest areas Lindi District. Today coastal forest is mainly found on the highest parts of the plateau inside the Rondo Forest Reserve while the western slopes are now mainly covered with woodland. The coastal forest of Rondo Plateau contains a far greater number of endemic plant species than any other Eastern African Coastal. The woodland, especially on the western and northern side of Rondo Forest Reserve is also rich in species. South of Rondo F.R. is the much smaller Matama F.R., which mainly consists of woodland



Map 6.*Vegetation in Lindi District*.

Small pockets of coastal forest still exist in other parts of Lindi District but they are all less than two square kilometres in size and many will probably be cleared in the near future. This study sadly revealed that on Likonde and Maputwa Plateaus coastal forests no longer occur.

Below the major forests on the separate plateaus and hills are described. It consists of the areas that were identified from the study of satellite images to have major forest areas left. For the purpose of this publication the forested plateaus and hills have been subdivided as follows:

- Dimba Hill
- Ruawa-Likonde Plateau (with Ruawa Forest Reserve)
- Noto-Chitoa Plateau (with Chitoa and Litipo Forests)
- Rondo Plateau

Dimba Hill

Nearly all the remaining lowland forest on Dimba Hill is contained in Dimba Forest Hill. The forest reserve is described in the following chapter on page 56.

Ruawa-Likonde Plateau

General description

Forest is mainly present on the escarpment edge of the Likonde Plateau. Almost all the remaining forest is found inside Ruawa Forest Reserve, which is situated on part of the south-eastern side of the Likonde plateau and includes an area of the coastal plain at the base of the plateau. The remaining forest on this plateau only covers some 9 km^2, with high land use intensity in the surrounding areas. Along the escarpment there are massive outcrops of ancient coral rag which have probably been responsible for ensuring the survival of forest in the north-western part of Ruawa Forest Reserve, as these have reduced the incentive to clear the area for agriculture (Clark 1995). Elsewhere in the reserve there is a long history of agricultural encroachment.

Forest vegetation

Three Eastern African Coastal Forest types were identified. **Mixed dry forest, Legume dominated forest** and **Groundwater forest.** In particular the Groundwater Forest is very impressive with very tall trees and high diversity of species.

Species of forest trees

The following species of trees were recorded during this study:

Mixed dry forest: Dominant tree species: *Milicia excelsa, Baphia macrocalyx, Cussonia zimmermannii, Bombax rhodognaphalon* and *Scorodophloeus fischeri*

Legume dominated forest: Dominant tree species: *Scorodophloeus fischeri, Millettia bussei* and *Craibia cf. brevicaudata*

Ground water forest: Dominant tree species: *Pouteria alnifolia, Trichilia sp., Pteryogota sp. nov. Ricinodendron heudelotii, Sterculia cf. schliebenii, Ficus exasperata* and *Sorindeia madagascariensis*

A possible new species of tree was discovered in the Ground Water Forest inside Ruawa Forest Reserve: *Preryogota sp. nov. Milicia excelsa*-which also occur in the Ground Water Forest is a vulnerable timber species. In addition the following East African coast endemic were recorded: *Craibia cf. brevicaudata, Sterculia cf. schliebenii, Lasiodiscus holstii, Mkilua fragans, Olax pentandra, Asteranthe lutea* and *Uvariodendron gorgonis*.

Mammals

Very limited information is available. So far only two species of large mammals have been documented:

Leopard *Panthera pardus* – CITES Annex 1 species and Threatened according to IUCN

Zanj Elephant Shrew *Rynchocyon petersi* Coastal Forest endemic; IUCN Rare

Birds

53 species of birds were recorded from the coastal forest in Ruawa F.R. during a four days of bird survey in mid-December 2001 (Annex B). Most of the species recorded occur in both forest and woodland but six Forest Dependent species were also observed. These are African Broadbill *Smithornis capensis*, Square-tailed Drongo *Dicrurus ludwigii,* Tiny Greenbul *Phyllastrephus debilis*, Yellow-streaked Greenbul *P. flavostriatus*, East Coast Akalat *Sheppardia gunningi* and Reichenow´s Batis, *Batis reichenowi*.

The population of East Coast Akalat in Ruawa F.R. represent the fourth coastal forest this rare species is known from in coastal Tanzania south of Rufiji River (the others being Rondo, Litipo & Chitoa). This species seems to occur in lower densities in Ruawa F.R. than in the other forests in Lindi District.

Other birds of conservation concern recorded from Ruawa F.R. were Uluguru Violet-backed Sunbird *Anthreptes neglectus* which is a Restricted-range Species and Plain-backed Sunbird *Anthreptes reichenowi* which is a Near-threatened Species according to the BirdLife International Saving Species Index. Fisher's Greenbul *Phayllastrephus fischeri*, which is common in this area, is a Coastal Forest Endemic.

Green Barbet *Stactolaema olivacea* was also recorded from this area. The subspecies of this barbet was *S. o. hylophona,* which is endemic to southeast Tanzania. So far it has only been recorded (with certainty) from the two Ngarama forest reserves and Rondo FR although Green Barbets observed in Mitundumbea Forest Reserve in December 2001 most likely also belonged to this subspecies.

A pair of the rare and local Bat Hawk *Macheiramphus alcinus* was observed resting in the forest near a system of caves. Furthermore, Barred Long-tailed Cuckoo *Cercococcyx montanus*, African Pitta *Pitta angolensis,* Red-tailed Ant-thrush *Neocossyphus rufus* and Terrestial Brownbul *Phyllastrephus terrestris* were all found to be common inside the forest.

Human impact

Most of the plateau is transformed into agricultural land and even parts of Ruawa FR are heavily disturbed. Only on the coral rag hills and valleys inside Ruawa FR survive a relatively pristine coastal forest.

Protected areas

Ruawa Forest reserve is the only protected area on the Ruawa-Likonde Plateau.

Biodiversity value

The brief ornithological survey carried out in connection with this study appears to be the first study of the animals of the coastal forests on this plateau. Previously botanists have paid brief visits. For this reason little is still known about the biodiversity values of the coastal forest of this area. From what is known the remaining forest – which only survive inside Ruawa Forest reserve – appear to be of large biodiversity importance. The avifauna contains large numbers of forest dependent species and includes rare and local species such as the East Coast Akalat. Also a possible new species of tree was discovered inside Ruawa Forest Reserve during the short botanical survey as well as a number of tree species endemic to the East African coastal forests.

Geographical the coastal forest of Ruawa FR is situated within the Lindi local centre of endemism which is defined as the lowland forests between the Lukuledi and Mbemkuru rivers to within 75 km inland (due west) of Lindi (Clarke in prep.). The coastal forests within this area is by far the most important in SE Tanzania from a biodiversity point of view with more that 90 endemic plant species and also several endemic species of animals.

Noto-Chitoa Plateau

General description

The Noto and Chitoa Plateaus constitute a large upland area north-east of Rondo Plateau. The Mikomoro River separates Noto and Chitoa plateaus.

Most of the Noto Plateau was probably covered by coastal forest decades ago, especially near the edges of the plateau. Today app. 45 km^2 of **Mixed Scrub Forest** with patches of **Mixed Dry Forest** remain.

