

FRONTIER

TANZANIA

COASTAL FOREST RESEARCH PROGRAMME

PRELIMINARY RESULTS OF BIOLOGICAL SURVEYS  
OF TONG'OMBA FOREST RESERVE, TANZANIA.

JULY - SEPTEMBER 1992

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SEPTEMBER 1992

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## 1. INTRODUCTION

This report presents a summary of the research work undertaken by the Frontier- Tanzania TZ13 Coastal Forest Research Project (F-T CFRP) to Tong'omba Forest Reserve, Lindi Region between mid July and mid September 1992.

General aims and justifications of the F-T CFRP are presented in a separate report (Dickinson and Burgess, 1991a).

A full site description, including Reserve history, condition and status are included in the report by Stubblefield & Brewin (in prep.): "Tong'omba Forest Reserve: Site Description and Conservation Evaluation", SEE London.

### 1.1 AIMS

The specific aims of the expedition to Tong'omba Forest Reserve were:

- 1) To survey and map the Vegetation types, concentrating on the forested areas, within the Reserve.
- 2) Through collection techniques assess the plant and animal species present, and make a comprehensive and near complete inventory of all aspects of the forest flora and fauna.
- 3) Assess the condition of the forest and its social and economic importance to the local population.

### 1.2 JUSTIFICATION

Tong'omba Forest Reserve has received little scientific attention despite its potentially high biological importance. Previous work was carried out in the Matumbi area , in particular Kiwengoma Forest Reserve, but mapping of the total extent of forest boundaries within the area in conjunction with extensive field research in other Forest Reserves, would allow a comprehensive management plan for the whole Matumbi Massif to be proposed.

## 2. EXPEDITION SCHEDULE

The expedition departed on the 18th July from Dar es Salaam and a subsidiary camp was set up at Somanga to study the extent of mangrove stands around the village (see Lowe & Ponder 1992). In addition to the work conducted at Somanga this time was required to sort out administrative difficulties and site localities. From Somanga a camp was deployed to Kibata on the edge of Tong'omba Forest Reserve on 25th July. This camp was active from 27th July to 13th September. A second camp to Namakutwa Forest Reserve was deployed from Somanga to a site near Nambunju, just within the reserve boundary, on 29th July (see Lowe & Ponder, 1992: A preliminary science report). This camp was active from the 1st August to the 13th September.

From the camp a recce was made to Mbinga Forest Reserve (38°50'E, 8°37'S) in order to survey and map the extent of forest in this area, encompassing a visit to Nang'oma Caves for a brief biological survey. A total of 705 man days were spent at Tong'omba with 15 man days spent at Mbinga.

### **3. FIELD PERSONNEL**

**Camp Leader-Michael Brewin**

**Science coordinator-Paul Matthews**

**Science coordinator-Leigh Stubblefield**

**Zoologist and Ectoparasitologist, UDSM -Philip Kihale**

**Local forest and medicine guide- Faraji Omari**

**Research assistants- Nick Beale**

**Tim Bowdin**

**Karen Crawley**

**Tim Holden**

**Chris Jones**

**Tamsin Knight**

**Catherine Liston**

**Noreen Matheson**

**Gita Prahbu**

**Laura smith**

**Matthew Stables**

**Richard Telford**

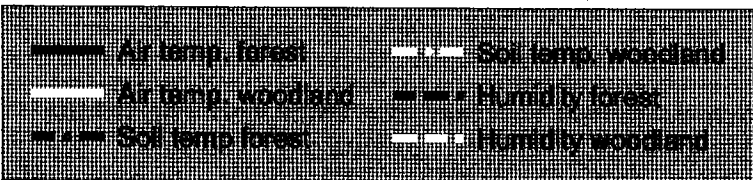
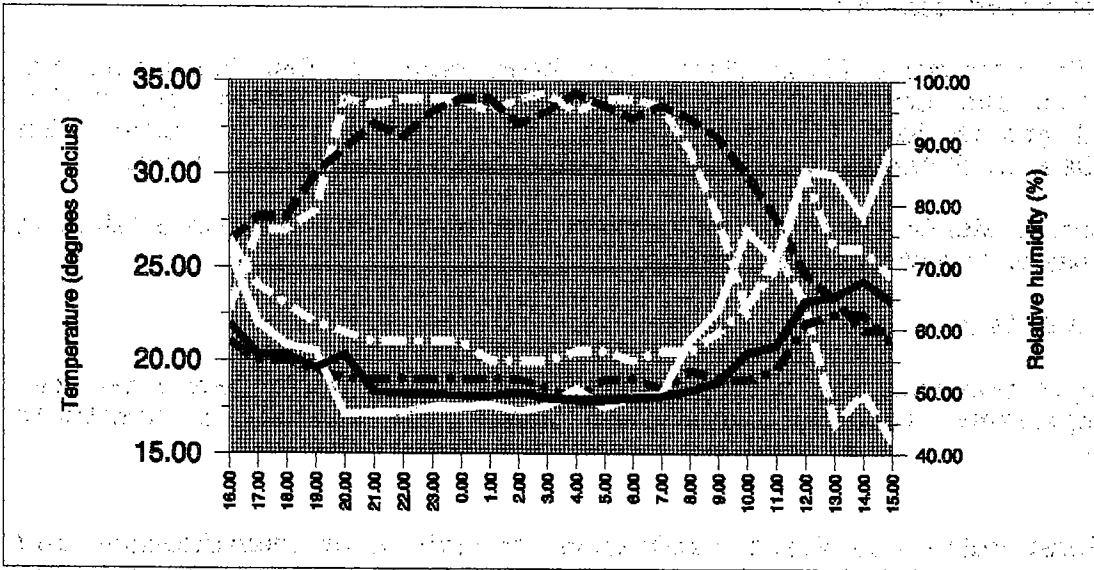
**Driver: Rajabu Mohammed**

## 4.2 CLIMATE

Climate data recorded at Kilwa Kivinje Weather station is shown below. Mean annual rainfall is 901mm (mainly falling on 60 'wet' days), Mean temperature 26.7 degrees, Mean maximum temperature 30.6 and mean minimum 22.8.

**Figurexx: Climate diagram for Kilwa Kivinje (39°25'E, 8°45'S, 10m asl)**

Kilwa is a coastal town, although at a low altitude. It can be expected, therefore, that rainfall in the Matumbi massif is significantly higher than shown here (most of the Tong'omba Reserve is well above 400m asl), though showing a similar year-round distribution.



