Tanzania Forest Conservation Group
Shirika la Kuhifadhi Misitu ya Asili Tanzania

TFCG TECHNICAL REPORT 40

The biodiversity and forest condition of forests on village land in Lindi Rural District

By N. Doggart, M. Mwangoka, R. Gereau, E. Lyimo, R and A. Perkin

Dar es Salaam
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Cover photographs (from left to right): Rondo galago by Andrew Perkin; View over the Noto Plateau by Andrew Perkin; *Gladiolus* sp. By Moses Mwangoka

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EXECUTIVE SUMMARY

Introduction

The Coastal Forests of Lindi Rural District are part of the Coastal Forests of Eastern Africa biodiversity hotspot. The East African Coastal Forest with the most single-site endemics is Rondo Forest in Lindi Rural. Twenty-six kilometres to the north-east of Rondo, the adjoining Noto, Chitoa and Likonde Plateaux are poorly known areas of coastal forest that may have similar biodiversity values to Rondo. It is already known that 91 of the 180 endemic plant species restricted to the coastal hinterland of southern Tanzania are collectively restricted to the Rondo / Noto Landscape.

There are two forest reserves on the Chitoa Plateau: Chitoa and Litipo Forest Reserves, these cover 1770 ha. Outside of the forest reserves there are approximately 75,000 ha of forest, woodland and coastal thicket on Village Land. The surveys described in this report have focused on recording the biodiversity values of the vegetation on village land.

This report documents the aims, methods, results and conclusions of biodiversity surveys carried out in forests on Village land in Lindi Rural District by teams from the Tanzania Forest Conservation Group. The surveys were carried out as part of the project 'Making REDD work for communities and forest conservation in Tanzania' financed by the Norwegian Ministry of Foreign Affairs.

The surveys aim was to document the presence and distribution of threatened species; coastal forest endemic species; and invasive species as well as to provide a baseline of the biodiversity present in the project area at the start of the REDD process.

Methods and sampling localities

The surveys were conducted in two phases in February and August 2011. A review of the literature was also carried out. Additional records have been included from a TFCG survey to the area in 2008; and from the carbon plots that were established in March – April 2011. The surveys covered plants, mammals and birds.

Plant species were recorded on the basis of observations and collections. Additional botanical data is derived from the circular carbon plots established following NAFORMA methods. Botanical collections have been sent to Missouri Botanical Gardens for identification. Botanical collections were made in six sites. In addition, thirty-eight circular vegetation plots were established. Botanical surveys were carried out by Moses Mwangoka.

The team used a combination of observations, sound recordings and camera trapping in order to record vertebrate species. Indigenous knowledge was also documented through interviews with community members and herbalists. The team carried out vertebrate surveys in two sites. Bird and mammal surveys were carried out by Andrew Perkin, Emmanuel Lyimo and Justine Gwegime.

Results

The landscape comprises three lower-Cretaceous sandstone plateaux uplifted during the Miocene, and intersected by valleys. The Noto Plateau is the highest of the three plateaux and extends up to 534 m from the valleys at approximately 200 m asl. Forest is found primarily on the plateau tops and escarpments. Natural vegetation remaining on the wide valley floor to the west of the Chitoa and Noto plateaux is primarly woodland, now interspersed with agricultural land. Soils show a catenary succession from the sandy loams characteristic of the plateau tops down to the alluvial and lacustrine clays of the valley floors. Mean annual rainfall from nearby weather stations ranges from 1074 – 1200 mm however there is little data for the plateau tops where precipitation is likely to be higher.

Species and species richness

The survey team recorded 279 plant, 26 mammal and 36 bird species. This does not include any amphibian, reptile, bat or fish species as such the total number of species in these forests is greater than the 341 species that have been documented so far.

Endemism

In terms of endemic taxa, there are a total of 25 restricted range taxa found in the Lindi coastal forests on village land within the REDD project area (Tables 1 and 2).

Table 1. Summary of the number of restricted range taxa

Taxon	Lindi (E)	Coastal Forest Endemic	Coastal forest near-endemic
Plants	8	10	1
Mammals	0	2*	1
Birds	0	1	2
Total	**8**	**13**	**4**

*includes one sub-species. All other records in this table refer to species.

Table 2. List of restricted range taxa recorded from Village land in Lindi

Common Name	Scientific name	Range notes
Endemic to the Lindi Region Coastal Forests		
Plants		
	Cincinnobotrys pulchella (Brenan) Jac.-Fel.	Known from Rondo and Likonde Plateaux only.
	Artabotrys modestus Diels subsp. *modestus:*	Clarke (1995) reports that this shrub / liana was collected from Noto in the 1930s by Schlieben. It is also known from Rondo Forest Reserve.
	Mimosops acutifolia Mildbr.:	Clarke (1995) states that this shrub or small tree is only known from the Noto and Rondo forests.
	Premna hans-joachimii Verdc.	Clarke (1995) states that this shrub or tree is only known from the Noto and Rondo forests.
	Homalium elegantulum Sleumer	Only known from Noto.
	Xylia schliebenii Harms:	Known from Noto, Simara-Kitunda and Ngarama North forests
	Gomphia lutambensis (Sleumer) Verdc	Verdcourt (2005) reported this shrub from the Noto Plateau and Rondo Forest Reserve. Only known from these two sites.
	Bullockia impressinerva (Bridson) Razafim., Lantz & B. Bremer:	'A coastal forest species. Known from three sites in south-east Tanzania. It has been collected from an unprotected tract of forest on the Noto Plateau and from the nearby Rondo Plateau
	Cincinnobotrys pulchella (Brenan) Jac.-Fel.	Known from Rondo and Likonde Plateaux only.
Endemic to the East African Coastal Forests		
Plants		
	Streptosiphon hirsutus Mildr.	Recorded during current surveys. T8 endemic. Rare 2 locs only according to Burgess and Clarke (2000).
	Pteleopsis apetala Vollesen	Recorded during current surveys. T6, 8. Rare 3 locs. only according to Burgess and Clarke (2000).
	Peponium leucanthum (Gilg.) Cogn.	Recorded during current surveys. T8 endemic. Rare, 2 locs. only according to Burgess and Clarke (2000).
	Dichapetalum braunii Engl. & K. Krause	Recorded during current surveys. T8 endemic. Rare less than 5 locs. according to Burgess and Clarke (2000)
	Heinsia bussei Verdc.	Recorded during current surveys. T8 endemic. Rare less than 5 locs. according to Burgess and Clarke (2000)

Common Name	Scientific name	Range notes
	Leptactina papyrophloea Verdc.	Rondo, Likonde and Northern Mozambique.
	Mkilua fragrans Verdc.	A Kenyan and Tanzanian coastal species, also found on all the Tanzanian islands.
	Bauhinia loeseneriana Harms:	Endemic to coastal forest in Tanzania, this species is known only from four sites.
	Millettia eriocarpa Dunn:	Endemic to south-east Tanzania, a species of dry coastal forest.
	Millettia impressa Harms subsp. *goetzeana* (Harms) J.B. Gillett:	Noto and Litipo Forests.
Mammals		
Rondo galago	*Galagoides rondoensis*	Recorded from nine forests in the Tanzanian coastal forests.
Chequered sengi	*Rhynchocyon petersi*	The subspecies *R. c. macrurus* is endemic to the coastal forests of SE Tanzania in the coastal forests from the Ruvuma river north to the Mbemkuru R. near Kilwa.
Birds		
Little Yellow flycatcher	*Erythrocercus holochlorus*	Widespread north of the Rufiji (Mlingwa *et al* 2000)
Near endemic to the East African Coastal Forests being found in adjacent mountains		
Plants		
	Monanthotaxis trichantha (Diels) Verdc.	Coastal forests and lowland Nguru and Usambara Mountains.
Mammals		
Small-eared greater galago	*Otolemur garnettii*	Found in the coastal forests from S. Somalia south to the Ruvuma river and the Eastern Arc Mountains, Mt. Kilimanjaro, Mt. Meru and the Kukuyu highlands of Kenya.
Birds		
Southern banded snake eagle	*Circaetus fasciolatus*	
Plain backed sunbird	*Anthrepetes reichenowii*	
East Coast akalat	Sheppardia gunningi	Along the East African coast from Kenya to Mozambique with an outlying population in northern Malawi. The sub-species *S. g. sokokensis* that is found in southern Tanzania is restricted to a few coastal forest in Tanzania and Kenya.
Forest batis	Batis mixta ssp. reichenowi	Eastern Arc Mountains and coastal forest. The sub-species Reichenow's batis is endemic to the southern Tanzanian coastal forests.

Threatened taxa

In terms of globally threatened taxa, there are 19 taxa listed on the IUCN red list as threatened that are present in the project area and six listed as Near-Threatened. These are summarised in Table 3 and the taxa are listed in Table 4.

Table 3. Number of threatened taxa recorded from village land in Lindi.

Taxon	Critically Endangered	Endangered	Vulnerable	Near threatened
Plants	2	5	9	1

Taxon	Critically Endangered	Endangered	Vulnerable	Near threatened
Mammals	1		2	2
Birds				3
Total	**3**	**5**	**11**	**6**

Table 4. List of threatened taxa recorded from village land in Lindi.

Common name	Scientific name	Status (IUCN 2011)
Plants		
	Homalium elegantulum Sleumer	Critically Endangered
	Artabotrys modestus Diels subsp. *modestus:*	Critically Endangered
	Leptactina papyrophloea Verdc.	Endangered
	Xylia schliebenii Harms:	Endangered
	Gomphia lutambensis (Sleumer) Verdc	Endangered
	Dichapetalum braunii Engl. & K. Krause	Endangered
	Pteleopsis apetala Vollesen.	Endangered
	Monanthotaxis trichantha (Diels) Verdc.	Vulnerable
	Mimosops acutifolia Mildbr.	Vulnerable
	Mkilua fragrans Verdc.	Vulnerable
	Peponium leucanthum (Gilg) Cogn.	Vulnerable
	Millettia eriocarpa Dunn:	Vulnerable
	Millettia impressa Harms subsp. *goetzeana* (Harms) J.B. Gillett:	Vulnerable
	Premna hans-joachimii Verdc.	Vulnerable
	Bullockia impressinerva (Bridson) Razafim., Lantz & B. Bremer:	Vulnerable
	Bauhinia loeseneriana Harms.	Vulnerable
	Lettowianthus stellatus	Near threatened
Birds		
Southern banded snake eagle	*Circaetus fasciolatus*	Near threatened
East coast akalat	*Sheppardia gunningi*	Near threatened
Plain backed sunbird	*Anthrepetes reichenowii*	Near threatened
Mammals		
Rondo galago	*Galagoides rondoensis*	Critically endangered
Lion	*Panthera leo*	Vulnerable
African elephant	*Loxodonta africana*	Vulnerable
Leopard	*Panthera pardus*	Near threatened
Chequered sengi	*Ryhnchocyon cirnei*	Near threatened

Survey photographs

Some of the survey team (left to right) Dr. Kate Nowak, Abdallah Mangwacha, Abdallah Mtambule, Baraka Samwel, Andrew Perkin, Justine Gwegime.

The edge of the Noto plateau on the northern side where coastal forest gives way to a woodland dry forest mosaic.

Setting a camera trap

The Rondo Galago *Galagoides rondoensis* photographed in the Noto forest near campsite 1.

Central African large-spotted genet

An unidentified forest geko

An unidentified fruit bat species coming to a flowering tree for nectar.

Unidentified caterpillars, the invertebrates of the Noto plateau remain largely unknown

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Tanzania Forest Conservation Group
The Tanzania Forest Conservation Group (TFCG) is a Tanzanian non-governmental organisation that has been promoting the conservation of Tanzania's forests since 1985. TFCG's mission is to conserve and restore the biodiversity of globally important forests in Tanzania for the benefit of present and future generations. We achieve this through capacity building, advocacy, research, community development and protected area management, in ways that are sustainable and foster participation, cooperation and partnership.

TFCG supports field based projects promoting participatory forest management, environmental education, community development, advocacy and research in the Eastern Arc and Coastal Forests. TFCG also supports a community forest conservation network that facilitates linkages between communities involved in participatory forest management. To find out more about TFCG please visit our website www.tfcg.org

About 'Making REDD work for communities and forest conservation in Tanzania'

This 5 year partnership project was launched in September 2009 by the Tanzania Forest Conservation Group (TFCG) and the Community Forest Conservation Network of Tanzania (MJUMITA). The project aims to demonstrate at local, national and international levels, a pro-poor approach to reducing deforestation and forest degradation by generating equitable financial incentives from carbon finance sources for communities that are sustainably managing or conserving Tanzanian forests at community level. The project is financed by the Norwegian Ministry of Foreign Affairs.

The project is being implemented in two biodiversity hotspots. One site covers 17 villages in Lindi Region in the Coastal Forest ecoregion. The other site covers 19 villages in the Eastern Arc Mountains of Kilosa and Mpwapwa Districts.

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Abbreviations and acronyms

a.s.l.	above sea level
CR	Critically Endangered
dbh	Diameter at Breast Height
DNRO	District Natural Resources Office(r)
EN	Endangered
FBD	Forestry and Beekeeping Division
GEF	Global Environment Facility
GIS	Geographical Information System
IUCN – SSC	International Union for the Conservation of Nature Species Survival Commission
MJUMITA	Mtandao wa Jamii wa Usimamizi wa Misitu Tanzania
NT	Near Threatened
REDD	Reducing emissions of greenhouse gases from Deforestation and forest Degradation
TFCG	Tanzania Forest Conservation Group
UNDP	United Nations Development Programme
VNRC	Village Natural Resources Committee
VU	Vulnerable

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Funding

This survey was funded by the Norwegian Ministry of Foreign Affairs as part of the project 'Making REDD work for communities and forest conservation in Tanzania'.

Survey Team

Team Leader: Nike Doggart
Botanist: Moses Mwangoka
Primatologist: Andrew Perkin
Ornithologist: Andrew Perkin
Game Officer: Yusuph J. Mponda (Game office – Milola)
Mammals: Justine Gwegime and Baraka Samwel
Monitoring and Evaluation Officer: Emmanuel Lyimo
Field Assistants: Mr. Rajabu Said (Ruhoma)
Mr. Said Issa Kainame and Mr. R. Selenge (Kiwawa)
Mohamed H. Mbanguli (Mkanga 1)
H.M.Pangani & Mr. Ally Said Pangani (Central Likonde) in Muungano village.
Mr. Hassani I. Ng'angwi and Mr. J. Bakili from Rutamba ya Sasa village.
Mr. Hassani J. Mzee and Mr. Said Juma Machela from Kinyope
Mr. K. Selemani from Nandambi village.
Abdallah Mangwacha, Ruhoma VNRC member
Abdallah Mtambule, Muungano VNRC member and
Mwanahamisi Mbala, cook from Ruhoma.

We are extremely grateful to the people of Ruhoma, Muungano, Mkanga 1, Mkombamosi and Kiwawa Villages in Lindi Rural district for their co-operation in carrying out these surveys.

We also thank the Lindi District Staff for their assistance.

Report writing

The report has been written by Nike Doggart, Moses Mwangoka, Andrew Perkin and Emmanuel Lyimo. Authors of the individual chapters are indicated in the text.

Editing

Detailed editing of the botanical section of the report was carried out by Roy Gereau.
The overall editing of the report was carried out by Nike Doggart.

Maps

Maps were made by Sylvia Kalemera, TFCG GIS Officer.

Technical advice

We are grateful to all those who have provided technical advice in the development and implementation of this report including Katarzyna Nowak, Roy Gereau and Neil Burgess.