Large areas on the Chitoa Plateau are also cultivated but along the southeast edge of the plateau and at the southern most end of the plateau small patches of very rich coastal forest still occur. Most of the remaining coastal forest on the Chitoa Plateau occurs inside the Chitoa and Litipo Forest Reserves.

Chitoa Forest Reserve (7718 ha) is situated on the southwestern edge of the Chitoa Plateau at 330-420 m above sea level. The majority of the forest reserve is covered by **Mixed Scrub Forest** on the Chitoa plateau and on the slope running down to the Mkongore River (Clarke 1995). **Evergreen forest** occurs on the southern rim of the plateau, to about 100-300 m north of the plateau edge.

Litipo Forest Reserve (996 ha) lies between Lake Tandangogoro and Lake Lutamba at the edge of the southern most extension of the Chitoa Plateau. The reserve has an altitude range of between 180-270 m above sea level. The vegetation of Litipo varies from forest with low trees and many climbers to woodland in the north (Clarke 1995). Dry undifferentiated forest with a very regular structure (12-20 m canopy) occurs on many of the slopes rising above Lake Lutamba. Moist undifferentiated forest occurs in the riverine areas and around parts of both lakes. Scrub woodland occurs in extensive patches on the ridgetops. Evergreen thicket occurs in large areas on the slopes towards Lake Tandangogoro and in places on the ridgetops. Wooded grassland occurs in patches at higher altitudes throughout the reserve (description from Clarke 1995).

Forest vegetation

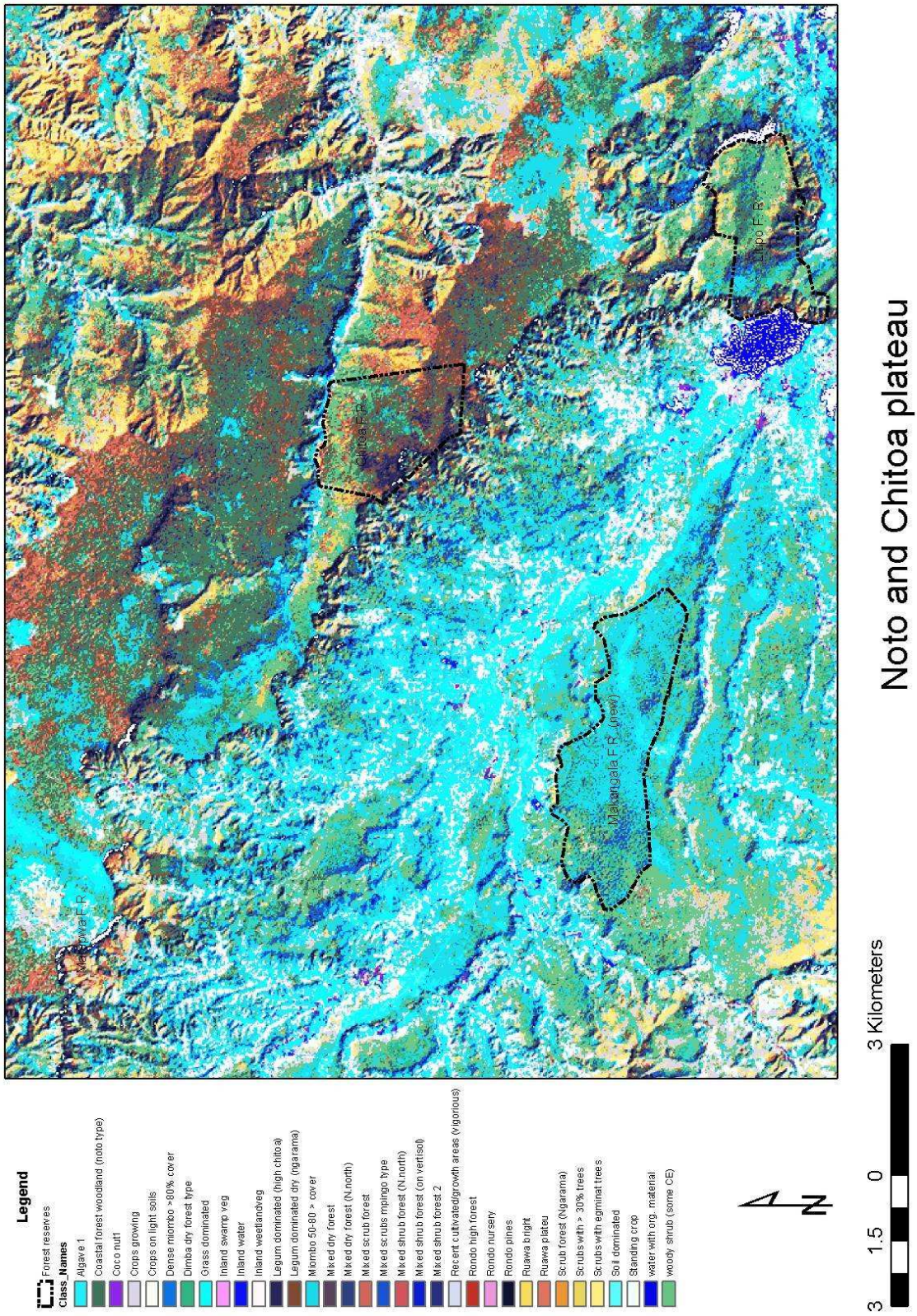
The following forest types have been recognised on Chitoa Plateau:

Chitoa Forest Reserve (data from this study): **Legume Dominated Forest** and **Mixed Scrub Forest.**

Legume dominated forest: Dominant tree species: *Tessamannia densiflora,*

T. martiana var. martiana, Newtonia paucijuga, Hymanaea verrucosa, Scorodophloeus fischeri,Baphia cf. wollastinii, Guibortia schliebenii, Baphia macrocalyx, Teclea nobilis and *Cola microcarpa.*

Mixed scrub forest: Dominant tree species**:** *Hymenocardia ulmoides, Pteleopsis myrtifolia, Swartizia madagascariensis, Dialium holstii, Bombax rhodognaphalon, Fernandoa magnifica, Grewia conocarpa* and *Afzelia quanzensis*.



Map 6. *Vegetation on Noto and Chitoa Plateaus*

Litipo Forest Reserve (data from Clarke 1995): **Legume Dominated Forest, Riverine Forest** and **Mixed Scrub Forest.**

Legume dominated forest: Dominant tree species: *Berlinia orientalis Dracaena usambarensis, Garcinia acutifolia, Pterocarpus tinctorius* and *Xylia africana.*

Riverine Forest: *Khaya anthotheca, Trichilia emetica* and *Newtonia buchananii.*

Mixed Scrub Forest: Common species are: *Baphia kirkii, Millettia punctulata, Manilkara sulcata* and *Pteleopsis myrtifolia*.

Mammals

At least 27 species of mammals have been recorded for this area (Clarke 1995). These include:

Rondo Dwarf Galago *Galago sp. nov.*- endemic to Rondo and Chitoa Platueaus

"Newala Small Galago" a pygmy form of *Otolemur crassicaudatus* of uncertain taxonomic status known only from Litipo F.R. and the Makonde Plateau.