The graph illustrates the diurnal cycle of temperature and humidity in forest and woodland environments. Air temperature in both environments shows a similar pattern, peaking around 12:00 and reaching a minimum around 06:00. Soil temperature remains relatively stable throughout the day, indicating a lag in temperature response. Relative humidity is highest during the night and lowest during the day, with forest environments generally having higher humidity than woodland environments.

The data suggests that forest environments are more humid and have higher air temperatures during the day compared to woodland environments. This is likely due to the higher canopy cover in forests, which reduces wind speed and increases humidity. The woodland environment, with its lower canopy, experiences more wind and lower humidity. The soil temperature is similar in both environments, indicating that soil conditions are not significantly affected by the canopy structure.

The graph also shows that relative humidity is higher in forest environments than in woodland environments. This is consistent with the higher humidity observed in forests. The diurnal cycle of relative humidity is similar in both environments, with the highest values occurring at night and the lowest values during the day. The overall pattern of temperature and humidity in both environments is similar, but the forest environment is more humid and has higher air temperatures during the day.

#### 4.4 INVERTEBRATES

##### 4.4.1 General Collection

Invertebrates were collected by hand, on opportunistic occasions and by a variety of trapping methods. The results of ground malaise and pitfall traps are summarised in figs XX. It is worth noting that the aerial malaise, placed at 17m in high canopy ridgetop forest, caught nothing. Catches were sorted to group level and are now awaiting taxonomic identification. Orthoptera were most prolific, though Araenae, Hymenoptera, Coleoptera and Dictyoptera were also well represented. Live molluscs were scarce, though some specimens were collected from the moister riverine areas and await identification. Shells of *Achatina fulica* were common in the forest though no live specimens were found. XX specimens of crab were collected from XX and around the camp, these await identification. Both internal and external parasites were collected from vertebrate specimens for further identification.

TABLE \*\*\*\*\*: Methods and sampling effort (Invertebrate collection)

Method	Activity time
Malaise trapping (Ground & ariel)	38 trap-days
Tree beating	20 beating hours
Pitfall trapping (array of 4)	59 trap days
UV light trapping	58 hours
Butterfly trapping	38 trap days
Opportunistic capture	Numerous

The processing of the specimens is covered by another report ('Methodology', Matthews 1992).

##### 4.4.2 UV light trapping

Extensive collection yielded a wide variety of moth species, including specimens of hawk moths (Sphingidae), silk moths (Saturnidae) and day flying moths, see Appendix \*\*\*\* for species list.

##### 4.4.3 Butterfly trapping

A total of \*\*\*\*\* butterfly species were collected including 9 specimens of the Charaxinae sub family, see Appendix II for species list. The family Papilionidae were under-represented owing to their quick and erratic flight patterns. A mixture of pombe and fermenting bananas was found to be the best bait for Blendon butterfly traps.



Table \*\*\* : Summary of Vertebrate Captures

Group	Individuals caught	Number of species records	Identification number
Amphibians	31	8	10300 - 10329
Reptiles	29	18	10350 - 10378
Mammals: bats	36	8	10420 - 10430
small mammals	7	4	10400, 10440, KBT 1-5

#### 4.5.3 Other captures and observations

i) Mammals: The faunal diversity was notably high with 24 species recorded (see appendix XX). Extensive disturbance caused by buffalo (*Synceus caffer*) and elephant (*Loxodonta africana*) was observed within the Reserve though no sightings occurred. Leopard (*Panthera pardus*) footprints and faeces were found in riverine forest. Two Wild Boar (*Sus scrofa*) and a Two Spot Palm Civet (*Nandinia binotata*) caught in cultivated areas bordering the forest were brought to camp by locals. Bush pigs (*Porcus*) and numerous Black and Rufous Elephant Shrews (*Petrodromus tetradactylus*) were observed in all forest vegetation types.

Troupes of Sykes' Blue Monkey (*Ceropithecus albogularis*) were frequently observed in forest canopy and woodland, and also feeding in shambas near the Reserve. Two species of bushbaby were identified as common in the forest using the Bearder's advertising calls, a third species was heard but could not be identified.

Numerous bones were found in the riverine forest including elephant vertebrae. Particularly interesting was a collection of bones from beneath the nest of a Crowned Eagle (*Stephanoaetus coronatus*) including femur, pelvis and several scapulas thought to be from monkey and Suni (*Neotragus moschatus*).

ii) Amphibians: 7 species have been recorded and 10 specimens await further identification (see appendix XX for full species list). 9 of these specimens were caught by pitfall traps in primary, secondary and riverine forest types. Preliminary identifications indicate at least two may be *Arthroleptis stenodactylus*, true forest dependent leaf litter frogs.

iii) Reptiles: 21 species have been recorded (Stubblefield & Matthews, 1992). Of particular interest were the forest geckos, *Cnemaspis* sp. possibly *C. uzungwae*, which had previously been thought to have been restricted to the forests of the Eastern arc mountains (Broadley and Howell, 1989). A specimen of the East African Spiny-tailed lizard, *Cordylus t. tropidosternum* was also obtained, a cordylid lizard that seems to be specific to a forest habitat.

A *Rhampholeon* chameleon was also captured which could not be adequately identified and may prove to be a new species.

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\* Maps:

COASTAL FOREST RESEARCH PROGRAMME

*DRAFT*

SITE DESCRIPTION AND CONSERVATION EVALUATION:

Tong'omba Forest Reserve, Kilwa District, Tanzania

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September 1992

produced in collaboration with  
The Regional Development Director's Office, Coast Region

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THE SOCIETY FOR ENVIRONMENTAL EXPLORATION  
AND  
THE UNIVERSITY OF DAR ES SALAAM



## PREFACE

## 1.0 introduction

### 1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This document aims to provide a comprehensive description and evaluation of the forest within the Tong'omba Forest Reserve, and its associated features. Using this information a number of management options have been discussed and recommendations proposed. It is hoped that this will provide a sound basis for the formulation of future management policies for the site.

### 1.2 NATIONAL AND REGIONAL BACKGROUND

To date 40 Coastal Forest sites over 2km<sup>2</sup> have been identified in Tanzania supporting vegetation of the Zanzibar-Inhambane Undifferentiated type (White,1983). 26 of these sites are known to occur within Forest Reserves, with 23 theoretically afforded government protection, the other 3 being managed on a productive basis. Lindi Region is host to at least 10 Coastal Forest sites.