1) Introduction

1.1 Background to the project

This report documents the results of biodiversity surveys carried out in forests on village land in Lindi Rural District. The surveys were carried out as part of the project 'Making REDD work for communities and forest conservation in Tanzania'. The project is a partnership between the Tanzania Forest Conservation Group (TFCG) and the Community Forest Conservation Network of Tanzania (MJUMITA). The project is financed by the Norwegian Ministry of Foreign Affairs.

The goal of the project is:

> 'To reduce greenhouse gas emissions from deforestation and forest degradation in Tanzania in ways that provide direct and equitable incentives to rural communities to conserve and manage forests sustainably.'

The Purpose of the project is:

> 'To demonstrate, at local, national and international levels, a pro-poor approach to reducing deforestation and forest degradation by generating equitable financial incentives from the global carbon market for communities that are sustainably managing or conserving Tanzanian forests at community level.'

The project will achieve this by supporting communities to reduce deforestation rates and to access REDD financing.

The project includes an evaluation and communication component designed to capture the lessons learnt in order to inform project implementation and share them with the national and international community including sharing lessons learnt during project inception at the UNFCCC meeting in Copenhagen. The project also focuses on building in-country capacity with regards to REDD at both local and national governmental levels. This is linked with a strategic advocacy component aimed at forging a smooth path for REDD in Tanzania by engaging in the formulation of REDD frameworks and processes at national and international level.

The project is being implemented in two biodiversity hotspots. One site covers 17 villages in Lindi Region in the Coastal Forest ecoregion. The other site covers 19 villages in the Eastern Arc Mountains of Kilosa and Mpwapwa Districts.

In order to generate tradable voluntary emission reduction credits, the project is seeking validation by the climate, community and biodiversity alliance. As part of this process the project must demonstrate that the project zone includes a site of high biodiversity conservation priority by meeting either the vulnerability or irreplaceability criteria defined below:

1. Vulnerability
Regular occurrence of a globally threatened species (according to the IUCN Red List) at the site:
1.1. Critically Endangered (CR) and Endangered (EN) species - presence of at least a single individual; or
1.2. Vulnerable species (VU) - presence of at least 30 individuals or 10 pairs.

Or,

2. Irreplaceability
A minimum proportion of a species' global population present at the site at any stage of the species' lifecycle according to the following thresholds:
2.1 Restricted-range species - species with a global range less than 50,000 km2 and 5% of global population at the site; or
2.2. Species with large but clumped distributions - 5% of the global population at the site; or
2.3. Globally significant congregations - 1% of the global population seasonally at the site; or
2.4. Globally significant source populations - 1% of the global population at the site.

The results of the surveys described in this report are intended to contribute to the assessment of the biodiversity values of the site.

The overall objectives of the surveys were:

1. To document the plant and vertebrate species present in selected forests on village land within the REDD project area.
2. To assess rates of disturbance in different parts of the Lindi landscape.

The surveys were carried out between February and December 2011. Results from previous surveys by TFCG as part of the design of the GEF / UNDP Coastal Forest project are also included.

1.2 Report structure

The report is organised in seven sections. The report begins with an executive summary, which gives an outline of the overall findings of the surveys.

The introduction contains an overview of the MJUMITA and TFCG REDD project and a description of the study area, including an overview of the location, geology, climate, hydrology, altitudinal range and vegetation of the Lindi village forests.

The next four sections have information on the plants, medium and large mammals, nocturnal mammals and birds of the forests surveyed. Each section includes an introduction, aims, sampling intensity, results and discussion.

In the two final sections, conclusions and recommendations are made.

Methods used in these surveys are based on Doggart 2006.

1.3 An overview of village forests around the Chitoa, Noto and Likonde plateaux

1.3.1 Location

The Noto / Chitoa / Likonde Landscape comprises a group of dissected plateaux between the Mbemkuru / Mbwemburu and Lukuledi Rivers and extends to the coast in SE Tanzania. The landscape is in Lindi Rural District in Lindi Region.

1.3.2 Topography

The landscape extends for 40 km from North to South and 54 km from East to West. At the centre of the landscape, the Mnanguru River has cut down into the Pliocene surface leaving a 3 km wide valley, now the site of Muungano, Mkombamosi, Makumba and Kikomolela Vilalges. To the north, the Likonde plateau rises up the steep escarpment from the valley floor at around 215 m asl to the plateau top at 300 – 380 m asl. The Likonde plateau undulates gently descending in the east towards the coastal plain. Running parallel to the Mnangaru River to the north of the Likonde escarpment, the Eastward flowing, ephemeral Kikande river cuts through the plateau, along which Lihimilo Village is now situated. To the west the Likonde plateau meets with the Jurassic surface at Kiwawa and along the watershed between the Mnanguru and Milola basins.

South of the Mnangaru Valley, the Noto plateau rises up, steeply in the west and more gently in the east. The highest point in the landscape lies at the north western edge of the Noto plateau at 534 m asl. From north-west to south east the plateau descends gently down towards the coastal plain. To the south the narrow Mkomole Valley divides the Noto plateau in the north from the Chitoa plateau in the South. The Chitoa plateau is lower than the Noto plateau extending up to only 340 m asl on its western edge. As with the Noto plateau, its western escarpment rises steeply from the Milola Valley whilst the eastern side descends gently down to the coastal plain.


View across the Mnangaru river valley towards the northern side of the Noto Plateau.

1.3.3 Hydrology and water use

Several of the major rivers supplying water to Lindi District originate at the base of the Likonde, Noto or Chitoa plateaux.

In the north of the landscape, the east-ward flowing Mnangaru and Likandilo rivers have eroded the 3 km wide valley that divides the Noto plateau to the south from the Likonde plateau to the north.

At the southern base of the Chitoa plateau there are two lakes, Lake Lutamba and Lake Nampawara which support small-scale fishing activities in the communities living at Rutamba, Milola and Nampawara. From Lake Lutamba flows the Ngahava River. The Mkomole valley between the Noto and Chitoa plateaux is the source of the Mahuiui River which provides water to Lindi Town.

Orographic precipitation (rain and mist) contributes to the high levels of precipitation on the plateaux. However this water quickly drains away through the free draining sands and gravels of the plateaux. The water re-emerges as rivers and lakes in valleys on the edge of the plateaux and at the plateau base. As a result, settlements and agriculture are based in the valleys and at the base of the plateaux. This has contributed significantly to conserving the plateau top forests.

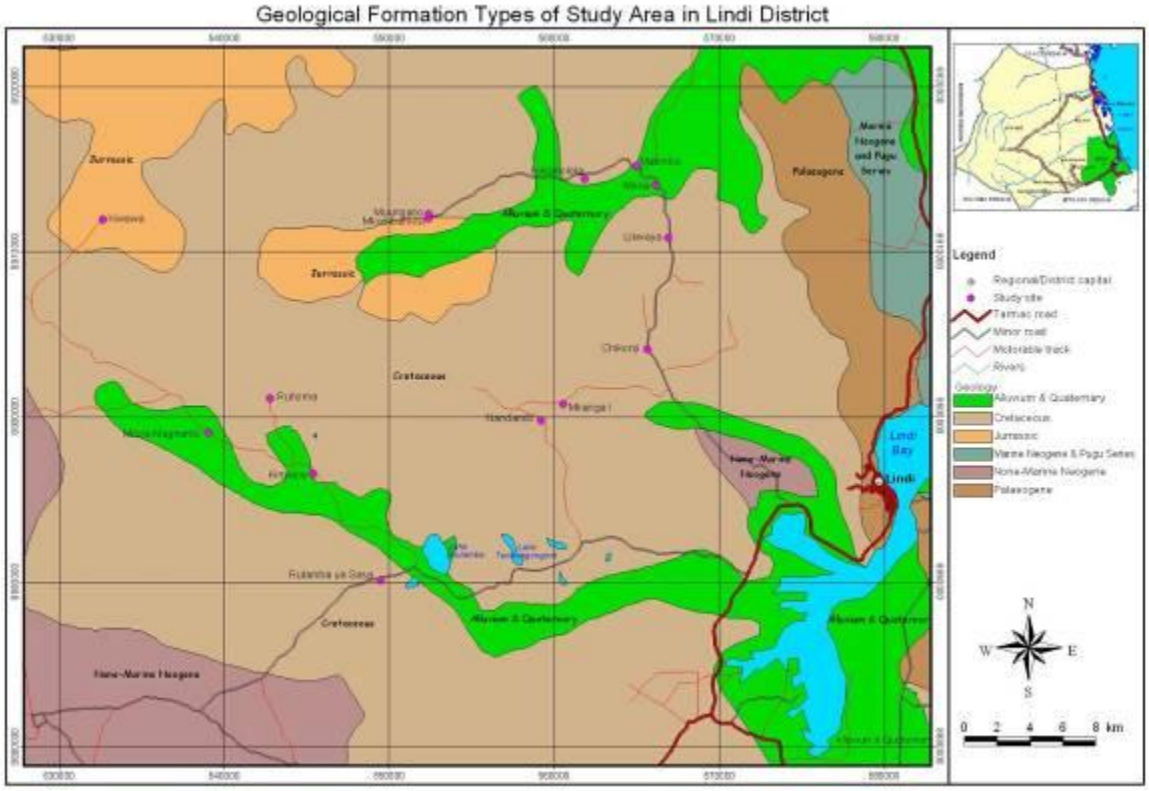
There are signs of old farms on the Noto plateau but people were moved at Ujamaa time (in the early 1970s) but were also forced to move due to the scarcity of water.

1.3.4 Geology

The Lindi plateaux are remnants of a lower-Cretaceous sandstone layer, warped and uplifted during the Miocene. Rivers have subsequently gouged out valleys from the original Miocene ‘swell’ combined with gravity-driven retreating scarp erosion. Three of the six fragments of this Miocene swell lie within the project landscape. This includes the Chitoa plateau in the south, divided by the narrow Mkomole river valley from the Noto plateau which in turn is separated from the Likandilo Plateau by the the Mnangaru river (Clarke and Burgess, 2000). More recent neogene sandstone is also present.

The valley floors are characterised by quarternary deposits and alluvium.

Older, Jurassic formations are exposed around Kiwawa Village and at the head of the Mnangaru River in Muungano Village.



1.3.5 Soils

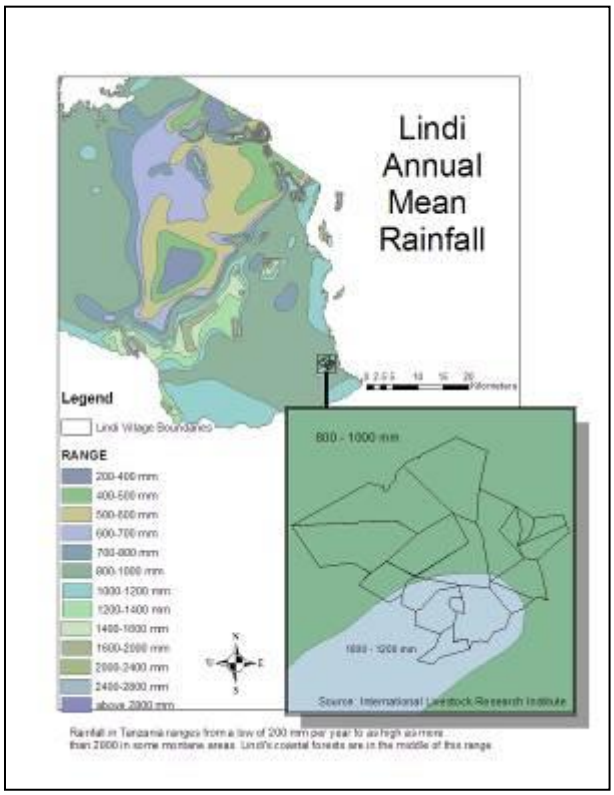
The landscape is characterised by a gradation or 'catenary succession' of soils from the well-drained, friable, sandy loams and loamy sands of the plateau tops down to the dark cracking clays and sandy clays formed from lacustrine and riverine allumvium in the valleys and floodplains (Burgess et al. 2000a). Typical of many parts of coastal Tanzania, there is high local variability in the soils reflecting different substrates, slope angles, vegetation and drainage. Broad-scale maps (e.g. ILRI 2005) are therefore misleading.

Clarke (1995) describes the soils of Chitoa Forest Reserve, on the south-western edge of the Chitoa plateau as 'Red brown sandy soils prone to retreating scarp erosion at the plateau edge' whilst he describes soil samples from Litipo Forest Reserve, at the southern edge of the landscape as having 'a pH that ranges from slightly acidic to neutral. The texture of the soil is sandy and the moisture content low. The leaf litter is fairly shallow and there is no fermentation layer due to the quick turnover of minerals and ions. Soil profiles from the riverine forest show more of a mineral horizon.'

1.4 Climate

Clarke (2000) describes the climate of the eastern African coastal forests as being 'characterised by high temperatures and incident sunlight with little seasonal or annual variation, combined with very variable rainfall patterns.'

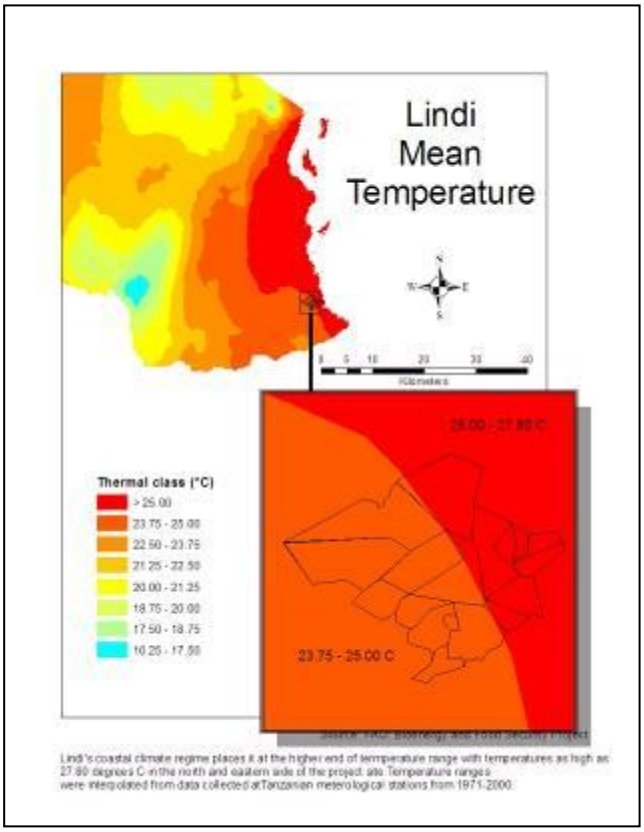
The position of the Inter-Tropical Convergence Zone (ITCZ) determines the direction of the prevailing winds and rainfall patterns in the project area. Between October / November to February / March when the ITCZ lies to the south of the project area, the north-easterly trade winds prevail whilst between May and September when the ITCZ lies to the north, south-easterly winds prevail (Clarke 2000).



Meteorological data from the project area are scarce, particularly from the plateau tops. The closest meteorological station is in Lindi at 37 576624E 88940221S at 41 m asl (Clarke 2000). A rainfall station was operational at Rondo Ntene (10°08'S, 39°15'E, 758 m altitude) on the nearby Rondo plateau from 1954 – 1973; at the Ngurumahamba Estate (12 km east of Litipo) between 1932 – 1962; at the Rutamba Tanganyika Refugee Service (10°02'S, 39°30'E, 300 m) from 1969 – 1973; and at the Naitivi Plantation (10°02'S, 39°33'E, 90 m altitude) from 1934 – 1957 (Clarke 1995)

Across the District, annual mean rainfall varies from 800 mm in the lowlands to an estimated 1200 mm on the plateaux. Over the time that they were operational, the various rainfall stations described above recorded annual mean rainfalls that ranged from 1074 mm at Rutamba; 1096 mm at Naitivi Plantation; and 1215 mm at Rondo Ntene. There is considerable variation in the total annual rainfall. For example the Ngurumahamba Estate rainfall station, recorded a peak annual rainfall of 1418 mm and a minimum of 667 mm over the 30 years that it operated (Clarke 1995).