Lesser Pouched Rat *Beamys hindei* – a coastal forest/Eastern Arc endemic

African Elephant *Loxodonta africana* – rated "Vulnerable" by IUCN.

Leopard *Panthera pardus* – rated "Threatened" by IUCN.

Zanj Elephant Shrew *Rhynchocyon peteri* – a coastal forest endemic rated "Rare" by IUCN.

Zanzibar Galago *Galagoides zanzibarius* – rated "Vulnerably" by IUCN

Reptiles

18 species have been recorded (from Litipo F.R.) (Clarke 1995). These include:

Litipo Limpless Skink *Scolecoseps sp. nov.* – only known from Litipo

Baker´s Sharp-snouted Worm Lizard. – *Ancylocranium ionidesi* - a Tanzania endemic known only from Lindi District and Newala.

Eastern Four-toed Fossorial Skink *Sepsina tetradactyla* – a coastal forest endemic.

Amphibians

8 species have been recorded from the forest (Litipo), with a further 2 species recorded just outside the forest (Clarke 1995). The amphibians include:

Leaf-litter Toad *Stephopaedes loveridgei* – found in both Chitoa and Litipo. This toad is a coastal forest endemic known only from app. 10 sites in SE Tanzania.

Birds

At least 100 species of birds have been recorded from the Chitoa Plateau in Litipo & Chitoa Forest Reserves (Bagger *et al*. 1990, Eriksen *et al.* 1993, this study (Annex B)).

This includes 13 Forest Dependent species: Southern Banded Snake Eagle *Circaetus fasciolatus* (only in Litipo), Crowned Eagle *Stephanoaetus coronatus* (only in Chitoa), Lemon Dove *Aplopelia larvata* (only in Litipo), African Broadbill *Smithornis capensis*, Square-tailed Drongo

Dicrurus ludwigii, Little Greenbul *Andropadus virens* (only in Litipo), Tiny Greenbul *Phyllastrephus debilis*, Yellow-streaked Grenbul *P. flavostriatus*, White-chested Alethe *Alethe fuelleborni* (only in Chitoa), East Coast Akalat *Sheppardia gunningi*, Spotted Ground Thrush *Turdus fisheri* (only in Litipo), Reichenows Batis *Batis reichenowi* and Green-backed Twinspot *Mandingoa nitidula.*

Chitoa Forest Reserve is the only coastal forest in Tanzania where White-chested Alethe has been recorded. This thrush is common in the Eastern Arc Mountains and has been recorded from a few coastal forests in Kenya and Mozambique.

Litipo and Rondo are the only suspected breeding grounds for the East African population of Spotted Ground Thrush – an Endangered Species according to BirdLife International Saving Species Index.

Other birds of conservation concern recorded from Chitoa Plateau are Uluguru Violet-backed Sunbird *Anthreptes neglectus* which is a Restricted-range Species and Plain-backed Sunbird *Anthreptes reichenowi* which is a Near-threatened Species according to the BirdLife International Saving Species Index. Fisher's Greenbul *Phyllastrephus fischeri,* which is common in the forest on the Chitoa Plateau is a Coastal Forest Endemic. During the Northern winter African Pitta *Pitta angolensis* appear to be a common breeding bird on this plateau. Pittas are absent in other parts of the year from coastal Tanzania and are believed to migrate to and from "wintering grounds" in Kenya.

Human impact

It appears that most of Noto Plateau has been cultivated at some point within this century. Within the last decade the northern part of the plateau the natural forest has ben cleared for shifting cultivation. Selective logging of the larger and valuable trees also occurs Recently part of the coastal forest on the south-eastern part of the plateau has also been cleared for cultivation which has broken the natural corridor of forest that connects Chitoa and Litipo FRs.

Protected areas

Chitoa Forest Reserve (7718 ha) is situated on the southwestern edge of the Chitoa Plateau at 330-420 m above sea level. Litipo Forest Reserve (996 ha) lies between Lake Tandangogoro and Lake Lutamba at the edge of the southern most extension of the Chitoa Plateau.

Biodiversity value

Next to the coastal forest inside Rondo Forest reserve the coastal forests of Chitoa and LitipoFR on the Chitoa are the most important from a biodiversity perspective in coastal Tanzania south of the Rufiji River. The number of endemic and near-endemic species of trees is very large. Also the fauna is particularly rich and include species that are found no where else in the coastal forests of Tanzania.

In an area on the plateau between Chitoa and Litipo FRs app.10 km^2 of relative undisturbed coastal forest still occur. This forest – which still remain to be surveys – potentially has high biodiversity value.

Rondo Plateau

Introduction

The forest on the Rondo Plateau has received many visits from biologists and this is the best known Tanzanian coastal forest south of the Rufijii. The Rondo forest was not visited in connection with this study.

General description

Coastal forest is situated on the eastern section of the Rondo Plateau at around 850-900 m a.s.l. The coastal forest is very variable as a result of a long history of human disturbance in the area. Small patches of forest remain that appear to be in primary condition, together with areas that have regenerated following extensive logging, areas that may have regenerated from earlier cultivation and also large areas of plantation forest (Clarke 1995).

Forest vegetation

The following coastal forest types have been recognised inside Rondo F.R.: **Dry Evergreen Forest** and **East African coastal *Brachystegia* Forest** (Clarke 1995).

Species of forest trees

Rondo Forest is probably the riches coastal forest in Tanzania in terms of species and with particular important concentrations of endemic plants (two endemic and two near-endemic genera and 60 endemic species)(Burgess and Clarke 2000).

Birds

The bird fauna of Rondo Forest Reserve is the best known among the coastal forests of Tanzania south of the Rufiji River. Together with the Chitoa Plateau, Rondo has the highest number of Forest Dependent species in the region.

At least 122 bird species has been recorded from Rondo Plateau (Clarke 1995, Tanzania atlas data). This includes 13 Forest Dependent species: Southern Banded Snake Eagle *Circaetus fasciolatus*, Crowned Eagle *Stephanoaetus coronatus* (recorded during this survey), Lemon Dove *Aplopelia larvata*, African Broadbill *Smithornis capensis,* Square-tailed Drongo *Dicrurus ludwigii*, Little Greenbul *Andropadus virens*, Tiny Greenbul *Phyllastrephus debilis*, Yellow-streaked Grenbul *P. flavostriatus*, East Coast Akalat *Sheppardia gunningi*, Spotted Ground Thrush *Turdus fisheri*, Reichenows Batis *Batis reichenowi*, Black-fronted Bush Shrike and Green-backed Twinspot *Mandingoa nitidula.*

The forest on Rondo Plateau is the only coastal forest in Tanzania south of the Rufiji where the predominately montane Black-fronted Bush Shrike has been recorded. It is also the only place where Green-headed Oriole (not entirely forest dependent) is found in coastal Tanzania south of the Rufiji.

Rondo Forest Reserve was the first place where the East African population of Spotted Ground Thrush was recorded breeding (although definite proof still is lacking) – this species has subsequently been recorded in Litipo F.R. during what is believed to be the breeding season. Spotted Ground Thrush is an Endangered Species according to BirdLife International Saving Species Index.