## 2.0 EXECUTIVE SUMMARY

**SITE:** Tong'omba Forest Reserve

**MAP SHEET:** Ordnance Survey 1:50,000 Series Y742 Sheets 240/3 & 239/4.  
Boundary Map 1:25,000 Jb 451

**GRID REF:** 8°25'S, 39°01'E

**LOCALITY:** Kilwa District, Lindi Region, Tanzania

**STATUS:** Protective Forest Reserve

**MANAGED BY:** Kilwa District Council (Kilwa Masoko)

**AREA:** 25.1km<sup>2</sup> ( 7.1km<sup>2</sup> of forest)

**TENURE:** Government land under District Authority control

### **SITE DESCRIPTION:**

Tong'omba Forest Reserve is characterised by a highly dissected topography of sinuous forested ridges and steep sided narrow valleys naturally supporting moister riparian forest. The surrounding woodland and scrub is subject to clearance for agriculture. The forest supports several internationally important species and many of national importance.

### **RECOMMENDED MANAGEMENT OBJECTIVES:**

Conserve the site as one of the most natural examples of Coastal Forest in Tanzania.

Provide alternative sources of forest products to reduce future exploitation of the Reserve.

Encourage and facilitate further research of Tong'omba Reserve, considered individually or as part of the Matumbi forest block.

Preserve the catchment value of the site.

### **MAIN MANAGEMENT RECOMMENDATIONS:**

Maintain the pristine nature of the forest by enforcing Reserve status

Develop sustainable local projects to provide alternative sources of forest products

Clarify the position from government to local level on land acquisition and logging licenses.

Increase and strengthen communication links between all levels of management within the Forestry Division.

Establish links with other government bodies and non-government organisations to determine potential research and development of the site.

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- 8.1.1 Location of the Tong'omba Forest Reserve
- 8.1.2 Tong'omba Forest Reserve Boundaries
- 8.1.3 Physical Features of the Tong'omba Forest Reserve
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### 3.0 SITE FEATURES

#### 3.1 GENERAL INFORMATION

##### 3.1.1 LOCATION AND ACCESS

Site Name:	Tong'omba Forest Reserve.
Region:	Lindi
District:	Kilwa
Nearest Town:	Kipatimu
Forestry Office:	Kilwa Masoko (Forestry Officer in Kipatimu)
Access:	Accessible by vehicle from the north and south (See Maps 8.1.1 & 2).
Grid Ref:	8°25'S, 39°01'E
Area:	25.1km <sup>2</sup> (7.1km <sup>2</sup> of forest)
Boundary Length:	Approx. 23km
Maps:	Ordnance Survey 1:50,000 Series Y742 Sheets 239/4 & 240/3. Boundary Map 1:25,000 Jb 451
Aerial Photographic Coverage:	Spartan Air Services Ltd., Photogrammetric Engineers, Ottawa, Canada; June-July 1965 & June 1966.

##### 3.1.2 MAIN FEATURES

Tong'omba Forest Reserve encompasses a mosaic of vegetation types including three distinct Forest assemblages. The highly dissected topography characterises the area and enhances Tong'ombas important water catchment effect. The natural geography of the site makes access to the Reserve difficult hence levels of anthropogenic disturbance are negligible.

### 3.2 ESTABLISHMENT, STATUS, ADMINISTRATION AND MANAGEMENT

#### 3.2.1 HISTORY OF ESTABLISHMENT

Established in as a Protective Forest Reserve in 1961 when Tangomba and Kisangi forest reserves were merged. Forest Reserve under the control of the Central Government Forestry and Beekeeping Division (FBD), Ministry of Tourism, Natural Resources and Environment. The reserve is managed by the Local District Authorities (Kilwa District at Kilwa Masoko)

#### 3.2.2 OFFICIAL STATUS

Central Government Protective Forest Reserve

#### 3.2.3 LAND TENURE AND RIGHTS OF WAY

Wholly owned by the Government of the United Republic of Tanzania.

A footpath runs through the reserve from Pungutini to Mwenge. No roads run through the reserve.

### 3.2.4 MANAGEMENT AUTHORITY AND CURRENT MANAGEMENT

Since 1961 management decisions have been made at the Local Government level, by the various Kilwa District Authorities. The District Natural Resources Officer (DNRO) operates under the District Council, the District Development Committee and District Executive Director. The District Forestry Officer (DFO) advises the DNRO, and it is his responsibility to ensure implementation of all management directives by his personnel.

The Regional Natural Resources Officer, advised by the Regional Forestry Officer, acts as a coordinator between the Prime Minister's Office and the District but there is no direct control of personnel, plans and activities in the District.

Furthermore, the management decisions for the forest have to conform to the policies set by the Forestry and Beekeeping Division (FBD), Ministry of Tourism, Natural Resources and Environment. However, the FBD have no direct control of activities at either the District or Regional levels.

### 3.2.5 SITE DEFINITION AND BOUNDARIES

The original Reserve status of Tangomba and Kisangi forests was revoked in 1961 and the area was re-gazetted as Tong'omba Forest Reserve that year. The boundary was first surveyed and demarcated using beacons in 1958 (Job Number 451).

Map 8.1.2 shows the Forest Reserve boundaries as drawn in 1959, and fitted as far as possible to the main topographical features of the site. (The Ordnance Survey maps of 1968 do not show the Reserve boundary.)

## 3.3 ENVIRONMENTAL FEATURES

### 3.3.1 PHYSICAL ASPECTS

#### 3.3.1.1 Climate

Generally oceanic, with oceanic temperatures. Subject to orographic rain from westward moving moist sea air. Appendix 8.4 gives climatic data from Kilwa Kivinje, Kilwa Masoko and Kilindoni (Mafia Island), situated 45 and 60 km to the South-East, and 105km to the North-East respectively of the Reserve.

These show the area to experience a six month dry season (mid-May to mid-November) and a corresponding six month wet season (mid-November to mid-June), during which rainfall is very low. October is the warmest month and June the coolest.

Kilwa Masoko is a coastal town, 10m asl, thus it can be expected that rainfall in the Matumbi massif is significantly higher (most of Tong'omba Reserve is well over 400m asl) though showing a similar annual pattern.