Map 1. Lindi annual mean rainfall.



The rainfall pattern in Lindi is bimodal with rains between November and January (*vuli*) and between March and May (*masika*). Clarke (1995) reports that the rainfall stations at the Rutamba Tanganyika Refugee Service; at the Naitivi Plantation and at Rondo Ntene all recorded an average monthly rainfall of less than 50 mm between June and October. The seasonal pattern of precipitation varies annually.

Loveridge (1944) describes a significant occult precipitation effect from both the morning and evening mists that gather over the Rondo plateau and a similar phenomenon may also affect the Noto, Chitoa and Likonde plateaux.

The mean annual temperature across the District ranges from 24°C - 28°C.

Tropical storms are rare in the Coastal forest belt although high winds periodically cause tree falls.

Map 2. Lindi mean temperatures

2) Plants

By Moses Mwangoka and Roy Gereau

2.1 Literature Review

Whilst much of the literature on plants in Lindi Rural District is focused on Rondo Forest Reserve, some work has been done on the forests further north including the Chitoa and Litipo Forest Reserves and on the Noto Plateau. Important collections were made in the 1930s by the botanist Hans Joachim Eberhard Schlieben. Clarke (1995) collated information on the Lindi forests including Noto, Chitoa, Likonde and Litipo. UTUMI (2002) included the project area in a vegetation mapping exercise using remote sensing. Information on the forests is also included in Burgess and Clarke (2000). Prins and Clarke (2006) also included information on the Lindi Village forests in their vegetation analysis of Lindi.

2.1.1 Red Listed plants from Lindi Rural District that are cited in the literature or documented by herbarium specimens

In the literature there are records of 75 taxa (species, subspecies, and varieties) of plants present in the Rondo, Noto, Chitoa and Likonde Plateau that have been categorised as threatened according to the IUCN Red List threat categories. Of these 21 have been recorded from the Noto, Chitoa or Likonde plateau and / or adjacent valleys i.e. within or immediately adjacent to the REDD project area forests. The remaining 54 species have been recorded from other forests in Lindi Rural District but not from the Noto, Chitoa or Likonde Plateaux. Many of these species are known from the Rondo Plateau and from the Mlinguru Forest. The latter forest is thought to have been entirely cleared. The inclusion of records from other sites in Lindi Rural in this report is intended to give an indication of how numerous threatened plant species are in this area and to provide an indication of species that might be found in the area subject to more intensive survey effort. The list includes 7 taxa listed on the 2012.2 IUCN Red List (www.iucnredlist.org) under the current Version 3.1 of the IUCN Red List Categories and Criteria (IUCN, 2001), 63 taxa assessed by the Eastern Africa Plant Red List Authority (EAPRLA) with assessments not yet published on the Red List website, and 5 taxa on the Red List with assessments performed using Version 2.3 of the IUCN Red List Categories and Criteria (IUCN, 1994) and not yet assessed by the EAPRLA. The total number of assessments in each threatened category are as follows: Vulnerable, 24; Endangered, 32; Critically Endangered, 19 (of which 9 are possibly extinct).

Amaranthaceae

Cyathula braunii Gilg ex Schinz: Townsend (1985) reported that this herb is known from a locality between the Rondo Plateau and Lake Lutamba. The EAPRLA has assessed this species as Critically Endangered: CR D.

Psilotrichum vollesenii C.C. Towns.: This herb has been collected on the Rondo Plateau (*Bidgood et al. 1546* in herbaria DSM, K). The EAPRLA has assessed it as Endangered: EN B2ab(iii).

Annonaceae

Artabotrys modestus Diels subsp. *modestus:* Clarke (1995) reports that this shrub / liana was collected from Noto in the 1930s by Schlieben. It is also known from Rondo Forest Reserve. It appears on the 2012 IUCN Red List as Critically Endangered: CR B1ab(ii,iii,v)+2ab(ii,iii,v).

Mkilua fragrans Verdc.: Clarke (2001) reports that this shrub or small tree is known from the Noto Forest. It appears on the 2012 IUCN Red List as Vulnerable: VU B1ab(iii).

Monanthotaxis trichantha (Diels) Verdc.: Clarke (2001) reports that this climbing shrub is known from the Noto Forest. It appears on the 2012 IUCN Red List as Vulnerable: VU B2ab (ii,iii,v). The IUCN Red List notes that *M. trichantha* has a small area of occupancy (probably lower than the 500 km² threshold for Endangered), is known from six to seven locations, and it is hard to know if it is severely fragmented or not. May well be able to persist under disturbance, but to be precautionary is listed as Vulnerable because of ongoing habitat loss. In terms of range it has been recorded from southern coastal Tanzania and northwards to the Nguru and Usambara Mtns.

Monodora carolinae Couvreur: Couvreur et al. (2006) report that this tree or shrub is known from the Rondo Plateau. It appears on the 2012 IUCN Red List as Endangered: EN B1ab(iii)+2ab(iii).

Uvaria decidua Diels: Vollesen & Bidgood (1992) report that this climbing shrub is known from the Rondo Plateau. It appears on the 2012 IUCN Red List as Critically Endangered: CR B2ab(iii).

Xylopia collina Diels: Verdcourt (1971) reported this shrub or small tree from the Rondo Plateau (under its synonym *X. latipetala* Verdc. [Couvreur et al., 2006]). It appears on the 2012 IUCN Red List as Endangered: EN B2ab(iii).

Araceae
Stylochaeton euryphyllus Mildbr.: Mayo (1985) reported this herb from near the Mbemkuru River. It appears on the 2012 IUCN Red List as Vulnerable: VU B2ab(iii).

Asteraceae
Blepharispermum brachycarpum Mattf.: Beentje & Hind (2005) reported this shrub from the Chitoa Forest Reserve. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii).

Vernonia muelleri Wild subsp. *integra* C. Jeffrey: Jeffrey & Beentje (2000) reported this herb or small shrub from the Rondo Forest Reserve. The EAPRLA has assessed it as Critically Endangered: CR B1ab(iii).

Bignoniaceae
Fernandoa lutea (Verdc.) Bidgood: Vollesen et al. (2000) reported this tree from the Rondo Forest Reserve. The EAPRLA has assessed it as Critically Endangered: CR B2ab(iii,v); however, it appears on the IUCN Red List as Endangered: EN B1+2bc (ver. 2.3).

Boraginaceae
Cordia trichocladophylla Verdc.: Verdcourt (1991) reported this shrub from Mlinguru Forest. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) D.

Ehretia glandulosissima Verdc.: Verdcourt (1991) reported this small tree from the Rondo Plateau. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) B2ab(iii); however, it appears on the IUCN Red List as Endangered: EN B1+2c (ver. 2.3).

Burseraceae
Commiphora fulvotomentosa Engl.: This tree has been collected from the Rondo Forest Reserve (*Bidgood 1543* in herbaria K, MO). The EAPRLA has assessed it as Vulnerable: VU B2ab(i,ii,iii,iv)

Buxaceae
Buxus obtusifolia (Mildbr.) Hutch.: Verdcourt (1962) reported this shrub or small tree from Mlinguru Forest (as *Notobuxus obtusifolius* Mildbr.). The EAPRLA has assessed it as Vulnerable: VU B2ab(ii,iii,iv,v); it appears on the IUCN Red List as Vulnerable: VU B1+2b (ver. 2.3).

Canellaceae
Warburgia ugandensis Sprague subsp. *longifolia* Verdc.: Verdcourt (1956) reported this tree from the Rondo Plateau. The EAPRLA has assessed it as Critically Endangered: CR B2ab(iii,v), C2a(i,ii), D; however, it appears on the IUCN Red List as Vulnerable: Vu B1+2d (ver. 2.3).

Capparaceae
Capparis viminea Hook.f. & Thomsen ex Oliv. var. *orthacantha* (Gilg-Ben.) DeWolf: Elffers et al. (1964) reported this shrub from the Rondo Plateau. The EAPRLA has assessed it as Critically Endangered: CR B2ab(iii).

Maerua acuminata Oliv.: Elffers et al. (1964) reported this shrub from the Rondo Plateau. The EAPRLA has assessed it as Endangered: EN B2ab(iii); however, it appears on the IUCN Red List as Data Deficient: DD (ver. 2.3).

Maerua schliebenii Gilg-Ben.: This shrub has been collected from the Rondo Forest Reserve (*Bidgood 1511* in herbaria DSM, K). The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii).

Celastraceae

Pristimera graciliflora (Welw. ex Oliv.) N. Hallé subsp. *newalensis* (Blakelock) N. Hallé: Hallé & Mathew (1994) reported this liana from the Rondo Plateau. The EAPRLA has assessed it as Vulnerable: VU B1ab(iii)+2ab(iii).

Salacia orientalis N. Robson: This scandent shrub or liana has been collected from the Rondo Forest Reserve (*Kayombo 5099* in herbaria MO, NHT). The EAPRLA has assessed it as Endangered: EN B2ab(iii).

Clusiaceae
Vismia pauciflora Milne-Redh.: Milne-Redhead (1953) reported this tree from the Rondo Plateau. The EAPRLA has assessed it as Endangered: EN B2ab(iii); it appears on the IUCN Red List as Endangered: EN B1+2c (ver. 2.3).

Connaraceae
Vismianthus punctatus Mildbr.: Hemsley (1956) reported this shrub from the Rondo Plateau. The EAPRLA has assessed it as Vulnerable: VU B1ab(iii)+2ab(iii).

Convolvulaceae
Ipomoea consimilis Schulze-Menz: Vercourt (1963) reported this twining subshrub from the Rondo Plateau. EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) B2ab(iii).

Ipomoea flavivillosa: Vercourt (1963) reported this subshrub from the Rondo Plateau. The EAPRLA has assessed it as Endangered: EN B2ab(i,ii,iii,iv,v).

Ipomoea ticcopa Verdc.: Vercourt (1963) reported this prostrate or twining herb from near the Rondo Plateau. The EAPRLA has assessed it as Endangered: EN B2ab(ii,iii).

Cucurbitaceae
Momordica glabra A. Zimm.: This woody climber has been collected from the Rondo Forest Reserve (*Bidgood et al. 1465* in herbaria DSM, K). The EAPRLA has assessed it as Endangered: EN B2ab(i,ii,iii,iv,v).

Peponium leucanthum (Gilg) Cogn.: This herbaceous climber has been collected from the Noto Plateau (*Kindeketa et al. 2608*, herbaria MO, NHT). The EAPRLA has assessed it as Vulnerable: VU B1ab(iii)+2ab(III).

Dichapetalaceae
Dichapetalum braunii Engl. & K.Krause: This shrub has been collected from the Rondo Forest Reserve (*Kindeketa et al. 2640*, herbaria MO, NHT). The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii).

Dichapetalum macrocarpum M.Krause: This shrub has been collected from the Rondo Plateau (*Bidgood et al. 1620* in herbaria K, NHT). The EAPRLA has assessed it as Vulnerable: VU B1ab(iii)+2ab(iii).

Ebenaceae
Diospyros magogoana F. White: White & Verdcourt (1996) reported this small tree from the Rondo Escarpment. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) D; however, it appears on the IUCN Red List as Endangered: EN B1+2bc (ver. 2.3).

Euphorbiaceae
Meineckia grandiflora (Verdc.) Brunel ex Radcl.-Sm.: Radcliffe-Smith (1987) reported this shrub from the Rondo Plateau (as *Zimmermannia grandiflora* Verdc.). The EAPRLA has assessed it as Critically Endangered: CR B2ab(iii).

Fabaceae
Acacia latistipulata Harms: Brenan (1959) reported this shrub from the Rondo Plateau. The EAPRLA has assessed it as Vulnerable: VU B2ab(iii).

Baikiaea ghesquiereana J. Léonard: This tree has been collected from Ruawa Forest Reserve (*Kayombo 4729* in herbaria MO, NHT). The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii); it appears on the IUCN Red List as Endangered: EN B1+2c (ver. 2.3).

Baphia macrocalyx Harms: Brummitt (1971) reported this tree from the Rondo Plateau. The EAPRLA has assessed it as Vulnerable: VU B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); it appears on the IUCN Red List as Vulnerable: VU B1+2b (ver. 2.3).

Baphia punctulata Harms subsp. *punctulata*: This tree has been collected from Litipo (*Bidgood et al. 1745* in herbaria K, MO, NHT) and Chitoa (*Mbago FMM2188* in herbarium DSM) Forest Reserves. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii); however, it appears on the IUCN Red List as Vulnerable: VU B1+2b.

Bauhinia loeseneriana Harms: This tree has been collected from Rondo Forest Reserve (*Bidgood et al. 1666* in herbaria K, NHT). The EAPRLA has assessed it as Endangered: EN B2ab(iii); however, it appears on the IUCN Red List as Vulnerable: VU B1+2b, D2 (ver. 2.3).

Berlinia orientalis Brenan: This tree has been collected from Litipo (*Bidgood et al. 1720* in herbaria K, MO, NHT) and Rondo (*Laizer 1392* in herbaria MO, NHT) Forest Reserves. The EAPRLA has assessed it as Vulnerable: VU B1ab(iii)+2ab(iii); it appears on the IUCN Red List as Vulnerable: VU B1+2b (ver. 2.3).

Bussea eggelingii Verdc.: Brenan (1967) reported this shrub or tree from the Rondo Plateau. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) B2ab(iii); however, it appears on the IUCN Red List as Endangered: EN B1+2c (ver. 2.3).

Cynometra filifera Harms: Brenan (1967) reported this tree from Mlinguru Forest. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii); however, it appears on the IUCN Red List as Critically Endangered: CR B1+2abcde (ver. 2.3).

Dalbergia acariiantha Harms: This scandent shrub or small tree has been collected from the Rondo Plateau (*Bidgood et al. 1348* in herbaria K, NHT). The EAPRLA has assessed it as Endangered: EN B2ab(iii); however, it appears on the IUCN Red List as Vulnerable: VU B1+2b (ver. 2.3).

Gigasiphon macrosiphon (Harms) Brenan: Brenan (1967) reported this tree from the Rondo Plateau. The EAPRLA has assessed it as Critically Endangered: CR D; however, it appears on the IUCN Red List as Endangered: EN B1+abcde.

Indigofera fulgens Baker subsp. *fulgens*: This shrub has been collected from the Rondo Plateau (*Bidgood et al. 1534* in herbaria DSM, K, MO). The EAPRLA has assessed it as Vulnerable: VU B2ab(iii).

Millettia eriocarpa Dunn: Gillett (1971a) reported this tree from the Noto and Rondo Plateaux. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii); however, it appears on the IUCN Red List as Vulnerable: VU B1+2b (ver. 2.3).

Millettia impressa Harms subsp. *goetzeana* (Harms) J.B. Gillett: This liana has been collected from the Noto Plateau (*Kindeketa et al. 2610* in herbaria MO, NHT) and Litipo Forest Reserve (*Mwasumbi & Mponda 12262* in herbarium DSM). The EAPRLA has assessed it as Vulnerable: VU B2ab(iii).

Millettia schliebenii Harms: Gillett (1971a) reported this tree from Mlinguru Forest. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii); however, it appears on the IUCN Red List as Vulnerable: VU B1+2b (ver. 2.3).

Ormocarpum schliebenii Harms: Gillett (1971b) reported this shrub from Mlinguru Forest. The EAPRLA has assessed it as Endangered: EN B2ab(iii).