Other birds of conservation concern recorded from Rondo F.R. are Uluguru Violet-backed Sunbird *Anthreptes neglectus* which is a Restricted-range Species and Plain-backed Sunbird *Anthreptes reichenowi* which is a Near-threatened Species according to the BirdLife International Saving Species Index. Fisher's Greenbul *Phyllastrephus fischeri* is a Coastal Forest Endemic. During the Northern winter African Pitta *Pitta angolensis* appear to be a common breeding bird in this forest. Rondo is one of the few localities where Kreschmer`s Longbill (a restricted range species) has been recorded.

The subspecies *hylophona* of Green Barbet *Stactolaema olivacea* endemic to a few coastal forests in south-east Tanzania is common in Rondo Forest Reserve.

Mammals

26 species of mammals have been recorded from the forest on Rondo including the recently discovered and apparently endemic Rondo Dwarf Galago *Galago. sp.nov.* (Clarke 1995). Other species of conservation concern are (from Clarke 1995):

East African Collared fruit Bat *Myonycteris relicta* – a coastal forest/Eastern arc endemic known from only 8 other localities and rated "Vulnerable" by IUCN

Lesser Pouched Rat *Beamys hindei* – also a coastal forest/Eastern Arc endemic rated "Vulnerable" by IUCN.

African Elephant *Loxodonta africana* – rated "Vulnerable" by IUCN.

Leopard *Panthera pardus* – rated "Threatened" by IUCN.

Zanj Elephant Shrew *Rhynchocyon peteri* – a coastal forest endemic rated "Rare" by IUCN.

Zanzibar Galago *Galagoides zanzibaricus* – rated "Vulnerable" by IUCN.

Mouse-eared Bat *Myotis welwitschii* – infrequently encountered throughout its range.

Reptiles

11 Forest Dependent species of reptiles have been recorded from Rondo (Clarke 1995). These include:

Rondo Limbless Skink *Melanoseps rondoensis* – a Rondo endemic.

Rondo Blind Snake *Typhlops rondoensis* – a Rondo endemic

Bearded Pigmy Chameleon *Rhampholeon brevicaudatus* – endemic to the Eastern Arc Mountains and 6 Tanzanian coastal forests.

Usambara Green Snake *Philothamnus macrops* - known only from the Usambara Mountains and 3 Tanzanian coastal forests.

In addition to the forest dependent species, two woodland species are endemic to the Rondo area:

Rondo Round-headed Worm Lizard *Chirindia rondoensis* - a area Rondo endemic known only from woodland and low altitude savannah of the Makonde and Rondo Plateaux in southern Tanzania.

Baker´s Sharp-snouted Worm Lizard. – *Ancylocranium ionidesi* - a Tanzania endemic known only from Lindi District and Newala.

Amphibians

6 species of toads and frogs have been collected in the forest on Rondo Plateau (Clarke 1995). This includes (from Clarke 1995):

Tree-toad *Mertensophryne micranotis* – a coastal forest endemic

Leaf-litter toad *Stephopaedes loveridgei* – known only from about 10 sites in SE Tanzania, probably all Coastal Forests.

Methner`s toad *Spaelaeophryne methneri* – a coastal forest/Eastern arc endemic.

In addition the following species of toad has been recorded from woodlands just west of the coastal forest (this study):

Tiny Squeaker *Schoutedenella xenodactyloides,* which is a species usually associated with forests.

Protected areas

All the remaining coastal forest on the Rondo Plateau is situated inside the Rondo Forest Reserve (14,060 ha). This reserve also contains large areas of woodland as well as quite large areas with plantation (various pines, teak and other timber trees).

Biodiversity importance

The coastal forest on Rondo Plateau contains a far greater number of endemic plant species than any other Eastern African Coastal Forest. Moreover the plateau holds one endemic species of mammal. Also the number of endemic reptile species (two) is higher that other coastal forest. The forest on Rondo has the highest number of Forest Dependent birds among the coastal forests south of the Rufiji River, possibly among all Tanzanian coastal forests. For these reasons the coastal forest on the Rondo Plateau must be considered as the most important forest patch along the coast south of the Rufiji River – possible along the entire Tanzanian coast.

5.4 Conclusion

The satellite image study of the distribution of coastal vegetation in Kilwa and Lindi Districts has provided much new information regarding the distribution and type of coastal forest that still exist in this part of Tanzania. Also the field visits to a large number of sites in the two districts and the biodiversity studies carried out as part of this project has provided much new information.

The main conclusions of these studies carried out in 2001are the following:

(1) Almost all the remaining coastal forest in Kilwa and Lindi Districts is situated on low plateaus and hills.

(2) On the row of large plateaus that runs parallet to the coast in Kilwa District – Mitumdumbea, Ruwawa and Mbwalawala plateaus large areas of different types of coastal forest still remain. These are the larges forested areas in the Kilwa/Lindi Districts.

(3) On Mitumdumbea Plateau north of the forest reserve is a large area (app.100 square kilometre) with what appear to be a previously un-described coastal forest. Its biological importance still has to be determined but initial studies carried out as part of this project indicate a forest complex of high biological importance with at least one new species of trees discovered in 2001.

(4) On Ruwawa Plateau app 80 square kilometre of dry coastal forest occur inside Ngarama Forest reserve. This makes it the larges forestred area inside a Forest Reserve in Kilwa District. Two new species of trees were discovered in this reserve in 2001.

(5) In Lindi District the remaining coastal forest is much more fragmented than in Kilwa District with very little high coastal forest occurring outside Forest Reserves.

(6) The remaining coastal forest in Lindi District are small with no or only very small areas in a pristine condition. The forest inside Rondo Forest Reserve is an exeption since this forest still is relatively large.

(7) From a biodiversity point of view the most important known lowland forests in Kilwa and Lindi Districts are the Rondo, Litipo, Chitoa, Ruawa and Noto forests which collectively make up the Lindi local centre of endemism. At least 90 species of plants are endemic to the forests of this centre of endemism as well as several species of animals. The coastal forest at Ruawa has not previously been assigned to this centre of endemism. However, the results of biodiversity studies carried out as part of this project has documented the importants of this forest and that it clearly should be included in the Lindi centre of endemism.

(8) Although Dimba Forest Reserve is situated within the geographical limits of the “Lindi centre of endemism” the biodiversity value of this forests appear to be relatively low and it is not clear if this reserve should be regarded as part of this. It should, however, be pointed out that two new endemic trees were discovered in Dimba forest during this survey.

6. THE BIODIVERSITY OF THE PILOT SITES

The biodiversity studies in the four project sites were focused on species groups that are relatively well known in the region. For this reason the surveys were limited to trees, birds, reptiles and amphibians. Mammals were also recorded when observed but the surveys did not include specific activities to locate this animal group.

In the following we summarise the findings of the fieldwork carried out between October and December 2001. During this period visits of 5-6 days were made to the four pilot areas with sampling of the flora and the different animal groups carried out simultaneously. The fieldwork was undertaken from tented camps inside or at the edge of the woodland/forest.

6.1 Mihima Village Based Forest Reserve (Rondo Plateau)

Description

Rondo is a deeply dissected plateau in the coastal plains, which rises slightly from east to west to reach an altitude of 600-800 m in Rondo Forest Reserve. In places, the escarpments slopes are very steep. The soils are leached white sands with very low nutrient status, derived from soft sandstones and unconsolidated sands of Jurassic or Cretaceous origin (Vollesen in Haywood & Davis 1994).