#### 3.3.1.2 Hydrology

The high relief and dendritic drainage pattern of the Reserve gives rise to two major tributaries of the Hanga River and thus can be considered an important watershed (see figure 8.1.3). These streams follow valleys trending NNE - SSW and NW -SE, this is thought to be controlled by

geological faulting (Moore, 1961). These water courses are permanent, though water levels may be severely reduced to localised ponding at the height of the dry season. The catchment effect of the forest was observed on 7/8/92 during an overnight bat-net session across the Nanyangu tributary, though no rainfall was experienced in the immediate area the water level rose by 5cm over 6 hours.

The site could be considered for the NORAD Catchment Forestry Programme, which includes forests close to streams and/or on slopes over 40°. In such cases forests are protected and all forms of human exploitation are prohibited. However this project is only operational in northern districts and expansion would more likely encompass inland sites.

### 3.3.1.3 Geology

The steep sided ridges and narrow valleys of the Matumbi hills are composed of Jurassic sediments of approximately Bathonian - Bajocian date (Moore, 1961). Stockley (1943) identified the following succession in the Jurassic sediments of the area. Firstly the Kipatimu Beds; some 600m of alternating light brown sandstones and red clays, with a few marine fossils, which are exposed throughout the Matumbi Hills. The underlying Mtumbei Beds comprise upto 150m of oolitic sandy limestone with calcareous sandstones and 230m of Basal Beds composed of coarse conglomeratic feldspathic sandstones and Red Mudstone with two thin oolitic limestones. The Mtumbei Beds are exposed in the Riverine areas where the comparatively resistant limestones form a characteristically different topography including seasonal waterfalls upto 12m. Throughout the area a thin covering of red Neogene sands occurs on the ridgetops.

The Matumbi Hills lie at the northern end of a geological fault zone trending NNW from Lindi. The main movement of faulting is post-Karoo to pre-Middle Jurassic (140-220 million years ago), and has continued intermittently until recent times (Moore, 1961) .

### 3.3.1.4 Soils

Soils of the forested ridgetops and upper slopes are predominantly sandy loams derived from superficial red Neogene sands and underlying parent sandstone. Sandstones form most of the outcrops but the presence of mudstones is indicated by the red clay soils. Soils were generally less than 1m with roots concentrated in the first 20cm, in some profiles dense surface rootmats occurred. Organic matter levels appeared low, with vertical distribution to 5cm, forming a moderate crumb structure held by surface root concentrations. Below this surface horizon soils were indurated, cemented by oxide compounds. Soils of the mid-slopes are generally shallower, a result of natural rates of erosion which increase with gradient. They show a similar texture and profile development to upper slope soils but with conspicuously fewer roots. All profiles showed signs of free drainage but the compact subsurface soils must impede drainage to some extent. Moore (1961) reports black cotton soils (Vertisols) present in the valley bottoms.

The primarily sandy soils of the Riparian forest are generally alluvial deposits underlain by sandy limestones and calcareous sandstones. Profiles increased in depth, from 30cm to over 1m, on moving upslope from the river. Rooting became more abundant with increasing profile depth but roots were generally concentrated in the first 20cm.

Where forest cover was complete there were negligible signs of accelerated

erosion. In the few areas where tree felling and saw pits occurred there was localised disturbance and compaction. Serious gully and rill erosion was observed in an area of Namburiki Ridge where forest had been cleared and colonised by acacia woodland. No ground cover was present and the shrub layer was sparse allowing the exposed soil to dry out, consequently the surface layers of the soil had been removed and weathering had "laterised" underlying layers, hardening them irreversibly.

For a full appraisal of the soils of Tong'omba see Stubblefield & Matthews, 1992 (in prep.).

### 3.3.1.5 Altitudinal Range

The site has an altitudinal range of 500-1780ft (150-540m). (See figure 8.1.3).

### 3.3.2 BIOLOGICAL ASPECTS

#### 3.3.2.1 Habitats

Evergreen Dry Coastal Forest	3.25km <sup>2</sup> (Approx.)
Ridge Top Ground Water Forest	0.065km <sup>2</sup>
Evergreen Riverine Coastal Forest	0.66km <sup>2</sup>
Deciduous Transition Woodland	3.1km <sup>2</sup>

Figure 8.1.4 shows the distribution of these habitats.

#### 3.3.2.2 Flora

i) **Vascular Plants:** 95 fertile specimens (2745 - 2840) of vascular plant were collected. This comparatively high number is attributable to the moist conditions that prevailed during the collection period (2/8/92 - 7/9/92). 5 sterile specimens of common species (TONG 1-5) were taken to assist forest classification

A full species list is in preparation (Clarke and Sheil, in prep.).

ii) **Non-vascular Plants:** No data available.

iii) **Vegetation Communities:** A basic vegetation survey was carried out by Frontier-Tanzania in 1992. 9 broad vegetation types were present in the Reserve though in places merged resulting in a range of intermediate forms (see figure 8.1.4).

Ridgetop Ground Water Forest (30m), with affinities to Zanzibar-Inhambane Lowland Rainforest (White, 1983), was dominated by 2825 and PAULUS Q. Though ground flora was largely absent, 2848 and 2857 dominated the well formed shrub layer. At lower altitudes dry evergreen forest with a lower canopy (15m) merges with scrub forest (7m). These may be considered a mosaic of Zanzibar-Inhambane Undifferentiated Forest (White, 1983). In all types of forest epiphytes were found and creepers were abundant, especially in disturbed areas.

High canopy riparian forest (30m) follows the watercourses, TONG2 is indicative of this forest type. The shrub layer is typically poor in the high canopy areas, though elsewhere 2757 is monospecific. Impatiens (2779) was

found growing on rocks and ferns were common. In areas of lower canopy (10m) 2802 was dominant becoming monospecific where forest borders grassland.

The semi-deciduous dry forest (15m) supported Mvule and other large timber trees, many were losing their leaves. The herb layer was virtually absent especially on drier slopes.

Towards the end of the ridges with a NE aspect *Brachystegia* woodland, 8-10m high, is found. TONG 5 dominates the canopy and was frequently monospecific. In the centre of this vegetation type the understory was sparse and ground cover non-existent resulting in serious erosion. Closed canopy woodland of a secondary nature was intermediary between forest and open canopy woodland. In open woodland (10-12m) MICURUMU was an important canopy tree and Baobabs were common. The shrub layer was typically poor. Grasses dominated the herb layer though 2839 was also found. Climbers were present but no epiphytes were found.