Pseudoprosopis euryphylla Harms subsp. *euryphylla*: Brenan (1959) reported this scandent shrub or small tree from the Rondo Plateau (as *P. euryphylla*). The EAPRLA has assessed it as Vulnerable: VU B1ab(iii)+2ab(iii).

Tessmannia martiniana Harms: This tree has been collected from Chitoa Forest Reserve (*Mbago FMM2179* in herbarium DSM). The EAPRLA has assessed it as Endangered: EN B2ab(iii).

Xylia africana Harms: This tree has been collected from Litipo Forest Reserve (*Bidgood et al. 1739* in herbaria K, NHT). The EAPRLA has assessed it as Endangered: EN B2ab(iii).

Xylia schliebenii Harms: Clarke (1995) reports that this tree was collected from Noto in the 1930s by Schlieben. In 2001, Mbago and Kibure recorded *X. schliebenii* further north in Kilwa. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii).

Flacourtiaceae
Homalium elegantulum Sleumer: Clarke (1995) reports that this shrub was collected from the Noto Plateau in the 1930s by Schlieben. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) B2ab(iii).

Lamiaceae
Clerodendrum lutambense Verdc.: Verdcourt (1992) reported this subshrubby herb from Lake Lutamba. The EAPRLA has assessed it as Critically Endangered: CR D.

Orthosiphon schliebenii A.J. Paton: Paton (2009) reported this herb from the Rondo [Mwera] Plateau. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) B2ab(iii).

Premna hans-joachimii Verdc. Clarke (1995) states that this shrub or tree is only known from the Noto and Rondo forests. Verdcourt (1992) cites the type collection from Mlinguru Forest, believed to be 10 – 20 km from Lindi. Clarke (1995) considers that the Mlinguru Forest has probably been entirely cleared. The EAPRLA has not yet assessed this species; it appears on the IUCN Red List as Vulnerable: VU B1+2b (ver. 2.3).

Linaceae
Hugonia grandiflora N. Robson: Smith (1966) reported this shrub or liana from the Rondo Plateau. The EAPRLA has assessed it as Endangered: EN B2ab(iii).

Loranthaceae
Agelanthus longipes (Baker & Sprague) Polhill & Wiens: Polhill & Wiens (1999) reported this parasitic shrub from the Rondo Plateau. The EAPRLA has assessed it as Vulnerable: VU B2ab(iii).

Agelanthus rondensis (Engl.) Polhill & Wiens: Polhill & Wiens (1999) reported this parasitic shrub from the Rondo Plateau. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) B2ab(iii).

Erianthemum lindense (Sprague) Danser: Polhill & Wiens (1999) reported this parasitic shrub from the Rondo Forest Reserve. The EAPRLA has assessed it as Vulnerable: VU B2ab(iii).

Oncella curviramea (Engl.) Danser: Polhill & Wiens (1999) reported this parasitic shrub from the Rondo Forest Reserve. The EAPRLA has assessed it as Vulnerable: VU B2ab(iii).

Oncella schliebeniana Balle ex Polhill & Wiens: Polhill & Wiens (1999) reported this parasitic shrub from the Rondo Plateau and Litipo Forest Reserve. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii).

Malpighiaceae
Acridocarpus pauciglandulosus Launert: Launert (1968) reported this straggling shrub from the Rondo Plateau. The EAPRLA has assessed it as Endangered: EN B2ab(iii).

Melastomataceae
Dissotis aprica Engl.: Wickens (1975) reported this shrub or small tree from the Rondo Plateau. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii).

Ochnaceae

Gomphia lutambensis (Sleumer) Verdc.: Verdcourt (2005) reported this shrub from the Noto Plateau and Rondo Forest Reserve. The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii).

Ochna apetala Verdc.: Verdcourt (2005) reported this shrub from Chitoa Forest Reserve. The EAPRLA has assessed it as Vulnerable: VU B2ab(iii).

Ochna braunii Sleumer: Verdcourt (2005) reported this shrub from the Rondo Plateau. The EAPRLA has assessed it as Critically Endangered: CR B2ab(iii).

Ochna pseudoprocera Sleumer: Verdcourt (2005) reported this shrub or tree from the Rondo Plateau. The EAPRLA has assessed it as Vulnerable: VU B1ab(iii)+2ab(iii).

Ochna schliebenii Sleumer: Verdcourt (2005) reported this shrub from Mlinguru Forest. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) B2ab(iii).

Plumbaginaceae
Plumbago ciliata Engl. ex Wilmot-Dear: Wilmot-Dear (1976) reported this herb from the Rondo Plateau. The EAPRLA has assessed it as Critically Endangered (possibly extinct): CR(PE) B2ab(iii).

Rubiaceae
Bullockia impressinerva (Bridson) Razafim., Lantz & B. Bremer: Bridson (1991) reported this shrub or small tree from the Rondo and Noto Plateaux (as *Canthium impressinervium* Bridson). The EAPRLA has not yet assessed this species; it appears on the IUCN Red List (under *Canthium impressinervum*) as Vulnerable: VU B1+2b, D2 (ver. 2.3).

Coffea schliebenii Bridson: This shrub has been collected from Ruawa Forest Reserve (*Kayombo 4715* in herbaria MO, NHT) and Rondo Forest Reserve (*Bidgood et al. 1427* in herbaria DSM, K). The EAPRLA has assessed it as Endangered: EN B1ab(iii)+2ab(iii).

Leptactina papyrophloea Verdc.: Verdcourt (1988) reported this shrub or small tree from the Rondo Plateau. The EAPRLA has not yet assessed this species; it appears on the IUCN Red List as Endangered: EN B1+2c.

Sapotaceae
Mimusops acutifolia Mildbr.: Clarke (1995) states that this shrub or small tree is only known from the Noto and Rondo forests. It was first collected by Schlieben in 1935 from Noto. The IUCN Red List refers to its having been collected around Lake Lutamba and cites its presence in Litipo Forest Reserve. Another collection was made by Bridson *et al.* in 1991 in Rondo. The Red List also refers to its possible occurrence in the East Usambaras (see Hemsley, 1968). The EAPRLA has not yet assessed this species; it appears on the IUCN Red List as Vulnerable: VU B1+2b (ver. 2.3).

Sterculiaceae
Sterculia schliebenii Mildbr.: Cheek (2007) reported this tree from the Rondo Plateau. The EAPRLA has not yet assessed this species; it appears on the IUCN Red List as Vulnerable: VU D2 (ver. 2.3).

2.1.2 Published descriptions of the forests in the project area

Much of the forest biodiversity research in Lindi has focused on Rondo Forest Reserve. Within the project area, some research has also been carried out on the Chitoa and Litipo Forest Reserves. As these reserves are contiguous with the village forests, a description is provided of these two reserves. Records from these areas are not included in the summary.

Chitoa Forest Reserve
Chitoa Forest Reserve is located between 9°56'S - 9°58'S and 39°26'E - 39°28'E some 45 km from the Indian Ocean and is bordered by Kinyope and Nandambi Villages. Chitoa Forest Reserve includes 770 ha of woodland and scrub forest on the escarpment edge with dry evergreen forest dominated by *Cola discoglypremnophylla* and various species of *Diospyros*. Clarke (1995) states that the forest is home to three tree species, strictly endemic to Chitoa, *Trichilia* sp. nov., *Memecylon* sp. nov. and *Vepris* sp. nov., all of which were said to be pending publication but none of which have been published to date. Other

threatened species found in Chitoa Forest Reserve but that had not been recorded from village land include *Sterculia schliebenii* (Vulnerable).

Litipo Forest Reserve
Litipo Forest Reserve is located between 10°01'S - 10°03'S and 39°28'E - 39°31'E some 35 km from the Indian Ocean and is continguous with the Nandambi and Rutamba Village boundaries. Litipo FR comprises an area of 996 ha of of woodland, riverine, scrub and dry evergreen forest. Litipo FR has an altitudinal range of 240 - 420 m a.s.l. and protects a small part of the southern rim of the Chitoa Plateau. According to Clarke (1995) Litipo Forest Reserve contains a unique stand of forest dominated by *Berlinia orientalis*. Other areas of the forest are dominated by *Hymenocardia ulmoides*, *Grewia conocarpa*, *Ricinodendron heudelottii* and *Dialium holtzii*.

Noto Forest
The forests on the Noto Plateau have been described as containing mixed dry and mixed scrub forest (Prins and Clarke 2006; and UTUMI 2002). Parts of the plateau have been cultivated in the past. Former clearings are regenerating, and there are still mango trees present. UTUMI (2002) note that there has been 'extensive and organised selective timber logging and on the northern part of the (Noto) plateau. Larger areas have recently been cleared due to shifting cultivation.

2.2 Objectives of survey

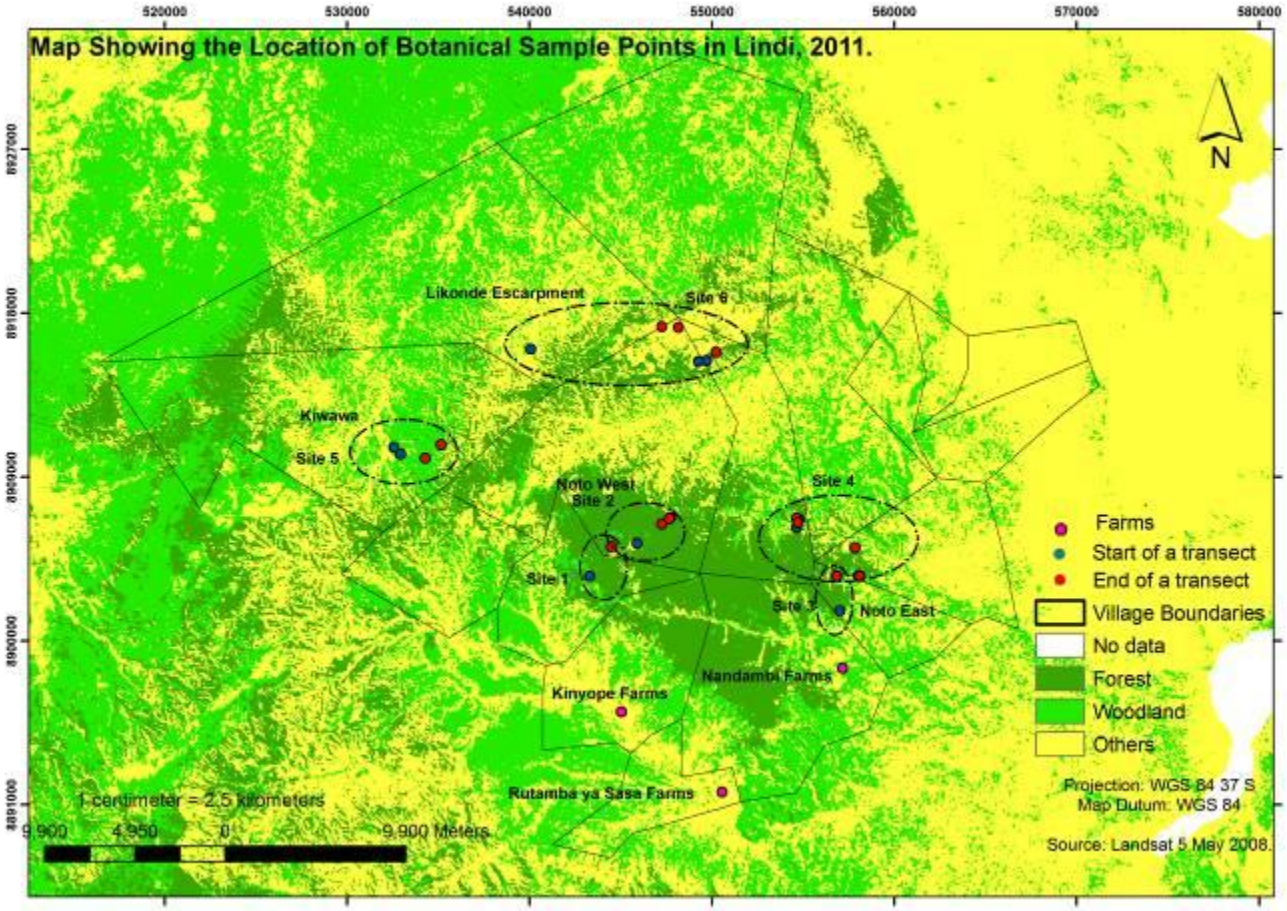
- To identify threatened and endemic plant species within forest on village land on the Chitoa, Noto and Likonde Plateaux.
- To record and collect fertile plants specimens with a particular focus on rare and threatened species.
- Characterization of the forest and woodland.

2.3 Methods

The survey involved observations and collecting specimens. Specimens will be identified using the Flora of Tropical East Africa and compared with the reference collection at the National Herbarium of Tanzania. One set of specimens has also been sent to the Missouri Botanical Gardens. Identifications used for the vegetation descriptions were made by the TFCG Botanical Collector Moses Mwangoka. Specimens will also be reviewed by plant taxonomists from Missouri Botanical Gardens and updates to the report will be made once any additional identifications are provided.

2.4 Sampling intensity

The botanical survey described in this report involved four forests on village land within villages participating in the TFCG and MJUMITA REDD project in Lindi Region. These forests are: Noto West in Ruhoma (Site 1) and Muungano Villages (Sites 1 and 2); Lidoho Forest on the eastern side of the Noto Plateau in Mkanga 1 (Site 3); and Chikonji and Mkombamosi Villages (site 4); Nawamba woodland in Kiwawa Village (Site 5); and Likonde escarpment forest in Muungano, Mkombamosi and Namkongo Villages (Site 6).



Map 3. Location of botanical sampling areas.

Surveys were also carried out on farms in three villages in maize, rice and cassava fields in order to identify common weeds. Those villages were Nandambi, Rutamba ya Sasa and Kinyope. More than 10 weed species were identified.

The botanical survey took 17 working days. A total of 252 collections were made during the survey; these collections include herbs, lianas, shrubs, ferns and trees. The survey was carried out between 5 – 23/2/2011.

In addition, the project has established 20 carbon plots across the landscape. The plots follow the NAFORMA methods (Vesa *et al*. 2011). During this period the author also worked with the MJUMITA Carbon Monitoring Officer, Mr Baraka Samweli to establish vegetation plots in Noto and in the Miombo woodland near Ruhoma Village.

Results from a previous collecting trip by Moses Mwangoka to the Lindi landscape in May 2010 have not been included here as most collections were made from within the Litipo Forest Reserve, which is not part of the REDD project. Observations from a trip in 2008 to the north-west Noto Plateau by Moses Mwangoka have been included.

The specimen numbers for the collections from the 2011 survey range from MM 7234 – 7485. All of these are waiting formal identification in NHT and the Missouri Botanical Garden (correct at June 2013).

The Red List categories are derived from the IUCN Red List website (www.iucnredlist.org) and from the results of six Eastern Africa Plant Red List Authority workshops. Table 5 shows the coordinates for each forest visited.

Table 5. Location of sample sites.