It is believed that in particular the eastern part of the plateau was previously covered by coastal lowland forest. Today forest is almost exclusively found inside the large Rondo Forest Reserve. This forest is generally regarded as the most important in terms of biodiversity in southeast Tanzania. West of Rondo Forest Reserve the forest gives way to different types of woodland, shrub thickets, grasslands and cultivated areas.

The Village Based Forest Reserve, which was the target of the biodiversity surveys, was located app. 4.5 km north of the village Mihima at an altitude of 600m and a few kilometres west of Rondo FR.

Climate

Rainfall is unreliable and estimated to be c. 1500 mm per annum. Rainfalls of short duration occur from November to December, while longer rains extend from February-March to April-May. Even in the rainy season, there is no surface water on the plateau and in the dry season (May-June to October-November); most species of trees lose their leaves. Maximum temperatures reach well over 30 C at the end of the dry season (Vollesen in Haywood & Davis 1994).

Vegetation

The Rondo Plateau is mainly known for its lowland forest, which contain a far greater number of endemic plant species than any other coastal forest in eastern Africa. However, the western part of the Plateau (including the Village based Forest Reserve of this project) is covered with *Parinari curatellifolia* woodland, thickets, grasslands and other open vegetations.

The vegetation of the project area is open woodland with dense grass vegetation under the trees mixed with patches of shrub and thickets. In some parts of the area open areas without any vegetation occurs.

The dominating species of trees recorded along 12 transects inside the Village Based Forest Reserve is listed below. The dominating species are common and widespread woodland species. None of the many rare and endemic forest plants of Rondo FR were recorded inside the VBFR.

Name of forest	**Vegetation type**	**Transects & Location**
MHIMA VBFR	**Mixed woodland.** Common tree species are *:- Pseudolachnostylis maprounefolia, Makhamia obtusifolia, Brachystegia microphylla and Albizia gummifera,*	T1 37L 0514809 UTM 8871968
	Mixed woodland. Common tree species are *:-Hymenocardia ulmoides,Pterocarpus angolensis*	T2 37L05147749 UTM8872054
	Mixed woodland. Common tree species are *:- Securidaga longipedunculata, Swartia madagascariensis, Combretum molle & Grewia bicolor*	T3 37L0514544 UTM8871632
	Mixed woodland. Common tree species are *:-Parinari curatellifolia, Strychnos panganiensis & Diospyros verrucosa*	T4 37L05147749 UTM 8871518
	Mixed woodland. Common tree species are *:- Pseudolachnostylis maprounefolia Vismia orientalis,Ochna holstii Parinari curatellifolia, Strychnos panganiensis & Diospyros verrucosa*	T5 37L0515052 UTM887184
	Mixed woodland. Common tree species are *:-* *Makhamia obtusifolia, Parinari curatellifolia & Swartia madagascariensis*	T6 37L0514871 UTM8872292
	Woodland dominated by *Pterocarpus angolensis &Swartia madagascarienis*	T7 37L0514916 UTM8872543
	Mixed woodland. Common tree species are:- *Makhamia obtusifolia,Pterocarpus angolensis & Albizia gummifera*	T8 37L0514849 UTM8872875
	Woodland dominated by *Parinari curatellifolia*	T9 37L0515019 UTM882919

	Mixed woodland. Dominant tree species are:- *Parinari curatellifolia,Strychnos panganiensis,Hymenocardia ulmoides &Swartia madagascariensis*	T10 37L0516543 UTM8875674
	Mixed woodland. Dominant tree species are:- *Parinari curatellifolia,Vismia orientalis*	T11 37L 0517086 UTM 8871555
	Mixed woodland. Dominant tree species are:- *Makhamia obtusifolia & Scerocarya birrea*	T12 37L0514914 UTM8873795

Bird fauna

During a 7 days survey of the birds of the woodlands of the Rondo Plateau Village Based Forest Reserve 95 species were recorded (Annex B).

The bird fauna is characterised by high diversity (many species) of which the majority was common and widespread woodland species. Even after seven days of intensive field work the number of woodland species recorded was still increasing. It is estimated that over 100 woodland species occur in this area. During the northern winter this will increase further as palearctic migrants arrive to the Rondo Plateau. A few inter-African migrants such as African Pitta also occur in the woodlands on the Rondo Plateau.

Interestingly, four "Forest Dependent" species were recorded in the woodlands: Crowned Eagle, Southern Banded Snake Eagle, African Broadbill *Smithornis capensis* and Square-tailed Drongo *Dicrurus ludwigii.* Although normally regarded as dependent on forest these birds were recorded from woodland vegetation. The two species of birds of prey are probably breeding in the forest of Rondo Forest Reserve and mainly use the woodland area as hunting ground. The African Broadbill was relatively common in the denser parts of the woodlands while the Square-tailed Drongo was rare and recorded only once. It must be assumed that the occurrence of "Forest Dependent " bird species in the woodlands of the Rondo Plateau is because some forest species are able to penetrate into adjacent vegetation. However, it must be assumed that these species were not found in the woodlands of the VBFR if the closed forest in Rondo Forest reserve was not so close by.

Mammals

This group of animals was not the focus of the fieldwork, but large mammals were noted when observed.

Very few mammals were observed probably because areas with quite high populations surround the plateau: Yellow Baboon *Papio cynocephalus* and Chequered elephant shrew *Rhynchocyon cirnei.*

Reptiles

20 species of reptiles were recorded during the field survey. This included tortoises, worm lizards, agamas, chameleon, geckos, lizards and snakes. Based on experience in other coastal areas it is likely that even for such an area such as Rondo, a number of reptiles remain undetected. For instance, the endemic Rondo Plateau Blind Snake, which is known only from drier woodland of the Rondo Plateau and Mtwara Region, was not recorded during this study.

The reptiles that were reported from the woodlands north of Mihima are mostly common and widespread species that live outside forests. However, two very rare and local species of worm lizards were recorded during the fieldwork:

Rondo Round-headed Worm Lizard.This is a Rondo endemic known only from woodland and low altitude savannah of the Makonde and Rondo Plateaux in southern Tanzania. Little is known about its biology.

Baker´s Sharp-snouted Worm Lizard. Also a Tanzania endemic known only from Lindi District and Newala. Almost nothing is known about its biology.

Amphibians

Because the sampling period was very dry, little if any amphibian breeding activity was taking place, and relatively few amphibians were detected. In all 8 species of toads and frogs were located (Annex A). Non of which are typical forest species. An exception is the Tiny Squeaker *Schoutedenella xenodactyloides,* which is a species usually associated with forests.

Conservation issues

Although the Village Based Forest Reserve at Mihima is situated only a few kilometres west of Rondo Forest reserve, only very few of unique Forest Dependent species which occur here were recorded. The Rondo Forest Reserve contains about 200 endemic and near-endemic species of plants but no of these occur in the open woodlands of the VBFR.