Thorny scrub, often facing evergreen forest, was dominated by 2809. Herbs were almost absent except in gaps where 2808 is common.

Some of the valleys support a grassland community with isolated trees, generally these areas are disused shambas recolonised by secondary vegetation but others were apparently undisturbed. 2833 was the dominant tree (*Kiglia africana*), though other important woody plants were 2832 and 2811. Epiphytes were found on the trees and climbers were present, although rare. Signs of elephant activity were common.

#### iv) Vegetation Structure:

A new method of vegetation analysis was tested (Lowe 1992), where 16 random quadrats were located in a homogenous forest bloc. The vital statistics of each tree in the quadrat with a diameter of over 10 cm at 1.2m from the ground was recorded. Three homogenous blocs of forest were compared: primary, secondary and riverine vegetation types. The method was designed to quantify the specific differences between the various vegetation types forming White's Zanzibar-Inhambane Undifferentiated Forest classification (White 1983). The results of this project are presented in a separate paper (Lowe, in prep.).

oops .

v) Vegetation Components of Importance to Other Biotic Groups:

The forest canopy and associated understorey modifies the climate on ridgetops and in riverine areas providing an increased range of exploitable habitats within the mosaic of vegetation types found in the Reserve. Many plants are a source of food in terms of their seeds, leaves, roots and fruit.

The high diversity of forest vertebrates is attributable to the presence of permanent watercourses within the Reserve, providing an important source of water and further extending the diversity of available microhabitats.

vi) Natural Disturbance to Vegetation:

Elephant (*Loxodonta africana*) disturbance was found in all forest types except high canopy riverine and ridgetop forest. Buffalo (*Syncerus caffer*) disturbance could not be distinguished from that of elephants. Bush Pig (*Potamochoerus porcus*) rootings were frequent and localised disturbance was caused by burrowing animals such as Aardvarks (*Orycteropus afer*).

There were natural tree falls in all areas of the forest, possibly a consequence of the shallow depth of soil profiles and indurated subsurface horizons resulting in superficial root concentrations. Termite damage was observed to be greater in secondary forest vegetation.

3.3.2.3 Fauna

i) Mammals: At least 24 species have been recorded (Stubblefield & Matthews, in prep.). Some species of interest are listed below.

Vulnerable species (according to IUCN Red Data Book):

*Loxodonta africana* (African elephant)  
*Galago zanzibaricus* (Zanzibar bushbaby)

Rare species (IUCN Red Data Book):

*Rhynchocyon petersi* (Black and rufous elephant shrew)

Treatened species (IUCN Red Data Book):

*Panthera pardus* (Leopard)

Internationally scarce species:

*Cercopithecus albogularis* (Syke's monkey)  
*Triaenops persicus afer* (Persian leaf nosed bat)  
*Kerivoula* sp. (Woolly bat)

ii) Birds: No specific bird project was carried out, however, 9 species were observed in the forest (Stubblefield & Matthews, in prep.), including the Great Crowned Eagle (*Stephanoaetus coronatus*) and the African Goshawk (*Accipiter tachiro*).

iii) Reptiles: 21 species have been recorded (Stubblefield & Matthews, in prep.). Of particular interest were the forest geckos, *Cnemaspis* sp. possibly *C. uzungwae*, which had previously been thought to have been retracted to the forests of the Eastern arc mountains (Broadley and Howell, 1989). A specimen of the East African Spiny-tailed lizard, *Cordylus t.tropidosternum* was also obtained, a cordylid lizard that seems to be specific to a forest habitat.

A Rhampholeon chameleon was also captured which could not be

adequately identified and may prove to be a new species.

iv) **Amphibians:** 7 species have been recorded and 10 specimens await further identification (Stubblefield & Matthews, in prep.). 9 of these specimens were caught by pitfall traps in primary, secondary and riverine forest types. Preliminary identifications indicate at least two specimens may be *Arthroleptis stenodactylus*, true forest dependent leaf litter frogs.

v) **Fish:** A single species of fish, possibly a member of the *Cyprinidae* family, was collected from the Reserve and awaits final identification.

vi) **Invertebrates:** Extensive collections of most groups were carried out (Stubblefield & Matthews, in prep.). Specimens were sorted to group level and await taxonomic identification. Where present, both internal and external parasites were collected from vertebrate specimens for further identification.

### 3.4 CULTURAL, LAND USE AND SOCIO-ECONOMIC FEATURES

#### 3.4.1 HISTORICAL ASPECTS

The people of Kibata and surrounding area are predominantly Bantu in origin though many villagers are muslim as a result of the Arab slave trade (1832). In 1886 the Germans arrived in Kibata, introducing cotton, rice and maize. Historical sources indicate that forest clearance on the Matumbi Massif occurred around this time. A German fort was constructed at Kibata in 1905 in response to local unrest.

After 1918, the British used Kibata as an administrative centre for an area encompassing Somanga, Mohoro, Nandete and Kipatimu, though after several years operations were moved to Kilwa Kivinje. The British introduced coconuts, oranges and bananas in 1944 after a severe drought caused widespread famine in the area.

Tong'omba Forest was declared a Protective Reserve in 1953 and people living within the boundary were relocated.

In 1974, Kibata school was built under the government backed "UJAMAA" programme, the population of Kibata was then 1500. Since then the population has rapidly expanded to nearly 3000 and many new shambas have been cleared from surrounding bush and woodland.

#### 3.4.2 PAST AND PRESENT LAND USES

##### 3.4.2.1 Forestry

Tong'omba Forest Reserve was gazetted in 1953 and accurately mapped in 1958 (Jb 451). Legal logging activities within the Reserve were suspended after this date. In 1987, Kilwa District Forestry Officer granted permission to the chairmen of Mwenge and Pungutini CCM to authorise logging of 50 trees each year. The chairman of Kibata CCM was given similar permission in 1989 and selective logging began in 1991. Since then 7 trees have been felled; 4 outside and 3 inside the Reserve.

According to local sources the legal procedure has changed this year. The CCM chairman is given a logging quota by the Kilwa District Forestry officer and he then authorises felling. However the District Forestry officer stated no licences have been issued for logging within Tong'omba Forest Reserve. The Divisional forestry Officer in Kipatimu claims to have taken 4 people to



court for illegal logging who were subsequently fined.