Site	Sample point	Forest	Location (UTM coordinates)	Altitude (m)	Date	Number of specimens collected	Specimen numbers
Site 1 Noto	1	South-West Noto Plateau	0543303/8903559-0544491/8905158	367-514	7/2/2011	22	7234 - 7368
Site 2 Noto	2	Noto West	0545894/8905351-0547260/8906405	516-520	8/2/2011	24	
	3	Noto West	0547710/8906784-0547654/8906721	499-510	9/2/2011	21	
Site 3 Noto - Lidoho	4	Noto East (Lidoho Forest)	0557020/8901656-0558094/8903564	207-242	14/2/2011	21	7369 - 7404
	5	Noto East (Lidoho Forest)	0558035/8903601-0556839/8903564	204-355	15/2/2011	21	
	6	Noto East (Lidoho Forest)	0558165/8903555-0557828/8905120	224-326	16/2/2011	10	
Site 4 Noto	7	North-West Noto Plateau	05546401/8906220-05546369/8906722	509	8/7/2008	0	
	8	North-West Noto Plateau	05547608/8906674-05547364/8906496	511	8/7/2008	0	
Site 5 Kiwawa - Nawamba	9	Kiwawa (Nawamba)	0532927/8910263-0534241/89107717	213-317	12/2/2011	10	7302 - 7368
	10	Kiwawa (Nawamba)	0532557/8910618-0535142/8910776	312-317	13/2/2011	15	
Site 6 Likonde Escarpment	11	Likonde escarpment	0549709/8915385-0548160/8917210	468-488	18/2/2011	24	7405 - 7467
	12	Western Likonde escarpment	054005/8916018-0547244/8917244	482-493	19/2/2011	21	
	13	Eastern Likonde escarpment	0549263/8915349-0550208/8915846	429-447	20/2/2011	22	
Site 7 Nandambi farms	14	Nandambi farms	0557804/8998322	274	21/2/2011	10	
Site 8 Kinyope farms	15	Kinyope farms	0543660/8896488	201	22/2/2011	5	
Site 9 Rutamba ya sasa farms	16	Rutamba ya sasa farms	0549151/8891822	160	23/2/2011	3	

2.5 Results

Vegetation description

Chitoa Plateau

The Chitoa Plateau extends over approximately 3000 ha. It includes extensive areas of dry evergreen forest, mixed woodland forest and mixed scrub forest with a canopy height of 12 m and with emergents of up to 20 m in height. The most important patch of forest on the plateau is the Chitoa Forest Reserve.

On the plateau edge, the dominant species include *Scorodophloeus fischeri, Afzelia quanzensis, Manilkara sulcata, Milicia excelsa* and *Euphorbia spp*. Other trees present on the plateau include *Bombax rhodognaphalon* and *Newtonia buchananii*.

Noto Plateau

The Noto Plateau is predominantly covered by dry evergreen forest, with a well-developed canopy at 12 m and emergent trees extending to 20 m. Dominant canopy species include *Pteleopsis myrtifolia*, *Afzelia quanzensis*,

Zanthoxylum deremense and *Grewia conocarpa*. In the understorey the dominant species include *Annona senegalensis*, *Tabernaemontana elegans*, *Strychnos* sp., *Xylotheca tettensis, Carvalhoa campanulata*, *Erythrococca sp.* and *Cyathula* sp. The forest differs from the adjacent Chitoa Plateau in having few *Scorodophloeus fischeri* and few *Milicia excelsa*. More detailed descriptions of sampling sites in different parts of the Noto Plateau are provided below:

Site 1 and 2: South-west Noto Plateau in Ruhoma and Muungano Villages

Vegetation description
This is an area of mixed dry forest located from 367m-520m altitude above sea level in the south-west part of the Noto Plateau in Ruhoma Village. The forest is dominated by *Pteleopsis myrtifolia, Markhamia obtusifolia, Hymenocardia ulmoides*, *Pterocarpus angolensis, Afzelia quanzensis, Hymenaea verrucosa* (an indicator species for coastal forest)*, Caloncoba welwitschii* and *Grewia conocarpa*.

There are emergent trees up to 30 – 35m including *Bombax rhodognaphalon*, *Milicia excelsa, Pteleopsis apetala* and *Terminalia sericea*.

Canopy height ranges from 20-25m while canopy cover is more than 75%.

Understorey shrubs include *Heinsia bussei, Acalypha racemosa*, *Indigofera* sp. and *Xylotheca tettensis*.

Lianas include *Bonamia mossambicensis*, *Uvaria acuminata*, *Grewia forbesii*, *Dichapetalum braunii*, *Dictyophleba lucida* and *Monanthotaxis trichantha*.

Understorey herb includes *Gladiolus decoratus, Chlorophytum* sp. *and Elytraria minor.*

Endemic and threatened species
The forest contains some species that are endemic to Tanzanian coastal forests including *Heinsia bussei, Dichapetalum braunii*, *Pteleopsis apetala* and *Streptosiphon hirsutus*.

Threatened species include *Monanthotaxis trichantha* [VU B2ab(ii,iii,v)] and *Dichapetalum braunii* [EN B1ab(iii)+2ab(iii)].

Invasive alien species
Near Ruhoma, we observed *Stachytarpheta jamaicensis* but this was outside the forest on agricultural land.

Site 3: Description of the sampling site in the south-east part of the Noto Plateau in Mkanga 1 Village and Chikonji Village

Location: 37L 0556839 – 0558165 E / 8901656 – 8905120 S

Vegetation description
This is an area of dry coastal forest located north and north-west of Mkanga I Village. It is the continuation of the Noto Plateau coming from the west. The forest is called Lidoho Village Forest of Mkanga I. The forest is more than 4km from the village. The altitude ranges from 200 – 360m above sea level.

Dominant canopy and understorey trees include *Grewia conocarpa, Hymenocardia ulmoides, Carpordiptera africana, Pteleopsis apetala, Zanthoxylum chalybeum*, *Calancoba welwitschii*, *Bombax rhodognophalon* and *Milica excelsa*. The canopy height is about 15-20m. Canopy cover is estimated to be >70%, while ground cover for undisturbed forest is <30% but this varies from one place to another, with some places being burnt every year. There is little leaf litter in the areas affected by fire. Grasses and herbs regenerate quickly in the fire-affected areas. In the fire-affected areas, the ground cover is more than 50%.

Understorey shrubs*: Indigofera* sp., *Acalypha racemosa, Acalypha neptunica, Chassalia umbraticola* and *Carvalhoa campanulata*.

Lianas: *Dictyophleba lucida, Grewia forbesii (Mpokolo), Uvaria acuminata (mshofu), Bonamia mossambicensis (Dingili), Salacia madagascariensis (Ngulu)* and *Gossypium* sp.

Herbs*: Dorstenia* sp.*, Rhodopentas bussei, Celosia* sp.*, Spermacoce* sp.*,* and *Justicia scandens*.

Within this area we observed *Mangifera indica* (mango) and *Anarcadium occidentale* (cashew nut) trees evidence of earlier settlements. The field assistant explained that his ancestors had lived in this area and had had some small farms in the area before independence.

Endemic and threatened species
Species that were found in this part of forest that are endemic to Tanzanian coastal forests are:-
Heinsia bussei and *Dichapetalum braunii*.

Threatened species include *Peponium leucanthum* [VU B1ab(iii)+2ab(iii)], *Monanthotaxis trichantha* [VU B2ab(ii,iii,v)] and *Dichapetalum braunii* [EN B1ab(iii)+2ab(iii)].

Site 4: Description of the sampling site in the north-west part of the Noto Plateau in Mkombamosi and Chikonji Villages

Location: 37L 05546369 – 05547608 E / 8906220 – 8906722 S

Vegetation description
This is an area of mixed dry forest in the north-west part of the plateau in Mkombamosi and Chikonji village land. At 511 m, the site is located around the highest point on the Noto Plateau. The dominant canopy tree species are *Pteleopsis myrtifolia* and *Afzelia quanzensis.* In the east of this area where the canopy is higher and more dense, *Zanthoxylum deremense* and *Grewia conocarpa* are also common. The canopy height varied from 10 m – 20 m. To the west the canopy cover was < 50 % whilst to the east it was > 50 %.

Common understorey species include: *Annona senegalensis, Strychnos* sp.*, Xylotheca tettensis*, *Carvalhoa campanulata, Erythrococca* sp. and *Cyathula* sp..

Endemic and near threatened species
The Near Threatened tree species, *Lettowianthus stellatus*, which is endemic to the Coastal Forests and Eastern Arc Mountains, was relatively common in this area.

Site 5: Description of the sampling site in Nawamba Woodland in Kiwawa Village

Forest description
The vegetation in Nawamba is predominantly miombo woodland with a few patches of riverine forest. The woodland is dominated by *Brachystegia spiciformis* (Mchenga), *Millettia stuhlmannii* (Mpande), *Diplorrhynchus condylocarpon* (Ntomoni), *Pericopsis angolensis*, *Albizia veriscolor* (Ntanga), *Terminalia sericea* (Nchejea), *Pseudolachnostylis maprouneifolia* and *Pterocarpus angolensis* (Ntumbati).

There are also patches of bamboo scattered throughout the woodland. In the east, the woodland extends up to the Noto Plateau forest. Canopy height ranges from 10m – 15m, canopy cover is more than 60%, while ground cover is more than than 80% because the forest is burnt every year, therefore the regeneration of grasses takes place after burning. Emergent trees are *Brachystegia spiciformis*, *Millettia stuhlmannii* and *Pteleopsis myrtifolia.* These species can reach 20-25m tall.

Endemic and threatened species
A shrub / tree species that resembles the coastal forest endemic tree / shrub species, *Xylopia arenaria* was recorded along streams. This would represent a range extension from its known range in central coastal Tanzania and southern Kenya (K7 and T6). However until the identification of Specimen 7312 is confirmed this record is not included in any of the summary statistics.

No invasive alien species were recorded in Nawamba.

Site 6: Description of the sampling site in Likonde Escarpment in Mkombamosi Village

Location 0554005 05550208

Vegetation description

There is a band of coastal forest remaining along the edge of the escarpment. This is mainly in the areas where agriculture is not possible due to cliffs, rock outcrops and steep slopes. The rest of the forest and much of the woodland that adjoined the forest towards the base of the escarpment has been affected by shifting agriculture. Some of this is now regenerating into thicket. The forest is botanically diverse.

The dominant tree species *are Pteleopsis apetala* (Ng'windi), *Hymenaea verrucosa* (Nkumbi), *Grewia conocarpa* (Ng'ungulu), *Hymenocardia ulmoides* (Mmalala) and *Scorodophloeus fischeri*. The canopy height ranges from 10-12m, canopy cover is more than 70% while ground cover is less than 40%. The height of emergent trees is about 20-25m tall including *Bombax rhodognaphalon*, *Milicia excelsa, Ricinodendron heudelotii*, *Terminalia sambesiaca* (Nkulyungu) and *Dialium holtzii*.

Understorey shrubs: *Chassalia umbraticola*, *Erythrococca* sp., *Rhodopentas bussei* and *Acalypha neptunica*.

Lianas include: *Rhoicissus tridentata*, *Dalechampia scandens*, *Dictyophleba lucida*, *Bauhinia fassoglensis* and *Dichapetalum sp*.

Herbs: *Begonia oxyloba*, *Cincinnobotrys pulchella*, *Habenaria* sp. and *Scleria* sp.

Walking west onto the plateau towards 0549709/8915385, 05498136/8917199, 0547063/8916449, there are some relatively undisturbed forest patches remaining. These remaining patches are dominated by *Afzelia quanzensis* (Mbambakofi), *Milicia excelsa* (Mvule), *Hymenocardia ulmoides* (Mmalala), *Zanthoxylum chalybeum* (Namavele), and Bamboos in some areas.

Lianas include *Abrus precatorius*, *Combretum pentagonum*, *Entada rheedei*, *Pterolobium stellatum* and *Grewia forbesii*.

Shrubs include *Carvalhoa campanulata, Flueggea virosa*, *Acalypha racemosa, Hoslundia opposita* and *Whitfieldia elongata*.

Endemic and threatened species
The Likonde escarpment contains some species that are endemic to coastal forests including *Cincinnobotrys pulchella* (previously only known from Rondo), *Leptactina papyrophloea* and *Mimosops acutifolia*.

Invasive alien species
Outside of the forest in Likonde kati some *Cedrela odorata* has been planted on the edge of a farm approximately 200 m from the forest.

2.6 Summary of plant species endemic to Tanzanian Coastal Forests and threatened plant species recorded in the four forests

A total of 279 species from 73 families were recorded during the surveys. This includes eight Coastal Forest endemic plant species of which 1 species is only found in Lindi Rural; and 2 Vulnerable and 1 Endangered plant species. The number of species categorised as threatend is increased if the latest red-listing proposals by the East African Plant Red-list authority workshops are included such that four of the species recorded during the surveys are now considered to be Endangered and 3 species are considered to be Vulnerable. These assessments are coordinated by the IUCN African Plant Specialist Group However these proposals have not yet been uploaded onto the IUCN Red Listing website

The Coastal Forest endemic and threatened species are listed in Table 6. A full list of species recorded in the four forests is provided in Appendix 3 and a list of specimens is provided in Appendix 4.

Table 6. List of endemic and threatened species recorded during the surveys.

Species	Red list status	Endemic status	Noto West	Noto East	Nawamba	Likonde	Range Description[+]
ACANTHACEAE							
Streptosiphon hirsutus Mildr.		E	X				T8 Endemic. Rare 2 Loc.
ANNONACEAE							
Monanthotaxis trichantha (Diels) Verdc.	VU			X			East African coastal forests and lower slopes of East Usambaras
COMBRETACEAE							
Pteleopsis apetala Vollesen	EN*	E	X				T6,8 Rare.
CUCURBITACEAE							
Peponium leucanthum (Gilg.) Cogn.	VU*	E		X			T6,8 Endemic. Rare.
DICHAPETALACEAE							
Dichapetalum braunii Engl. & K. Krause	EN*	E	X	X			T8 Endemic. Rare, less than 5 localities.
FABACEAE							
Bauhinia loeseneriana Harms	EN*		X			X	
MELASTOMATACEAE							
Cincinnobotrys pulchella (Brenan) Jac.-Fél.		E				X	T8 endemic. Rondo endemic = *Primularia pulchella* Brenan
RUBIACEAE							
Heinsia bussei Verdc.		E	X	X			T8 endemic. Less than 5 locs.
Leptactina papyrophloea Verdc.	EN	E				X	T8 endemic. Formerly thought to be confined to undisturbed areas of the Rondo Forest Reserve (140 km²), but one 2003 collection is from Mozambique just south of Tanzania border (*Luke & Kibure 9838* in herbaria EA, UPS).
SAPOTACEAE							
Mimosops acutifolia Mildbr.	VU	E				X	T8 endemic. Rare. 2 locs only (Burgess and Clarke 2000). Found around Lake Lutamba. It may also occur in the East Usambara Mts. The area around the lake has been completely cleared, with the exception of a 10 km² patch of forest protected as Litipo Forest Reserve (IUCN Red List 2012.2)
Total number of endemic plant species			**4**	**3**		**3**	**Overall total = 8**
Total number of Vulnerable species				**2**		**1**	**3**
Total number of Endangered species			**3**	**1**		**2**	**4**

Key to Table 3
Red List Status
Where Red List status followed by an * it means that the assessment was performed by the Eastern Africa Plant Red List Authority (EAPRLA) and has not yet been entered on the IUCN database. Where there is no '*', it means that the status is that cited in the IUCN database (www.iucnredlist.org).

VU: Vulnerable

EN: Endangered

Endemic status
CF E: Endemic to the East African Coastal Forests (including northern coastal Mozambique).
Ranges are based on [+]Burgess and Clarke 2000 with additional data from TROPICOS (www.tropicos.org) and the Flora of Tropical East Africa

Threatened plant taxa
Details on the 16 plant taxa recorded during the surveys and in the literature from the village land forests, and listed as threatened on the IUCN Red List or assessed as threatened by the East African Plant Red Listing Authority are provided in Table 7. This includes 9 Vulnerable, 5 Endangered and 2 Critically Endangered taxa.

Table 7. List of threatened plant species from the village land forests.