Two rare and very local species of worm lizards are restricted to woodlands of the extreme southeast Tanzania, including the Rondo Plateau. The same applies to the Rondo Plateau Blind Snake, which is known only from drier woodlands of the Rondo Plateau and Mtwara Region.

6.2 Dimba Forest Reserve

General description

Dimba Forest Reserve is located on a low hill approximately 10 km inland from the Indian Ocean. The eastern boundary of the reserve borders a minor gravel road. The northern boundary borders a former Sisal plantation that was abandoned in the 1960s. Today the sisal plantation is overgrown with shrub and trees including some planted cashew trees. The reserve lies approximately 2 km south-east of Lake Mkoe. The Mitoi River forms the southern boundary of the reserve. There is a footpath from Dimba village through the forest reserve in an approximately north-south direction.

Vegetation

The original German gazettement map (from 1911) indicated that thick forest occurred on the southern part of the reserve (Clarke 1995). The northern part of Dimba hill consisted of a mosaic of thick forest and fallow cultivation, and on the eastern and of the reserve consisted of fallow cultivation at that time (Clarke 1995)

I 2001 the forest of the reserve is largely intact. It consists of rather low and dry vegetation with a canopy to 10 m in over large parts of the reserve. A few taller trees (up to app. 20 m) were observed in the northern part. Except for the eastern most part of the reserve (close to the road) the trees form a closed canopy with no or very little grass on the forest floor. Generally, the vegetation is very dense. The forest vegetation consists of a species poor **Legume dominated forest** with parts being a **Mixed dry forest**

The legume dominated dry forest is dominated by *Cynometra cf. alexandrie, Cynometra sp., Vitex mombassana* & *Zanthoxylum chalybeum.* The forest has a rather simple structure with large numbers of shrubs that often occur are mostly dominated by the same species as the tree canopy.

Mixed dry forest: Dominant tree species: *Lettowianthus stellatus, Makhamia obtusifolia, Cynometra sp. & Pteleospis myrtifolia*

DIMBA FOREST	Legume dominated dry forest. Dominant tree species:- *Cynometra cf. Alexandrie Cynometra sp.Vitex mombassana, Zanthoxylum chalybeum &Brachystegia bussei.*
	As above
	As above
	Mixed dry forest. Dominant tree species :- *Cynometra sp.Lettowianthus stellatus, Makhamia obtusifolia& Pteleopsis myrtifolia*
	As above
	Legume dominated dry forest. Dominant tree species:- *Cynometra cf. Alexandrie Cynometra sp., Kigelia africana &Terminalia sericea*

Birds

During a 6 days survey of the avifauna of Dimba Forest Reserve 46 species were recorded (Annex B). The majority were bird species associated with secondary forest, forest edges or dense woodland.

Six Forest Dependent species were recorded: African Broadbill *Smithornis capensis*, Square-tailed Drongo *Dicrurus ludwigii*, Yellow-streaked Greenbul *Phyllastrephus flavostriatus*, Tiny Greenbul *P. debilis*, Reichenows Batis *Batis reichenowi*, and Green-backed Twinspot *Mandingoa nitidula.* Among these, Tiny Greenbul is also a Restricted Range species endemic to the coastal forests of Tanzania to Natal while Reichenow`s Batis is a Coastal Forest Endemic restricted to SE Tanzania.

Other bird species of conservation concern are Fishers Greenbul *Phyllastrephus fisheri* - a Coastal Forest Endemic (not entirely restricted to forest but which also occur in other dense vegetation) and Plain-backed Sunbird *Anthreptes reichenowi* - a Near threatened species according to IUCN.

Mammals

Four species of mammals were recorded from Dimba Forest Reserve (see Table 1). The observation of Zanj Elephant Shrew *Rynchocyon petersi* is an extension of its known range which was thought limited to the coastal area between Mombassa in Kenya and Rufiji River (and Zanzibar & Mafia Islands)(Kingdon 1997). This species is listed Rare by IUCN

Table 1. *Species of mammals registered in Dimba Forest Reserve in October 2001.*

Species	**Type of registration**	**Conservation issue**
Vervet monkey *Cercopithucus pygerythrus*	Observed	-
Gentle monkey (Blue Monkey) *Cercopithecus mitis*	Observed	-
Zanj Elephant Shrew *Rynchocyon petersi*	Observed	East Coast Endemic
Leopard *Pathera pardus*	Tracks	-

Reptiles

13 species of reptiles were detected in Dimba Forest Reserve (see Annex A) all of which are relatively common and widespread species.

Amphibians

The sampling period was very dry and relatively few amphibian were detected Dimba Forest Reserve: Common Squeaker *Arthroleptis stenodactylus* and Loveridge`s Stephopaedes (or Leaf-litter Toad) *Stephopaedes loveridgei*.

The Common Squeaker is a widespread species of forest and woodlands, capable of surviving in highly disturbed habitats. Loveridge´s Stephopaedes is known only from forests in Southern Tanzania – so far it is detected in Kiwengoma FR, Tong`omba FR, Kikole Village, Kitope FR, Chotoa FR, Litipo FR and Rondo FR but it probably occur in all coastal forests.

Conservation issues

There is no evidence of major human interference threatening the forest at present. Some trees are collected by local people for building poles and other purposes but this does not appear to pose a threat to the forest.

The conservation value of Dimba Forest Reserve from a biodiversity point of view is mainly centered on the occurrence of two endemic trees discovered during this survey: *Cynometra sp. & Cynometra cf. alexandie* Both are among the most common trees in the forest. In addition the extremely local *Cynometra gillmani* was described from a forest patch near Lake Mkoe which can only be a few kilometre from Dimba forest itself. This rare tree was surprisingly also discovered just north of Mitundumbeau Forest Reserve during this study.

The animal groups that have been studies so far (birds, amphibians and reptiles) include 4 coastal forest endemics (2 birds, 1 mammal and one amphibian) and one near threatened bird species but all of these seem to occur in most if not all coastal forests in south-eastern Tanzania. For this reason these animals are not considered of particular conservation concern.

Clarke (2000) defined an Lindi local centre of endemism (for plants) which encompasses the series of plateau's and the adjacent coastline between Lukuledi and Mbemkuru rivers to within 75 km inland (due west) of Lindi (Clarke in prep.). Although Dimba lies within the geographical limits of the Lindi centre of endemism the vegetation it is not clear if this reserve should be regarded as part of this.

6.3 Kikole Village Based Forest Reserve

Description

This area is situated just north of the large Mitarure Forest Reserve. The altitude was app. 110 m. The area consisted of relatively dry ridges and more moist valleys. A river with associated moist thickens is found a few kilometres from the Village Based Forest Reserve. The vegetation of the VBFR consists of different types of woodlands.

Vegetation

Two vegetation types were identified inside the VBFR: Mixed woodland and Mixed scrub forest.

Two vegetation types were identified**. Mixed scrub forest** and **Mixed woodland.**

Mixed scrub forest: Dominant tree species: *Millettia stuhlamnii, Dalbergia melanoxylon, Sclerocarya birrea Pteleopsis myrtifolia* and *Combretum zeyheri*.