#### 3.4.2.2 Agriculture

Local people in the Kibata area are primarily subsistence farmers, though coconuts and oranges are grown as cash crops in the comparatively fertile river valleys. Other crops grown include cassava, maize, rice, millet, pawpaws, bananas, plantains, onions, tomatoes, sweet potatoes and tobacco. According to local sources cotton and coffee were grown during German colonial times.

Comparing the existing forest boundary with the Reserve boundary, it seems that along the NW and S edges some clearance for agriculture has occurred. However, Forest Boundaries appear to be generally respected with shamba clearance predominantly of surrounding bush and woodland. Local information indicates there is much fertile land available outside the Reserve and thus threat of agricultural encroachment to the forest is low.

Land acquisition in the Kibata area differs significantly from the usual approach of leasing government land. Land is bought from the Mandwango family, the sale is then ratified by the CCM chairman who informs the relevant government departments.

#### 3.4.2.3 Pharmaceutical

There is some use of forest plants by the local people for traditional healing purposes (Stubblefield & Matthews, in prep.).

#### 3.4.2.4 Tourism and Recreation

None.

#### 3.4.2.5 Water Supply and Management

Tong'omba Forest Reserve gives rise to two major tributaries of the Hanga River and can be considered to have a significant catchment effect. These water courses and associated seasonal streams provide water for Kipatimu and the surrounding area. Local information suggested that most shambas had immediate access to a well, though increasing demand and dry weather conditions occasionally results in water shortages.

There was no evidence of past or present water management of the site.

#### 3.4.2.6 Scientific Research

A Frontier-Tanzania expedition visited the site for six weeks from August to September 1992. Work carried out included a compilation of floral and faunal inventories, a basic survey of the forest boundaries and vegetation structure, assessment of forest disturbance (natural and unnatural), socio-economic surveys in Kibata and Kipatimu villages, gathering of general information about the forest (status, local usage etc.) as well as some more specialised ecological studies.

#### 3.4.2.7 Hunting

All hunting activities are illegal within the reserve and the local game officer is responsible for the extermination of any game animals deemed to be damaging crops of farmers. A charge of 10,000 Tsh is made for this service making it a non-viable option for most of the populace. Some evidence of hunting was seen within the reserve, mainly in the form of snares set for

bushpig and small deer which are trapped as a pest and a food source respectively. Rock Hyrax (*Heterohyrax brucei*) are trapped as a local delicacy and Blue Monkeys are occasionally hunted as an agricultural pest.

Interviews with locals revealed that game numbers within the reserve used to be higher but poaching has reduced populations of leopard, buffalo etc. to minimal levels. Buffalo are sometimes beaten out of the forest and then slaughtered for food whilst leopards are threatened by poachers armed with modern hunting rifles. Kipatimu is recognized as one of the forwarding posts for illicit game produce from the Selous and the surrounding areas and Tong'omba's proximity to this village means that hunting pressures are higher than normal.

#### 3.4.2.8 Extraction of Other Forest Products

i) Building materials: Some pole cutting was evident though apparently only carried out by those living on the forest edge. No significant damage has resulted from this small scale exploitation.

ii) Other: The local people collect bark, honey, rubber, incense, traditional medicines and some fruits from the forest, though no evidence was found of any major commercial use of these products.

#### 3.4.3 SURROUNDING LAND USE

Land adjacent to the forest boundaries in the NW and along the southern boundary has been cleared for agriculture. Towards Pungutini in the NE land clearance for agriculture has resulted in the destruction of significant areas of woodland and scrub, with small stands of trees remaining on less accessible hilltops.

#### 3.4.4 CURRENT HUMAN POPULATION IN AND AROUND THE RESERVE

There are no settlements within the Reserve though shambas occur immediately adjacent to the boundary in the NW and along the southern edge. The current population of the area is described above (section 3.4.1). A more detailed socio-economic survey would be required to further evaluate the nature and structure of population in and around the Reserve.

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## 4.0 EVALUATION

### 4.1 EVALUATION OF FEATURES

#### 4.1.1 BIOLOGICAL AND PHYSICAL FEATURES

##### 4.1.1.1 Size

The Forest Reserve boundary was mapped in 1959 (Jb 451) encompassing 9.69 sq. miles (25.1km<sup>2</sup>) and there has been no significant change in the extent of natural vegetation since then. True forest vegetation types currently occupies some 2.5 sq.miles (4km<sup>2</sup>) of the Reserve, though a number of intermediate vegetation types occur which also support apparently healthy populations of many of the species mentioned in section 3.3.2.3.

##### 4.1.1.2 Diversity

Three true Coastal Forest vegetation types are present which considered with the variety of other vegetation types provide a wide range of exploitable habitats. The low level of anthropogenic disturbance suggests habitat stability, reinforced by the high level of faunal diversity within the Reserve.

##### 4.1.1.3 Naturalness

Virtually all the disturbance within the Reserve results from natural factors hence the forest and associated understorey can be considered a good example of this vegetation type. Healthy regeneration of forest understorey species was observed in natural gaps.

##### 4.1.1.4 Rarity

Low levels of anthropogenic disturbance suggest Tong'omba Forest Reserve is a prime example of the globally threatened coastal forest vegetation type and is thus of international significance. The forest supports several internationally important species and others of national importance.

##### 4.1.1.5 Fragility

Despite its apparent stability, Tong'omba Forest Reserve is isolated (??) from similar vegetation types and increased levels of disturbance may lead to species loss through habitat destruction. The steep slopes and superficial rooting levels leading to the present levels of natural tree falls and incidence of severe erosion where forest has been cleared indicate potential problems arising from increased levels of disturbance.

##### 4.1.1.6 Typicalness

Preliminary identifications indicate the Reserve contains floral and faunal components typical of classic dry coastal forest and thus can be considered one of the central links to the chain of coastal forests extending from Somalia to Mozambique.

##### 4.1.1.7 Position in an Ecological Unit

The forest may be an isolated remnant of a formerly larger forest on the Matumbi Hills massif. The nearest other Coastal Forests are found 20km and 10km to the west and south in the Kiwengoma (Rufiji District) and

Namakutwa (Utete District) Forest Reserves respectively. Further forested areas exist further to the south and west of the Kiwengoma Forest Reserve.