Species	Threatened Category	Reference
Vulnerable		
Monanthotaxis trichantha (Diels) Verdc.	VU B2ab (ii,iii,v) according to the 2012 IUCN Red List.	Recorded during the current surveys and in Clarke 2001.
Mimosops acutifolia Mildbr.	VU B1+2b according to the IUCN Red List Version 2.3	Recorded during the current surveys. Clarke (1995) states that this shrub or small tree is only known from the Noto and Rondo forests. It was first collected by Schlieben in 1935 from Noto.
Mkilua fragrans Verdc.	VU B1ab(iii) according to the 2012 IUCN Red List.	Clarke (2001) reports that this shrub or small tree is known from the Noto Forest.
Peponium leucanthum (Gilg) Cogn.	VU B1ab(iii)+2ab(III) according to the EAPRLA assessment.	Recorded during the current surveys. This herbaceous climber has been collected from the Noto Plateau (*Kindeketa et al. 2608*, herbaria MO, NHT).
Millettia eriocarpa Dunn:	VU B1+2b (ver. 2.3). EN B1ab(iii)+2ab(iii) according to the EAPRLA assessment	Gillett (1971a) reported this tree from the Noto and Rondo Plateaux.
Millettia impressa Harms subsp. *goetzeana* (Harms) J.B. Gillett:	VU B2ab(iii) according to the EAPRLA assessment	This liana has been collected from the Noto Plateau (*Kindeketa et al. 2610* in herbaria MO, NHT) and Litipo Forest Reserve (*Mwasumbi & Mponda 12262* in herbarium DSM).
Premna hans-joachimii Verdc.	VU B1+2b (ver. 2.3).	Clarke (1995) states that this shrub or tree is only known from the Noto and Rondo forests.
Bullockia impressinerva (Bridson) Razafim., Lantz & B. Bremer:	VU B1+2b, D2 (ver. 2.3).	Bridson (1991) reported this shrub or small tree from the Rondo and Noto Plateaux (as *Canthium impressinervium* Bridson).
Bauhinia loeseneriana Harms:	VU B1+2b, D2 (ver. 2.3) subsequently assessed by EAPRLA as EN B2ab(iii);	Recorded during the current survey.
Endangered		
Leptactina papyrophloea Verdc.	EN B1+2c ver 2.3	Recorded in Likonde during the current survey. The IUCN Red List describes its range as 'Now thought to be confined to undisturbed areas of the Rondo Forest Reserve (140 km²).' A more recent collection records *L. papyrophloea* from northern Mozambique.
Dichapetalum braunii Engl. & K. Krause	EN B1ab(iii)+2ab(iii) according to EAPRLA assessment	Recorded in Noto East and West during current survey.
Pteleopsis apetala Vollesen.	EN B1ab(iii)+2ab(iii) according to EAPRLA assessment	Recorded in Noto West during current survey.
Xylia schliebenii Harms:	EN B1ab(iii)+2ab(iii) according to the EAPRLA assessment	Clarke (1995) reports that this tree was collected from Noto in the 1930s by Schlieben.

Species	Threatened Category	Reference
Gomphia lutambensis (Sleumer) Verdc	EN B1ab(iii)+2ab(iii).	Verdcourt (2005) reported this shrub from the Noto Plateau and Rondo Forest Reserve.
Critically Endangered		
Homalium elegantulum Sleumer	CR(PE) B2ab(iii) according to the EAPRLA assessment	Clarke (1995) reports that this shrub was collected from the Noto Plateau in the 1930s by Schlieben.
Artabotrys modestus Diels subsp. *modestus:*	It appears on the 2012 IUCN Red List as Critically Endangered: CR B1ab(ii,iii,v)+2ab(ii,iii,v).	Clarke (1995) reports that this shrub / liana was collected from Noto in the 1930s by Schlieben. It is also known from Rondo Forest Reserve.

There are also records from the literature of nine threatened plants species from forests immediately adjacent to the Lindi village forests in for example the Chitoa and Litipo Forest Reserves. These include four species considered to be Vulnerable: *Stylochaeton euryphyllus* Mildbr. (VU B2ab(iii) 2012), *Baphia punctulata* Harms subsp. *punctulata* (VU B1+2b.), *Berlinia orientalis* Brenan: (VU B1+2b (ver. 2.3)), *Ochna apetala* Verdc.: (VU B2ab(iii) by EAPRLA); four species considered to be Endangered: *Blepharispermum brachycarpum* Matt. (EN B1ab(iii)+2ab(iii) by EAPRLA), *Tessmannia martiniana* Harms. (EN B2ab(iii) by EAPRLA), *Xylia africana* Harms. (EN B2ab(iii) by EAPRLA) and *Oncella schliebeniana* Balle ex Polhill & Wiens: EN B1ab(iii)+2ab(iii) by EAPRLA; and one species categorised as Critically Endangered: *Clerodendrum lutambense* Verdc. (CR D by EAPRLA). Further research is required in order to determine whether the range of these species also extends into the Village land forests.

Endemic plant species

Details on the 19 plant taxa recorded during the surveys and in the literature from the village land forests that are endemic or near-endemic to the East African coastal forests are provided in Table 8. This includes 8 that are endemic to the Lindi Region Coastal Forests; 10 that are endemic to the East African Coastal Forests and 1 that is near-endemic, also being found in the lowland Eastern Arc Mountain forests.

Table 8. List of plant species endemic and near-endemic to the East African Coastal Forests recorded from Lindi Village forests.

Species	Reference
Endemic to the Lindi Region Coastal Forests	
Cincinnobotrys pulchella (Brenan) Jac.-Fel.	Recorded from Likonde plateau during current surveys. Known from Rondo and Likonde Plateaux only.
Artabotrys modestus Diels subsp. *modestus:*	Clarke (1995) reports that this shrub / liana was collected from Noto in the 1930s by Schlieben. It is also known from Rondo Forest Reserve.
Mimosops acutifolia Mildbr.:	Recorded during the current surveys. Clarke (1995) states that this shrub or small tree is only known from the Noto and Rondo forests.
Premna hans-joachimii Verdc.	Clarke (1995) states that this shrub or tree is only known from the Noto and Rondo forests.
Homalium elegantulum Sleumer	Clarke (1995) reports that this shrub was collected from the Noto Plateau in the 1930s by Schlieben. Only known from Noto.
Xylia schliebenii Harms:	Clarke (1995) reports that this tree was collected from Noto in the 1930s by Schlieben. Known from Noto, Simara-Kitunda and Ngarama North forests
Gomphia lutambensis (Sleumer) Verdc	Verdcourt (2005) reported this shrub from the Noto Plateau and Rondo Forest Reserve. Only known from these two sites.
Bullockia impressinerva (Bridson) Razafim., Lantz & B. Bremer:	Bridson (1991) reported this shrub or small tree from the Rondo and Noto Plateaux (as *Canthium impressinervium* Bridson). The IUCN red list describes its range as 'A coastal forest species. Known from three sites in south-east Tanzania. It has been collected from an unprotected tract of forest on the Noto Plateau and from the nearby Rondo Plateau
Endemic to the East African Coastal Forests	
Streptosiphon hirsutus Mildr.	Recorded during current surveys.
Pteleopsis apetala Vollesen	Recorded during current surveys.
Peponium leucanthum	Recorded during current surveys.

Species	Reference
(Gilg.) Cogn.	
Dichapetalum braunii Engl. & K. Krause	Recorded during current surveys.
Heinsia bussei Verdc.	Recorded during current surveys.
Leptactina papyrophloea Verdc.	Recorded in Likonde during the current survey. The IUCN Red List describes its range as 'Now thought to be confined to undisturbed areas of the Rondo Forest Reserve (140 km²).' A more recent collection records *L. papyrophloea* from northern Mozambique.
Mkilua fragrans Verdc.	Clarke (2001) reports that this shrub or small tree is known from the Noto Forest. The IUCN red list describes its range as 'A Kenyan and Tanzanian coastal species, also found on all the Tanzanian islands.'
Bauhinia loeseneriana Harms:	Recorded during the current survey. . The IUCN red list describes its range as 'Endemic to coastal forest in Tanzania, this species is known only from four sites.'
Millettia eriocarpa Dunn:	Gillett (1971a) reported this tree from the Noto and Rondo Plateaux. The IUCN red list describes its range as 'Endemic to south-east Tanzania, a species of dry coastal forest.'
Millettia impressa Harms subsp. *goetzeana* (Harms) J.B. Gillett:	This liana has been collected from the Noto Plateau (*Kindeketa et al. 2610* in herbaria MO, NHT) and Litipo Forest Reserve (*Mwasumbi & Mponda 12262* in herbarium DSM).
Near-endemic to East African Coastal Forests being found in adjacent mountains such as the Eastern Arc Mountains	
Monanthotaxis trichantha (Diels) Verdc.	Recorded during the current surveys and in Clarke 2001. Range extends to lowland Nguru and Usambara Mountains.

All identifications are pending confirmation following comparison of the specimens with the reference collections of the National Herbarium of Tanzania and the Missouri Botanical Garden.

Of the areas visited, the Noto West area has the higest number of Coastal Forest and threatened species and this area should be considered a conservation priority.

The East African Coastal Forests, a threatened ecosystem

The study area is part of the East African Coastal Forests. In a recent analysis by Godoy *et al.* (2011), they highlighted that rates of deforestation are high (between 0.6 – 1.4 % yr-1) with the highest rates occurring outside of forest reserves. Prins and Clarke (2006) estimate that only 5 % of the original extent of East African Coastal Forests is still remaining. IUCN have recently launched criteria for ecosystem red listing (Keith et al. 2013). Whilst the East African Coastal Forests have not yet been assessed, the current rates of deforestation would place the area within the Endangered category, based on Clarke's estimates.

Identification of weed species on farms

Identification of weed species identified as problematic by farmers was carried out in three villages: Nandambi, Rutamba ya Sasa and Kinyope. Ten weed species were identified. Some of these weed species are problematic because they strangle the crop plants whilst others are problematic because they grow faster than the crop plants thereby out-competing them. The following tables list the species found in each village.

NANDAMBI

0557804/8998322 ALT 274M

COLL. NO	SPECIES	FAMILY	HABIT
RECORDED	*Commelina benghalensis* (Likolova)	*COMMELINACEAE*	HERB
RECORDED	*Bonamia mossambicensis (Dingili)*	*CONVOLVULACEAE*	LIANE
7469	*Bougainvillea sp*	*NYCTAGINACEAE*	HERB
7471	*Justicia scandens*	*ACANTHACEAE*	HERB
7470	*Waltheria sp*	*STERCULIACEAE*	HERB
7468	*Ipomoea sp*	*CONVOLVULACEAE*	CLIMBER
7472	*Mucuna gigantea (Uwangu)*	*FABACEAE*	CLIMBER

7473	*Cyperus sp*	*CYPERACEAE*	SEDGE
7474	*Ipomoea sp*	*CONVOLVULACEAE*	HERB
7476	*Panicum trichocladum*	*POACEAE*	GRASS
7475	*Polygala sp*	*POLYGALACEAE*	SEDGE
7477	*Entada sp*	*FABACEAE*	LIANA

KINYOPE

0543660/8896488 ALT. 201 m

COL. NO	SPECIES	FAMILY	HABIT
7478	*Ipomoea sp (Nkokobwado)*	*CONVOLVULACEAE*	CLIMBE
7479	*Cyperus sp (Kidevu cha mbuzi)*	*CYPERACEAE*	SEDGE
7480	*Panicum sp (Kindatala)*	*POACEAE*	GRASS
RECORDED	*Oxalis sp (Kitesa)*	*OXALIDACEAE*	HERB
7473	*Cyperus sp*	*CYPERACEAE*	SEDGE
7469	*Bougainvillea sp*	*NYCTAGINACEAE*	HERB
RECORDED	*Commelina benghalensis(Likolova)*	*COMMELINACEAE*	HERB
RECORDED	*Bidens pilosa (Nyominyomi)*	*ASTERACEAE*	HERB
7481	*Hypitis suaveolens*	*LAMIACEAE*	HERB
7482	*Tribulus sp*	*ZYGOPHYLLACEAE*	HERB

RUTAMBA YA SASA

0549151/8891822 Alt. 160 m

COLL. NO	SPECIES	FAMILY	HABIT
RECORDED	*Commelina benghalensis (Likolova))*	*COMMELINACEAE*	HERB
7473	*Cyperus sp (Ndago)*	*CYPERACEAE*	SEDGE
7483	*Pentodon sp*	*RUBIACEAE*	HERB
7478	*Ipomoea sp*	*CONVOLVULACEAE*	CLIMBER
RECORDED	*? (Chipunga)*	*POACEAE*	GRASS
7484	*Imperata cylindrica*	*POACEAE*	GRASS
7485	*Panicum sp*	*POACEAE*	GRASS

According to discussions with the farmers, the most problematic species are *Commelina benghalensis* and MM 7469 which still needs to be identified. These are abundant. *Bonamia mossambicensis* was common in fields that had only recently been cleared whereas *Commelina benghalensis* was more common in fields that had been cultivated for some time.

Mucuna gigantea (Willd.) DC. was most common in newly cleared shambas but was not found in fields that had been cultivated for a long time.

Commelina benghalensis L.: Common name: Tropical spiderwort or Bengal dayflower. This plant is native to Africa and Asia where it is associated with disturbed areas. It readily forms pure stands that smother other small plants such as vegetables and grain crops. Widely used herbicides such as glyphosates have little effect on it. In the US where it has been introduced it is included on the Federal Noxious Weed list and is considered the most significant threat to the cotton crop. The leaves are widely used as fodder and the young leaves are eaten as a vegetable in Nepal.

2.7 Discussion

In all four areas that were visited, there remain areas of evergreen coastal forest. Of the four sites, woodland was most prevalent in Nawamba. The most disturbed area was around the Likonde escarpment and plateau and this forest is highly threatened. From a conservation perspective, the Likonde escarpment forest is important because it has populations of some threatened and coastal forest endemic species such *as Leptactina papyrophloea* and *Mimosops acutifolia*.

It is recommended that this area of forest should be conserved according to its botanical importance and its importance to the surrounding communities. Effort should also be made to conserve the remaining patches of forest on the Likonde Plateau area.

With rainfall at 1000 – 1200 mm it is likely that the remaining areas of coastal forest on the plateaux are vulnerable to any reduction in rainfall or to fire, both of which could favour the more widespread woodland species to the detriment of the more restricted-range coastal forest species.

There is a need for additional surveys in Likonde as this area is quite extensive; however the time available was not sufficient to visit all parts of the escarpment. In addition it would be valuable to visit the northern part of the Chitoa Plateau.

3) Medium and large mammals

By Andrew Perkin

3.1 Literature review

We found no published mammal records from the Noto Plateau.

3.2 Objectives

To document the medium and large mammal species present in the village land forests with a particular focus on medium and large mammal species that are endemic to the Eastern African Coastal forests and / or that are listed as threatened by IUCN.

3.3 Methods

We define medium to large mammals as all those mammal species that are usually not recorded using standard trapping methods for small mammals such as Sherman traps and pitfall traps and are instead recorded by the model of camera-traps used in these surveys. Thus, we included mammals from the size of a squirrel from the genus *Paraxerus* and elephant shrew from the genus *Petrodromus* and above.

A detailed account of the methods is provided in Rovero (2006). The following methods were deployed:

3.3.1 Census walks to count primates and forest antelopes

Long (> 1km) transects were walked during the day. These surveys aimed to detect diurnal species by direct observation; by recording vocalizations; or by recording signs of animals. Signs of animals e.g. tracks, dung, burrows, digging, signs of tree and fruit eating were noted. Photographs were taken and vocalisations were recorded where possible.