Mixed woodland: Dominant tree species: *Lannea stuhlmanii, Kigelia africana, Maprounea africana, Makhamia obtusifolia* and *Salvaroda persica.*

Biological important species*: Millettia stuhlmanii (Mnyamwezi).* Valuable timber species includes *Dalbergia melanoxylon* (Black wood/Ebony/Mpingo).

Birds

A rich and diverse bird fauna inhabits the woodland of this area. During the survey 111 species were recorded (Annex B). This number would probably have increased to over 120 resident species if the survey period was longer. The fieldwork was carried out at a time when the first Palearctic migrants arrived to the area and two European species were recorded (European Bee-eater and European Oriole). The number of migrants in the VBFR probably increased later on during the Northern winter. Finally, inter-African migrants such as the African Pitta may also occur in this area when they move into the woodlands of southern Tanzania in November-December to breed.

The bird species recorded in the VBFR are all common and widespread species. Except for a single species (African Broadbill – see below) all are typical species of woodlands and other types of open vegetation.

The proximity of the Selous Game Reserve and other areas with high density of game animals is clearly reflected in the avifauna. In contrast to the woodlands on the Rondo Plateau large numbers of birds of prey were recorded. This included scavengers such as African White-backed Vulture and also Marabou Stork. Bateleurs was recorded regularly as well as a few Red-billed Oxpeckers both typical species of East African game areas.

The African Broadbill is usually considered a Forest Dependent species. During this survey this species was recorded to be common in the denser parts of the woodlands at Kitiope – as well as in the woodlands on the Rondo Plateaux. The habitat requirements of this bird should probably be rephrased to “forests, forests edges and dense woodland” – at least for the coastal population of Tanzania as it is clearly not dependent on nearby forests.

Fisher's Greenbul was the only bird species recorded which has it range limited to the coastal belt from Kenya to Mozambique. This species occur in both forest and dense woodland.

Mammals

Although systematic registration of this group was not carried out quite large numbers of mammals were recorded (se table 2). Again the proximity of Selous Game Reserve and the low human population density are believed to be the main reason for the large numbers of large animals. Surprisingly, the Zanj Elephant Shrew *Rynchocyon petersi* appeared to be quite common in the more closed parts of woodlands. This species is usually considered endemic to coastal forests in Kenya and Tanzania but is obviously also able to inhabited more open vegetation.

Table 2. *Species of mammals registered in the woodlands at Kikole in October 2001*

Species	**Type of registration**	**Conservation issue**
Yellow Baboon *Papio cynocephalus*	Observed	-
Vervet Monkey *Cercopithucus pygerythrus*	Observed	-
Gentle Monkey (Blue Monkey) *Cercopithecus mitis*	Observed	-
Zanj Elephant Shrew *Rynchocyon petersi*	Observed	East Coast Endemic
Scrub hare *Lepus saxatilis*	Observed	-
Spotted hyana crocuta crocuta	Observed	-
Lion *Pathera leo*	Heard	-
Leopard *Pathera pardus*	Heard & tracs	-
Bush pig *potamochoerus larvatus*	Observed	-
Common warthog *phacochoerus africanus*	Observed	-
Waterbuck *Kobus ellipsiprymnus*	Observed	-

Reptiles

Most of the reptiles captured at Kikole were common and widespread species. However, several species that has infrequently been recorded and are little known were also captured. This include Boulenger` Skink *Mabuya boulengeri* which is known from Southeast Tanzania and further south, but is rarely recorded.

It also includes the Striped Keel-bellied Lizard *Gastropholis vittata*. This is one of the least known lizards in East Africa. It occurs along the coast of Kenya and Tanzania, but until two specimens were collected at Kikole, none were known between Dar es Salaam and Liwale. The two individuals captured at Kikole were found in hollow bamboo stems 10 m above ground, indicating that this species may live a largely arboreal life.

Amphibians

Six species of frogs and toads were recorded at Kikole. The low number is partly due to the dry conditions during the sampling period.

A single specimen of a species of *Afrixalus*, which seems not to have the characteristics of any previously known from the coastal strip, was collected at Kikole, but a series would be needed to confirm identification. The microhabitat situation, inside a small crevice in a bamboo stem, is also unusual.

The other species of amphibians collected are all common and widespread.

Conservation issues

By far the majority of plants and animals encountered during the study of Kikole VBFR are common and widespread species of woodland habitats in Tanzania - and in fact in large parts of southern Africa.

Among the amphibians and reptiles are a few exceptions. A possible new species of frog belonging to the genus *Afrixalus* may occur in the area. Furthermore several rare and little known reptiles were recorded. It should be noted that southeast Tanzania is one of the least known parts of the country in biological terms. In particular inconspicuous species such as frogs and skinks are very little known. With more work carried out in the future some of the "rare and local" species of widespread habitats such as woodlands will probably prove to be more widespread than previously thought.

6.4 Kitope Forest Reserve

Description

The reserve is situated on a hill with a number of steep valleys on the northern slopes situated close to the sea. Most of the forest on the southern slopes has gone following extensive logging and is substituted by open woodland with scattered large trees. Small patches of forest remain in the deep valleys on the north side along streams and in a few places on the southern slopes.

Vegetation

Most of Kitope Hill – which forms the main part of the reserve – is believed to have previously been covered with forest. Today most of the forest is cleared and the vegetation of the southern slopes and the land that surrounds Kitope Hill is converted to different types of woodlands and grasslands. At the foot of Kitope Hill the vegetation has in some places been cleared for agriculture. The grass and scrub vegetation of the lover parts of Kitope Hill appears to be repeatedly burnt.

At the highest part of Kitope Hill is a low and dense **Mixed Scrub Forest,** which also covers most of the ridges on the central-northern slopes. At the bottom of the steep ravines north of hilltop grows an impressive **Riverine Forest.** This forest follows the watercourses from just beneath the hilltop and app. 1½ km to the north. The riverine forest includes a number of tree species, which are sometimes also dominant in **Mixed Dry Forest**.

The majority of the closed canopy vegetation in Kitope Forest reserve comprises **Mixed scrub forest.** This vegetation covers an area of app. 8 square km. The dominant tree species were recorded to be: *Rothmannia urceliformis, Vitex doniana* and *Erythroxylum fischeri.*

The dominating trees recorded along the 12 transects studies carried out in Kitope FR

KITOPE FOREST	Mixed woodland.Common tree species:- *Makhamia obtusifolia, Turraea robusta & Diospyros loureiana*	T1 37L0517838 UTM907782
	Woodland. Dominant tree species:- *Pteleospis myrtifolia, Annona senegalensis & Grewia conocarpa*	T2 37L0517952 UTM907771
	Woodland. Dominant tree species:- *Makhamia obtusifolia,Albizia gummifera&Grewia conocarpa*	T3 37L0517714 UTM9077826
	Mixed scrub forest. Dominant tree species:- *Rothmannia urceliformis, Vitex doniana &Erythroxylum fischeri*	T4 37L0516926 UTM9078179

	Woodland. Dominant tree species:- *Pteleopsis myrtifolia, Dicrostachyus cinerea & Combretum molle.*	T5 37L0578828 UTM9079326
	Woodland. Dominant tree species:- *Makhamia obtusifolia, Dombeya cincinata & Kigelia africana*	T6 37L0511291 UTM9029118
	Woodland. Dominant tree species:- *Makhamia obtusifolia Lannea stuhlmannii,Turaea robusta*	T7 37L0511666 UTM9028411
	Woodland. Dominant tree species:- *Makhamia obtusifolia Turraea robusta, Maprounea africana*	T8 37L0511912 UTM9027480

	Mixed woodland. Common tree species:- *Grewia conocarpa, Pteleopsis myrtifolia, Albizia gummifera, Spyrostachys africana*	T9 37L0517685 UTM9075645
	Mixed woodland. Common tree species:- *Pteleopsis myrtifolia,Ozoroa mucronata,Sorindeia madagascariensis & Combretum molle*	T10 37L0516632 UTM9078234
	Open woodland. Dominant tree species:- *Annona senegalensis,Pterocarpus angolensis& Piliostigma thonningii*	T11 37L0516632 UTM9078234

Birds

During a 6 days survey of the avifauna of Kitope Forest Reserve 77 species were recorded (Annex B). The majority were bird species associated with secondary forest, forest edges or dense woodland.