#### 4.1.2 ECONOMIC VALUE

##### 4.1.2.1 Forestry

Numbers of commercial timber trees such as Mninga and Mvule have been reduced by locally based logging operations. Mature specimens of hardwood species do still exist within the reserve but their inaccessability renders removal commercially unviable. An increase in logging activities in Tong'omba and surrounding forested areas is expected when access is improved with the completion of the D.S.M - Lindi road in 1993.

The southern areas of the reserve around Kibata contain large numbers of the introduced species Mpili. The leaves of this tree can be eaten.

##### 4.1.2.2 Agriculture

Studies have shown that recently cleared forest areas experience better growth rates than traditional "shambas" (Lowe & Ponder, in prep.) but these rates are not expected to be sustainable. The steep gradients of most of the land within the reserve makes it very vulnerable to soil erosion. Any clearing of forested areas would enhance erosion and compromise the forest's water catchment properties which are essential to the farming activities which take place around the reserve.

##### 4.1.2.2 Pharmaceutical

As yet there is no information on the pharmeceutical value of the plants of the reserve. However, if Tong'omba forest contains a similar floral diversity to other similar forests it is likely that it contains plant species of commercial pharmeceutical value.

##### 4.1.2.3 Water Supply

Tong'omba is an afforested plateau attracting orographic rainfall and therefore is an important feature of the Hanga river catchment which provide groundwater to the surrounding local area.

The economic benefit of conserving the Forest to maintain existing water supply can be considered in terms of the comparative cost of obtaining water from any alternative source.

##### 4.1.2.4 Intrinsic Appeal for Nature Tourism

The presence of Leopard, Elephant and Buffalo plus some spectacular water falls and scenary in the Reseve give it some potential as a site for nature tourism. That the site exhibits large areas of pristine forest and it's proximity to the Selous Game Reserve enhance it's overall appeal. However, any potential is severley limited by poor access.

#### 4.1.3 CULTURAL VALUE

The forest is a source of building materials and traditional medicines for the

inhabitants of Kibata, Mwenge and Pungutini villages. According to local sources the forest has no spiritual value.

#### 4.1.4 ACTIVITIES LIKELY TO DAMAGE THE SITE AND ITS FEATURES

a) An increase in exploitation of forest products:

i) Selective logging, and resulting tracks, opens up areas of forest which are susceptible to erosion and may lead to a change in species composition.

ii) Pole removal practices affect forest regeneration and hence the site's naturalness.

iii) The eventual opening of the new DSM - Kilwa road in 1993/5 will improve access to the site and increase illegal logging activities.

iv) Increase of local population will lead to an increased demand for forest products.

v) Mismanagement of agricultural land leading to a loss in soil fertility and the subsequent clearance of new areas for farming.

vi) Increase in tree felling may affect water catchment properties of the site.

b) Hunting in the area could endanger forest populations of larger mammals.

c) Activities of future visitors to the area could potentially damage the site.

#### 4.2 POTENTIAL VALUE OF THE FOREST RESERVE

##### 4.2.1 POTENTIAL CONSERVATION VALUE

Tong'omba forest may be regarded as the most natural example of Coastal Forest in Tanzania. The Reserve supports species of national and international significance and thus has a high intrinsic conservation value.

In addition, its conservation would fulfil two of the aims of both the Forestry Action Plan for Coast Region (Nsemwa and Mkilanya, 1991) and the Tanzania Forestry Action Plan (Bensted-Smith and Msangi-Msangi, 1989); namely, preservation of Tanzania's catchment forests, and conservation of biological and genetic diversity.

##### 4.2.2 POTENTIAL ECONOMIC VALUE

###### 4.2.2.1 Development of Nature Tourism

Nature tourism may have a beneficial effect in raising awareness of the importance of this threatened vegetation type and it may also generate income to local communities. However, the poor access to this site and general lack of amenities mean development of a basic infrastructure would almost certainly be necessary. Considering the low level of current anthropogenic disturbance within the Reserve, such development may have a significant detrimental effect.

###### 4.2.2.2 Potential Agriculture and Commercial Forestry Value

From chemical analysis, it can be seen that the forest soils has an inherently low natural fertility maintained by the closed

forest ecosystem (Stubblefield & Matthews, in prep.). Disruption to this natural cycle would result in soil degradation and nutrient loss. Thus, clearance for agriculture would provide no long term benefit unless supervised as part of an agricultural extension scheme providing advice and resources on sustainable farming methods.

Though some commercial timber species are present, their scattered distribution and relative inaccessibility may reduce their commercial viability. Future research into natural regeneration rates of such timber species in this forest environment would be necessary before determining a sustainable harvest rate. With such information the Reserve, and surrounding woodland, could be zoned into productive and protective areas to provide a renewable timber resource. However, such practices would destroy the natural forest resulting in irreversible, and possibly severe, species loss.

#### 4.2.2.3 Potential Pharmaceutical Value

The ethnobotany study carried out at Tong'omba identified 17 medicinal uses of forest plants within the local community (see Stubblefield & Matthews, in prep.). Further research of the subject may prove the site to have significant pharmaceutical value

#### 4.2.3 POTENTIAL RESEARCH, RECREATIONAL, AND EDUCATIONAL VALUE

Tong'omba Forest Reserve offers excellent opportunities for research and has a high educational value. The site would be suitable for recreation and nature tourism (see section 4.2.2.1), though such activities may damage the site. The local school at Kibata could be involved in educational schemes to raise awareness of conservation issues, perhaps developing a nursery of native tree species. However, poor access severely compromises any potential the site may have for attracting tourists or day visits from schools, and, until the local roads have been improved and the D.S.M-Lindi road completed access to Tong'omba is limited to six months a year.

#### 4.2.4 POTENTIAL LAND ACQUISITIONS

Tong'omba Forest Reserve is flanked on its northern side by areas of forest unprotected by reserve status. Most of these areas are highly disturbed and are limited to the tops of hills.

#### 4.2.5 POTENTIAL ROLES OF OTHER GOVERNMENT BODIES IN RESERVE DEVELOPMENT

Game Division involvement in managing and protecting migrant wildlife populations using the reserve.