3.3.2 Camera-trapping to detect presence of medium to large mammals

Camera-traps (Deercam DC 300) were set to take photos 24-h per day and mounted with 36 exposure, Kodak 200 ISO films. The minimum delay between consecutive photos was set at 1 minute. We retrieved cameras after 34 - 37 days. Trap-days were computed as the number of 24-h periods cameras were operating, i.e. until they were retrieved or the film was full (and thus it can be less than 30 days). For each camera-trapped species, we computed the number of events as the number of photos of the same species. Trap-rate was computed as the number of events divided by trapping effort (in days) and multiplied by 100. Camera traps were left at suitable sites near each camp site (total 6). They were positioned along animal trails to target small to medium sized mammals.

3.3.3 Mammal live trapping

Three tomahawk live cage traps baited with palm wine (mnazi pombe) were deployed at each site to try to trap galagos and other small mammals. They were all sited near the camp sites where galagos were seen to be moving.

3.3.4 Opportunistic surveys

Since the camps were located in the forest we recorded any animals that we observed throughout the duration of the survey.

3.3.5 Indigenous knowledge

Throughout the survey, discussions were held with our colleagues from the local villages on the presence and absence of animals in the area. Additional information is included based on the project staff's interviews with local stakeholders as part of other REDD project activities.

3.3.6 Nocturnal transects

See Section 4 for more details on this. Records from the nocturnal transects have been included in this section for the purposes of estimating species richness however more details and discussions are provided in the next section.

3.4 Mammal sampling intensity

The sampling intensity is described below (Table 9). This section includes results from two surveys, one survey was conducted by a TFCG team in July 2008 on the Noto Plateau. A second survey was carried out in August 2011.

Table 9. Mammal survey sampling intensity.

Survey method	Noto Site 1	Noto Site 2	Noto Site 3	Total effort
Diurnal transects	18hrs	18hrs	8 hrs (2 transects)	36hrs
Diurnal opportunistic surveys	15hrs	15hrs	15 hrs	45hrs
Nocturnal transects	200m x 2 nights = 400m	100m x 2 nights = 400m	100 m x 4 nights = 400 m	1200 m
Nocturnal opportunistic surveys	8hrs x 3 nights = 24hrs	8hrs x 3 nights = 24hrs	4 hrs x 3 nights = 12hrs	60 hrs
Live mammal trapping	3 traps x 3 nights = 9 nights	3 traps x 3 nights = 9 nights	0 trapping	18 trap nights
Camera trapping	3 traps x 37 days = 111 trap days	2 traps x 34 days = 68 trap days	0 trapping	179 trap days
Survey dates	25-27 August 2011	27 - 29 August 2011	7th – 10th July 2008	
Location	0545314 / 8908214	0548373 / 8905408	0547337 / 8906552	

One of the three camera traps set around Site 2 did not function and so is not included in the analysis.

Map 4. Location of camera trapping on Muungano Village Forest Reserve on the Noto Plateau.

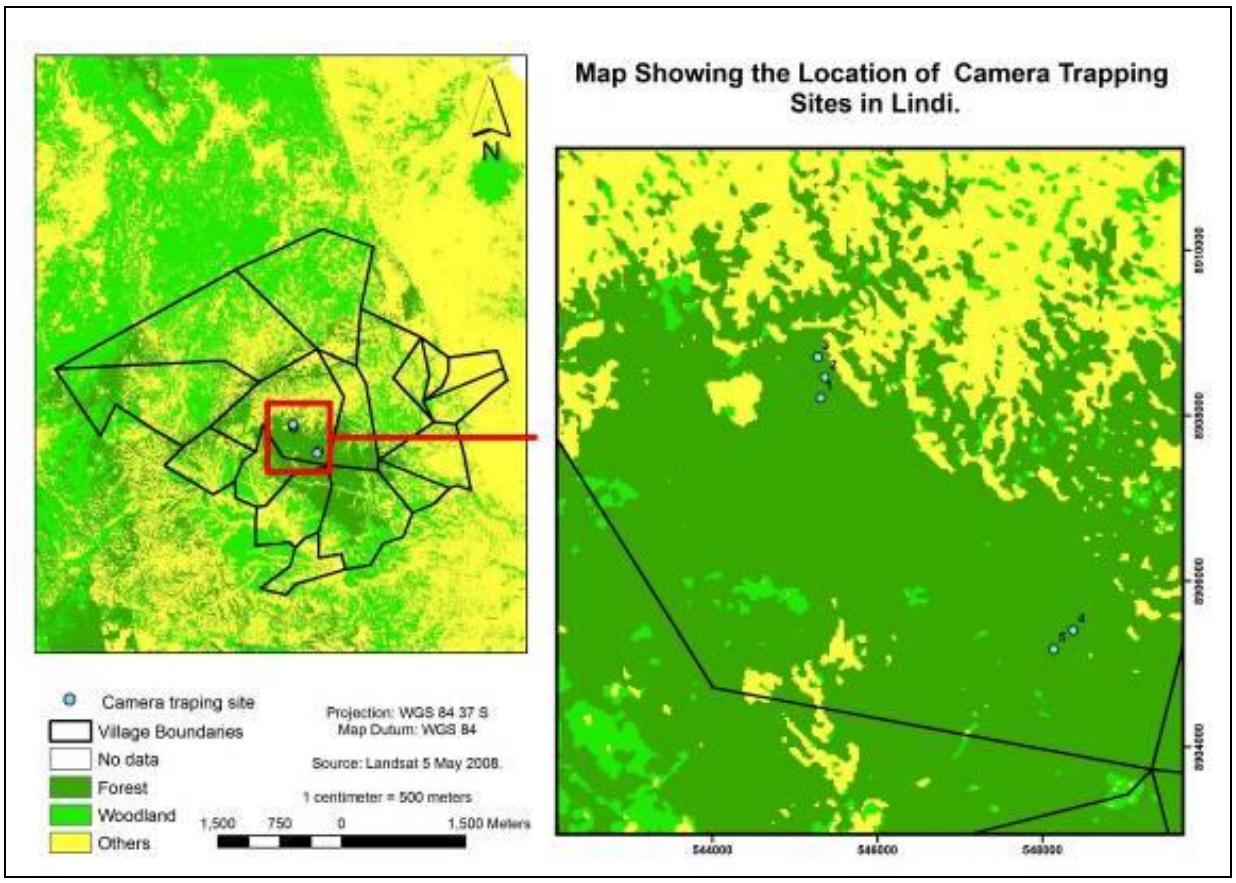


Table 10. Camera trapping locations.

Camera trap no. / TFCG no.	Position (UTM)	Date set	Date collected	Total days	Notes
Camera trap 1 / TFCG 13	0545314 / 8908214	26/8/2011	02/10/2011	37	Noto Site 1: Set on elephant path with duiker and leopard dung.
Camera trap 2 / TFCG 22	0545364 / 8908467	26/8/2011	02/10/2011	37	Noto Site 1: Set on a duiker path with red duiker dung and rubbing post.

Camera trap no. / TFCG no.	Position (UTM)	Date set	Date collected	Total days	Notes
Camera trap 3 / TFCG 05	0545278 / 8908705	26/8/2011	02/10/2011	37	Noto Site 1: Set on animal path with signs of bush pig digging.
Camera trap 4 / TFCG 09	0548373 / 8905408	29/8/2011	02/10/2011	34	Noto Site 2: Set on duiker path with sengi digging signs.
Camera trap 5 / TFCG 17	0548141 / 8905179	29/8/2011	02/10/2011	34	Noto Site 2: Set on elephant/duiker path with sengi digging signs.

3.5 Results

3.5.1 Overview of mammal species in the project area

26 species of medium and large mammal from 19 families were recorded, of which one is considered Critically Endangered, two are Vulnerable and one is Near-Threatened (see Table 11).

Table 11. List of mammal species recorded.

Species	Common name	Noto Site 1	Noto Site 2	Noto Site 3	Forest dependency	IUCN status	Endemism	Detection method
PRIMATES								
Cercopithecidae								
Cercopithecus mitis ssp. monoides I. Geoffroy-Saint. Hilaire, 1841	Tanzania Sykes' monkey	1	1	1	F	LC	W	CT, VH, Ob
Galagonidae								
Otolemur garnettii (Ogilby, 1838)	Small-eared greater galago	1	1	1	F	LC	CF N	VH
Galagoides granti (Thomas & Wroughton, 1907)	Grant's lesser galago	1	1	1	F	LC	W	VH, Ob
Galagoides rondoensis Honess in Kingdon, 1997	Rondo dwarf galago	1	1		FF	CR	CF E	VH, Ob (photo)
CHIROPTERA								
*Microchiroptera **spp*	Insectivorous bat	1	1		F		W	VH, Ob
*Megachiroptera **spp.*	Frugivorous bat	1	1		F		W	VH, Ob (photo)
MACROSCELIDEA								
Macroscelidae								
Rhynchocyoninae								
Ryhnchocyon cirnei macrurus Peters, 1847	Chequered sengi	1	1	1	F	NT	W (subsp CF E)	CT, Ob
Petrodromus tetradactylus Peters, 1846	Four-toed sengi	1	1	1	F	LC	W	VH, Ob
RODENTIA								
Nesomyidae								
Cricetomys gambianus Waterhouse, 1840	Northern giant pouched rat		1		F	LC	W	CT
Sciuridae								
Paraxerus palliatus (Peters 1852)	Red-bellied coast squirrel	1	1	1	f	LC	W	Ob, VH
Heliosciurus mutabilis (Waterhouse, 1842)	Mutable sun squirrel	1	1	1	F	LC	W	Ob,
Gerbillidae								
Gerbilliscus sp.		1			F	LC	W	Ob (burrows observed)
Hystricidae								
Hystrix cristata Linnaeus, 1758	Crested porcupine		1	1	f	LC	W	Ob (quill only)

Species	Common name	Noto Site 1	Noto Site 2	Noto Site 3	Forest dependency	IUCN status	Endemism	Detection method
CARNIVORA								
Nandininae								
Nandinia binotata (Gray, 1830)	African palm civet		1		FF	LC	W	Ob
Herpestidae								
Bdeogale crassicauda Peters, 1852	Bushy-tailed mongoose	1	1		f	LC	W	Ob, CT
Viverridae								
Genetta maculata (Gray, 1830)	Central African large-spotted genet		1		F	LC	W	Ob, CT
Mustelidae								
Mellivora capensis (Schreber, 1776)	Honey badger		1		F	LC	W	CT
Felidae								
Panthera leo (Linnaeus, 1758)	Lion			1	f	VU	W	D
*Panthera pardus*** (Linnaeus, 1758)	Leopard	1			f	NT	W	D
TUBULIDENTATA								
Orycteropodidae								
Orycteropus afer (Pallas, 1766)	Aardvark	1			f	LC	W	Ob (burrow only)
HYRACOIDEA								
Procavidae								
Heterohyrax brucei (Gray, 1868)*	Bush hyrax		1		O	LC	W	VH
PROBOSCIDEA								
Elephantidae								
Loxodonta africana (Blumenbach, 1797)	African elephant	1	1	1	f	VU	W	Ob, D, VH, CT
ARTIODACTYLA								
Suidae								
Potamochoerus larvatus Cuvier, 1822	Bush pig	1	1	1	F	LC	W	D, CT
Bovidae								
Syncerus caffer (Sparrman, 1779)	African buffalo		1		f	LC	W	D
Cephalophus harveyi Thomas, 1893	Harvey's duiker	1		1	F	LC	W	D, CT
Neotragus moschatus Von Dueben, 1846	Suni	1	1	1	F	LC	W	Ob, CT

* - provisional identification based on vocalisations, ** - identification to family only, *** - probable identification from dung,.

Key to Table 11

Red List (based on IUCN Red List 2011.2)
EN = Endangered, VU Vulnerable, LR/cd = Lower Risk/conservation dependent, DD = Data Deficient, LC = Least Concern, NT Near Threatened

Range
CF E – coastal forest endemic, CF N – coastal forest near endemic, W – widespread

Forest dependency
FF = Forest specialist, species that are typical of the forest interior and are likely to disappear when the forest is modified to any great extent,
F = Forest generalist, species that can occur in undisturbed forest but which are able to exist (and may even be more numerous) at the forest edge,

f = forest visitor, species that sometimes occur in forests but are more typical of other habitats especially moist woodlands and thickets.
O = non-forest species.

Detection method
CT = Camera Trap, D = Dung, Ob = Observation, VH = Vocalisation heard

Taxonomy follows Wilson and Reeder (2005)

Camera traps detected ten mammal species and one bird species. The trap rate was highest for suni, bushy-tailed mongoose and chequered sengi. No animals were caught in the Tomahawk traps.

Table 12. Camera trapping results.

Species	Common Name	Camera trap number						Total Events	Trap rate
		4	5	9	13	17	22		
Cercopithecus mitis ssp. monoides	Blue monkey				1			1	0.6
Rhynchocyon cirnei	Chequered sengi			2		3	2	7	4.0
Bdeogale crassicauda	Bushy-tailed mongoose			2		6	2	10	5.7
Cricetomys gambianus	Pouched rat			1	1		1	3	1.7
Genetta maculata	Central African large-spotted genet			1		4		5	2.9
Mellivora capensis	Honey badger			1		1		2	1.1
Loxodonta africana	Elephant		1					1	0.6
Potamochoerus larvatus	Bush pig					2		2	1.1
Cephalophus harveyi	Harvey's duiker		1		2			3	1.7
Neotragus moschatus	Suni		1	5	2	4	3	15	8.6
Guttera pucherani	Crested guineafowl				2			2	1.1
	Nothing		1	2	5	4	4	16	9.1
	Total events	**0**	**3**	**12**	**8**	**20**	**8**		
	Number of species		**2**	**5**	**4**	**5**	**3**		

Vocalisations were used to identify or contribute to the identification of 10 mammal species. Sonograms for two of these species are presented in the following figures.

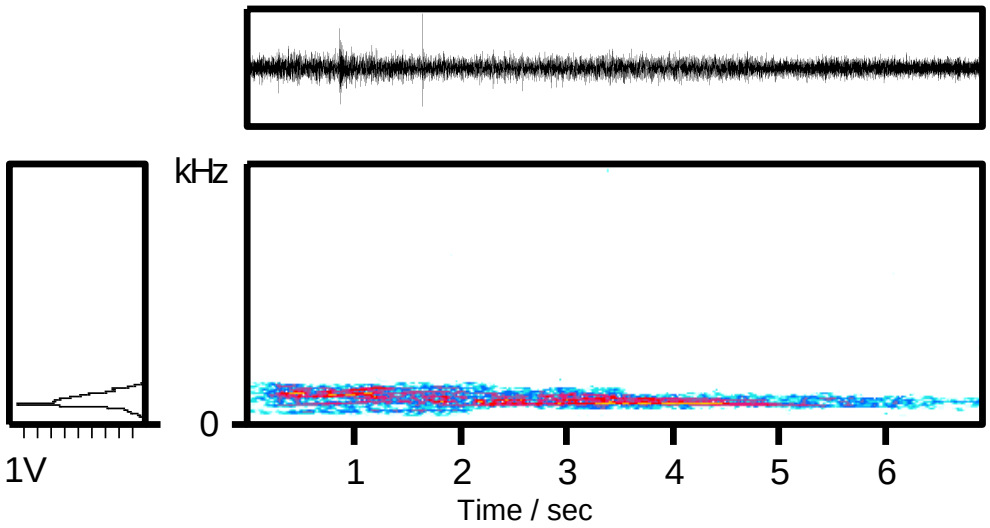


Figure 1. Elephant rumble sonogram from Noto

The sonogram in Figure 1 shows a low frequency elephant ‘rumble’ recorded on the Noto plateau.