Only five Forest Dependent species were recorded: Crowned Eagle *Stephanoaetus coronatus*, African Broadbill *Smithornis capensis*, Square-tailed Drongo *Dicrurus ludwigii*, Yellow-streaked Greenbul *Phyllastrephus flavostriatus*, Tiny Greenbul *P. debilis* and Reichenow`s Batis *Batis reichenowi*. Among these, Tiny Greenbul is also a Restricted Range species endemic to the coastal forests of Tanzania to Natal while Reichenow`s Batis is a Coastal Forest Endemic restricted to SE Tanzania.

Other bird species of conservation concern are Fisher's Greenbul *Phyllastrephus fisheri* - a Coastal Forest Endemic (not entirely restricted to forest but which also occur in other dense vegetation) and Uluguru Violet-backed Sunbird *Anthreptes neglectus*- a restricted range species.

Mammals

Table 3. *Species of* m*ammals registered in Kitope Forest Reserve in October 2001*

Species	**Type of registration**	**Conservation issue**
Yellow Baboon *Papio cynocephalus*	Observed	-
Gentle monkey (Blue Monkey) *Cercopithecus mitis*	Observed	-
Zanj Elephant Shrew *Rynchocyon petersi*	Observed	East Coast Endemic
Banded mongoose *Mungos mungo*	Observed	
Lion *Pathera leo*	Heard	-
African elephant *Loxodonta africana*	Heard & tracks	-

Six species of mammals were recorded from Kitope Forest Reserve. The observation of Zanj Elephant Shrew *Rynchocyon petersi* is an extension of its known range which was thought limited to the coastal area between Mombassa in Kenya and Rufiji River (and Zanzibar & Mafia Islands)(Kingdon 1997). This species is listed Rare by IUCN.

Small herds of elephants occur in the most closed parts of the reserve. These animals probably leave the area during the rains.

Reptiles

12 species of reptiles were recorded. All are common and widespread species, many of which are mainly associated with woodland habitats.

Amphibians

Nine species of frogs and toads were recorded in Kitope Forest reserve. The number of species would probably have been higher is the fieldwork was done under less dry conditions.

All the amphibians recorded are common of widespread species. Most of them are in fact not associated with forest but usually occur in woodlands and other open habitats. This reflects the poor condition of the forest vegetation in most of the reserve.

Conservation issues

The natural lowland forest of Kitope Forest Reserve has been heavily logged for centuries. Today nearly all the closed lowland forest is gone. The only places where tall closed forest patches still occur seem to be in the narrow valleys north of the summit. These forest patches are probably to small to support viable populations of coastal forest animals such as birds and mammals but may still hold small numbers of forest invertebrates and other animals which can survive temporarily in small forest remnants.

The knowledge about the flora of Kitope FR has so far reviled no plants of particular conservation concern. The trees that were collected during this study belong to wide-ranging species of the Tanzanian coastal forest and woodlands.

On the bases of the current knowledge about the flora and fauna of Kitope Forest Reserve this is an area of limited biodiversity importance.

6.5 Conclusion

The Forest Reserves

Both of the forest reserves that were selected for inclusion in the UTUMI project are situated close to the sea on isolated hills outside the main centres of coastal forest biodiversity. Kitope Forest Reserve is heavily disturbed by logging and subsequent cultivation while Dimba Forest Reserve is disturbed by human activity to a much lesser extent.

The avifauna of the two forest reserves is surprisingly similar and includes rather few Forest Dependent species (5 in Kitope FR and 6 in Dimba FR). Compared to for instance the small Litipo FR. where 11 Forest Dependent species have been recorded, these are low numbers.

The main reasons for the impoverish bird fauna – which is probably reflected in other animal groups as well – are believed to be (1) the small total area of the forests (to day and probably also in previous times when the human pressure was lower) and (2) their relative isolation from the main coastal forest blocks of the region which may have hindered colonisation during times where the lowland forest cover was larger.

Low diversity was also recorded among reptiles and amphibians although it should be noted that the sampling period was very dry and relatively few amphibians were active. No species of special conservation concern was recorded.

Dimba Forest Reserve appears to have two newly discovered tree species and one near endemic. The newly discovered endemics are quite common in the forest reserve. However, the extremely limited range these two trees must have makes it vital to take special precautions to protect them for being overexploited.

The Village based Forest Reserves

The Village Based Forest Reserves (VBFR) in fact consist of woodland vegetation not forest – the main difference being that the species of trees and plans are different, that the crowns of the individual trees does not overlap (as they do in a forest) and that grasses are present (in tropical forests grasses, if present, are localised and inconspicuous).

Although topographical rather different – Mihima is rather flat while Kikole is hilly – most of the birds recorded at the two VBFR were the same. However, Kikole has a higher diversity mainly because a number of birds associated with big game (such as vultures, Marabou Stork and oxpeckes) were recorded in Kikole not at Mihima. This does not have much to do with the actual habitats inside the VBFR but is caused by the proximity of Selous Game Reserve near Kikole. This was also reflected in the high numbers of large mammals that were recorded in Kikole as opposed to Mihima where few mammals were seen.

The VBFR at Mihima is situated only a few kilometres from Rondo Forest reserve, which is the largest and biological most important coastal forest of the region. The proximity of the large coastal forest is believed to be the reason why several “forest dependent” bird species were observed in the woodlands of the VBFR. This was not repeated among amphibians and reptiles but could be so among nocturnal mammals such as galagoes and bats.

The open habitats of the Rondo Plateau have 3 endemic or near endemic species of reptiles. This is a very unusual situation, which – as far as known - not is repeated on any other plateau in the region. Two of these extremely local reptiles were recorded in Mihima VBFS.

The vegetation of both VBFR consists of different woodland, wooded grassland and shrub communities. All the plant species recorded from the VBFRs are common and widespread species without conservation concerns. Exploitation of timber trees and other plants of human importance have undoubtedly let to significant changes in the species composition of both woodlands. In particular among valuable timber trees this is likely to have caused some species to become rare or even locally extinct.

The recovery of the original plant community to include plants that have previously been overexploited should be one of the important issues to address when preparing a management plan for the future use of woodland products from the VBFRs.

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