#### 4.2.6 POTENTIAL ROLES OF NGOS AND BUSINESS IN RESERVE DEVELOPMENT

Outside expertise, advice and financial assistance provided by NGOs and/or business would be of great benefit to the development of the Reserve in general. Parties with a possible interest include the Society for

Environmental Exploration (Frontier-Tanzania), World Wildlife Fund (Tanzania), the Wildlife Conservation Society of Tanzania, the Rotary Clubs, Malihai Clubs and "Roots and Shoots".

The development of agricultural and educational extension schemes in the local communities would be of great benefit and may reduce future pressures on the forest for natural resources.

## 5.0 RECOMMENDED MANAGEMENT OBJECTIVES

Conserve the site as one of the most natural examples of Coastal Forest in Tanzania.

Provide alternative sources of forest products to reduce future exploitation of the Reserve.

Encourage and facilitate further research of Tong'omba Reserve, considered individually or as part of the Matumbi forest block.

Preserve the catchment value of the site.

Develop sustainable local projects to provide alternative sources of forest products

Clarify the position from government to local level on land acquisition and logging licenses. Increase and strengthen communication links between all levels of management within the Forestry Division.

Establish links with other government bodies and non-government organisations to determine potential research and development of the site.

## 6.0 MAIN FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

1. Current position on authority within the Reserve needs clarification before any proposals can be implemented.
2. Integration of local community into any conservation or development programme.
3. Resources available: The feasibility of implementing any management prescriptions depends on the resources available (both within, and external to, the Local District Authorities).
4. The potential threat from increase in illegal logging activities coordinated by 'outside' organisations, resulting from improved access to the site.
5. Visitors: Any future developments involving an increase of visitors to the site must consider both the impact they may have on the site, and the need to provide basic amenities.
6. Access: If visitors are to be attracted to the site access must be improved from Kipatimu and Nya-Mwage. The local authorities have applied to the central government for money for road improvements: as yet nothing has been forthcoming. The scale of the work needed and the inhibiting gradients and weather conditions suggest it will be some time before the area is open to anything other than 4WD vehicles.
7. Game: Elephants from the reserve cause damage to neighbouring cultivation, and cause resentment from the local people.



## 7.0 MANAGEMENT RECOMMENDATIONS

1. Clearly demarcate the reserve boundary and ensure it is printed on the next publication of the Ordnance Survey topographical map of the Kipatimu area.
2. Employ permanent forest guard(s) to enforce reserve boundaries and keep a check on illegal hunting and logging. This should be carried out in conjunction with the development of local projects to increase awareness of forest conservation.
3. Investigate the feasibility of hardwood plantations outside the reserve to provide the locals with an alternative source of timber and income.
4. Check any further development of paths or roads within the reserve boundaries.
5. Review the timber extraction licensing system and ensure that it is adhered to.
6. Execute a public awareness programme to ensure the locals appreciate the importance of the forest to the continuation and sustainability of their way of life. Perhaps develop a nursery of native tree species as a local project.
7. Encourage and facilitate the continuation of scientific research at the site.
8. Investigate the viability of game corridors linking the reserve with the game rich areas to the south.

8.0 APPENDICES

8.1 MAPS

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8.3 Vertebrate Species Recorded From Tong'omba Forest By  
Frontier-Tanzania (August & September 1992)

Species Name	Status
<b>FISH</b>	
Cyprinidae sp.	

INTERNATIONAL STATUS: W=Widespread L=Localised VL=Very Localised

Species Name	Status
<b>AMPHIBIANS</b>	
<b>Hyperoliidae (tree-frogs)</b>	
Hyperolius sp.	-
Afrixalus sp.	-
Afrixalus fornasini	-
<b>Racophoridae</b>	
Chiromantis sp.	
<b>Pipidae</b>	
Xenopus cf muelleri (Clawed toad)	?
<b>Arthroleptidae</b>	
F Arthroleptis stenodactylus (leaf-litter frog)	?
F Stephopaede sp. (Flat backed toad)	
F Leptopelis flaumiculatis	
There are 19 other specimens waiting to be identified.	

HABITAT: Fo=Forest Sw=Swamp Sh=Shamba Wo=Woodland  
 ABUNDANCE: 1=Occasional 2=Common 3=Very common  
 INTERNATIONAL STATUS: W=Widespread L=Localised VL=Very Localised

Species Name	Status
<b>REPTILES</b>	
<b>Snakes</b>	
<b>Viperidae</b>	
Bitis arietans	
Causus defilippii	

**ZARANINGE FOREST, BAGAMOYO DISTRICT, TANZANIA**

**Bucerotidae**

*Tockus albiterminatus* (Crowned hornbill) W  
*Bycanistes bucinator* (Trumpeter hornbill) W

**Coraciidae**

*Coracias naevia*??

**Corvidae**

*Corvus albus* (Pied crow) W

**Cuculidae**

*Centropus superciliosus* (White browed coucal) W

HABITAT: Fo=Forest Sw=Swamp Sh=Shamba Wo=Woodland

ABUNDANCE: 1=Occasional 2=Common 3=Very common

INTERNATIONAL STATUS: W=Widespread L=Localised VL=Very Localised

**Species Name**

**Nectariniidae**

\* *Nectarinia olivacea* (Olive sunbird) L

**Numinidae**

*Guttera edouardi* L

**Scopidae**

*Scopus umbretta* (Hamerkop) W

**MAMMALS**

**Chiroptera (bats)**

**Hipposideridae**

*Hipposideros ruber* (Noack's african leaf nosed bat) FoSw 2 W

*Triaenops persicus* (Persian leaf nosed bat) Fo 1 L

HABITAT: Fo=Forest Sw=Swamp Sh=Shamba Wo=Woodland

ABUNDANCE: 1=Occasional 2=Common 3=Very common

INTERNATIONAL STATUS: W=Widespread L=Localised VL=Very Localised

**Species Name**

**Rhinolophidae**

*Rhinolophus cf fumigatus*

*Rhinolophus cf hildebrandti*

**Nycteridae**

*Nycteris grandis*

*Kerivoula harrisoni*

*Pipistrelles nanus*

**Pteropidae (fruit bats)**

*Lissonycteris (Rousettus) angolensis*  
 (Angolan rousette) SwFo 2 W

**Insectivora**

**Macroscelididae**

**8.3.3 Vascular Plants**

1997-1998, 1999-2000, 2001-2002, 2003-2004, 2005-2006, 2007-2008

8.4.1 Tong'omba Forest - 24 Hour Climate Study, \*\*\*\*\* 1992

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