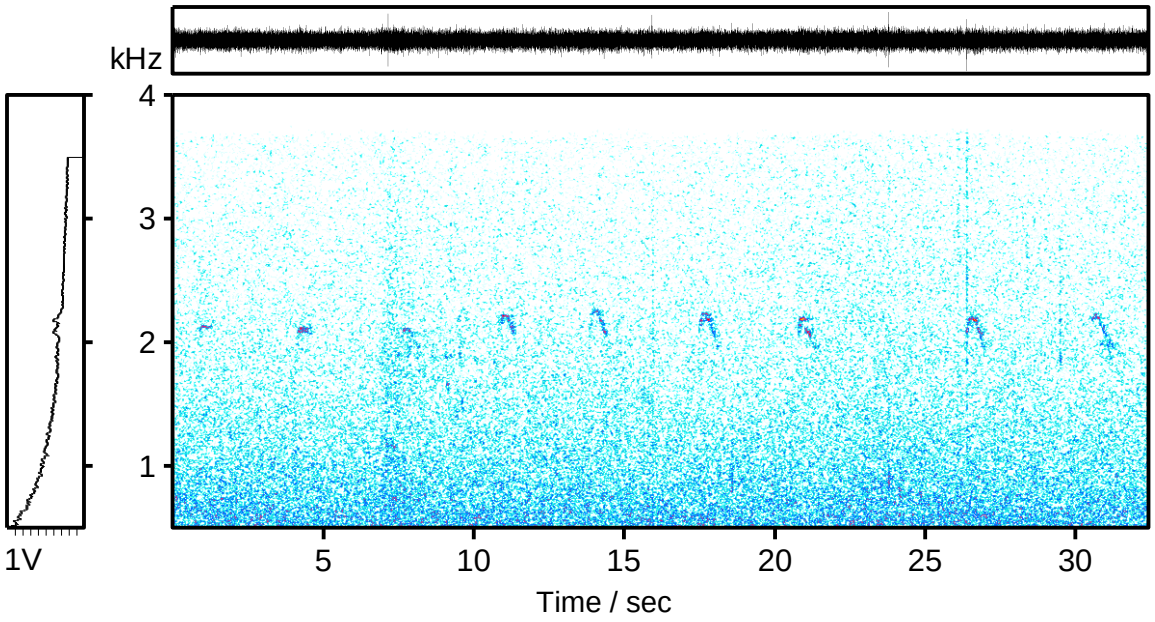


Figure 2. Sonogram of an unidentified mammal, possibly bush hyrax.

Figure 2 shows an unidentified call that resembles the whistle call of bush hyrax *Heterohyrax* sp. Local people report hyrax dwelling in the steep rocky parts of the plateaux edges but they were not reported to occur in the areas where this survey took place. Further survey work is needed in order to determine more conclusively which species was making the call.

3.5.2 Threatened mammal species found on the Noto plateau

Five mammal species listed as threatened or near-threatened on the IUCN Red List were recorded on village land. This incudes 1 Critically Endangered, 2 Vulnerable and 2 Near-threatened mammal species. Most notable is the Critically Endangered galago, the Rondo galago (Table 13).

Table 13. Threatened mammal species recorded on the Noto Plateau.

Species	Status (IUCN 2011)
Rondo galago	Critically endangered
Lion	Vulnerable
African elephant	Vulnerable
Leopard	Near threatened
Chequered sengi	Near threatened

3.5.3 Coastal forest endemic and near endemic mammal species

The surveys recorded one species and one sub-species endemic to the East African Coastal Forests and one mammal species that is considered near-endemic to the coastal forests. These are presented in Table 14.

Table 14. Coastal forest endemic and near-endemic mammal species recorded on the Noto Plateau.

Species	Range
Coastal Forest Endemic taxa	
Rondo galago	Recorded from nine forests in the Tanzanian coastal forests.
Chequered sengi	The subspecies *R. c. macrurus* is endemic to the coastal forests of SE Tanzania in the coastal forests from the Ruvuma river north to the Mbemkuru R. near Kilwa.
Coastal Forest Near-endemic species	
Small-eared greater galago	Found in the coastal forests from S. Somalia south to the Ruvuma river and the Eastern Arc Mountains, Mt. Kilimanjaro, Mt. Meru and the Kukuyu highlands of Kenya.

A review by Corbet and Hanks (1968) concuded that the subspecies *Rhynchocyon cirnei macrurus* occurs in a confined area in coastal thicket from the Mbemkuru river south to the Ruvuma river inland as far as Liwale and their more premenant rufous pigmentation is a recenty acquired unique character.

3.5.2 Indigenous knowledge

Discussions with the two Village Natural Resources Committee members Abdallah Mangwacha, Ruhoma VNRC member and Abdallah Mtambule, Muungano VNRC member whilst in the field indicated several interesting points concerning the mammals of the Noto plateau, the surrounding woodlands and the adjacent Chitoa plateau. These are summarised below:

Elephants

Elephants constantly use the plateau for shelter, feeding (preliminary observations indicate mostly fruits, bark and roots). Use is seasonal. More elephants are present on the plateau during rainy periods. Elephants also descend from the plateau into the adjacent farmlands of Muungano, Ruhoma and Kinyope Villages. It is likely that they range much further than these areas. The numbers of elephants were estimated as several tens or even 100.

Duikers and other bovids

Determining the species of duikers present based on dung and interviews revealed that three species or forms are present. However several names are used for one species which can lead to confusion. Interviewees reported 'mbutuka', a large goat like animal taken to mean red duiker. Ndima may mean blue duiker but this was unclear as it was also referred to as a male 'Ng'ondemkuru' or suni, and 'paa', 'Ng'ondemkuru' and 'diki diki' all seem to refer to suni antelope. Also quoted was 'Mbawala' (a standard kiswahili name) meaning bushbuck. 'Mbogo' meaning buffalo and 'ndovu' commonly used as the word for elephant were said to be quite common.

Sengis or elephant shrews

Based on the literature we would expect two species to occur in the Noto forests, the four toed sengi and the chequered sengi. The local informants described four forms which were all called 'nodo' with descriptive adjectives to describe the form:

Form 1.
A small brown sengi with white on the face. Makes paths ('wana safisha njia') and drumming noises. This describes the four-toed sengi very well.

Form 2.
A large sengi also called 'chitawala' that has chequers and lines on the back = chequered elephant shrew.

Form 3.
Another large form which is mainly black with some red.

Form 4.
A large form which is mostly reddish.

Whilst it is known that there is considerable variation within the chequered elephant shrew and several subspecies are named Corbet and Hanks (1968), it is interesting that these forms described above appear to sympatric and more research is needed in order to understand these patterns better.

Hyrax

Hyrax were said to occur in certain places in the rocky cliffs of the plateaux and it was said that they were hunted.

3.6 Discussion

3.6.1 Threatened and endemic mammal species

The presence of one critically endangered and two vulnerable species highlights the high conservation value of this area. It is likely that with additional survey effort, additional species would be recorded. For example, this survey did not target rodents and shrews. Amongst the large mammals, local people report several species that were not recorded during this survey including buffalo, bushbuck, wild dog and hyena. As such the species richness is higher than is presented here.

3.6.2 Primates

The only diurnal primate species that was recorded was the blue monkey. No black and white colobus, *Colobus angolensis* were recorded. This confirms the pattern that this species does not occur south of the Rufiji River even though apparently suitable habitat is available. Baboons *Papio cynocephalus* and vervet monkeys *Cercopithecus pygerythrus* are reported to be common at the forest edge but this survey did not record them.

3.6.3 Elephants

Signs of elephants are evident in many parts of the Noto Plateau where the team surveyed. From my experience (A. Perkin) there are very few coastal forests in Tanzania with so many signs of elephant present especially in the dry season. The role elephants play in the ecology of the forests of Noto and Chitoa requires more research. There was few signs of impacts on vegetation e.g. bark stripping. However elephants are impacting on peoples lives in the surrounding farm lands. Since the Noto plateau has no permanent water, elephants go out looking for water in surround areas which are located in valleys and at the base of the plateaux. Local people also utilise the water and thus compete with the elephants. Elephants also eat crops. A full assessment of the movements, seasonality and impacts and the role of the Noto / Chitoa habitat mosaic, would be useful to understand the local elephant ecology and to help find solutions to human elephant conflict.

3.6.4 Carnivores

The record of the Palm civet is interesting since this species has never been recorded in the Noto forests or even in other Lindi regional forests (Burgess and Clark 1999). This is a widespread species throughout Africa but is generally poorly known. It can be seen as an indicator of moist evergreen forests as this species prefers this habitat and is not generally found in dry thicket and woodlands. In general the carnivore diversity is high with six species detected within this short period. The presence of lion and leopard (both threatened species) also indicate the presence of a good density of prey species such as buffalo, bush pig, bushbuck, duiker and even porcupines. Local communities have reported lion attacks and fear of lion attacks was reported to be a cause of low school attendance by children living far from their primary schools.

3.7 Conservation

The results of this survey of the Noto plateau forest administered by Ruhoma and Muungano villages, indicate that it is an outstanding area for biodiversity both nationally and internationally and thus represents a high conservation priority. Other taxonomic groups e.g., bats, rodents, shrews, invertebrates, reptiles, and amphibians are poorly known and need surveying. The surveys show that some species require special attention where the taxonomic status is uncertain or unknown e.g. the giant sengis, hyrax and squirrels.

3.8 Survey photographs

Photo 1. An unidentified fruit bat species.

Photo 2. An aardvark hole.

Photo 3. Leopard dung at Site 1.

Photo 4. Lion dung.

Figure 3. Selected camera trap photos.

Honey badger. Camera Trap 9. Noto Site 2.

Giant pouched rat. Camera Trap 9. Noto Site 2.

Male suni. Camera Trap 9. Noto Site 2.

Central African large spotted genet. Camera trap 17. Noto Site 2.

Bush pig. Camera trap 17. Noto Site 2

Bushy tailed mongoose. Camera trap 17. Noto Site 2

Chequered sengi. Camera trap 17. Noto Site 2

Harvey's duiker. Camera Trap 13. Noto Site 1.

4) Nocturnal mammals

By Andrew Perkin, Oxford Brookes University, Nocturnal Primate Research Group

4.1 Literature review

The survey targeted the Rondo galago *Galagoides rondoensis* which is listed as Critically Endangered by IUCN and is in the list of the top 25 most endangered primates in the world. This galago is endemic to a few patches of coastal forests within Tanzania. Prior to these surveys, this species had not been recorded from village land on the Noto Plateau although it had been recorded in the contiguous Chitoa Forest Reserve.

4.2 Objectives

- To determine the presence of *Galagoides rondoensis* on village land on the Noto Pateau.
- To compile a list of nocturnal mammal species present on the Noto Plateau.

4.3 Methods

Three methods were employed to detect the Rondo galago and other nocturnal mammals.

4.3.1 Walking surveys

Walking surveys to detect nocturnal animals principally galagos started at dusk at around 18.45. From camp we marked out a 200 m transect which was used for surveys. we would walk out from camp using a GPS to navigate. We walked slowly and often stopped to listen for sounds. Torches were used to detect eye shine. When eye shine was detected, a Maglite spotting torch was used to show up the animal and binoculars were used to identify the species.

4.3.2 Recording vocalisations

A sound recorder (Marantz PMD660 digital sound recorder with a Sennheiser K6-ME66 shotgun microphone with a Raycote 'softie' windshield and pistol grip) was used to record animal calls. The sound files were then downloaded to a computer for analysis.

4.3.3 Photography

A camera (cannon XTi, 260mm lens and flash gun) was used to take photos where possible.

4.4 Sampling intensity

In July 2008, the survey team spent four nights at the Airtel tower, listed here as Noto Site 3. In 2011, the team camped for three nights each in two parts of the Noto Plateau which were chosen for the high probability of the presence of evergreen coastal forests by using satellite imagery generated by the TFCG REDD project (see Figure 4). There is a road built to the top of the plateau by the phone company Airtel that provides easy access to the forest.

Site	Position (UTM)	Altitude (m)
Noto Site 1	0545736 / 8908224	509
Noto Site 2	0548614 / 8905324	349.82
Noto Site 3 (Airtel phone mast)	0547337 / 8906552	515

Table 15. Location of nocturnal mammal survey sites.

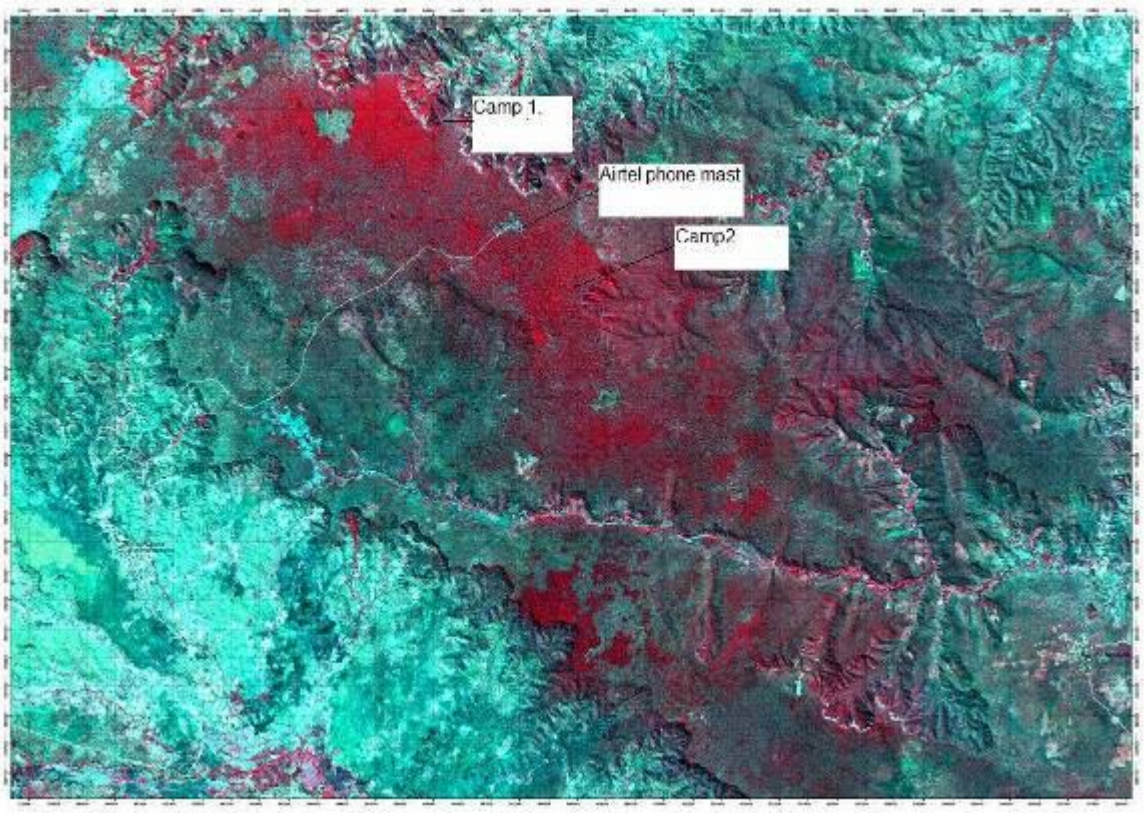


Figure 4. Location of the nocturnal mammal surveys.

Figure 4 is generated from a SPOT image and shows the forest, woodland and agriculture vegetation types. The image was taken in the dry season month of August. Dark red indicates moist evergreen forest, blue green shades indicate woodland and coastal thicket of various types (Image courtesy of T. Brown/TFCG and MJUMITA REDD project).

Date	Activity	Location
25 - 27 August 2011	Field survey in Noto camp 1	North-west Noto plateau
27 - 29 August 2011	Field survey in Noto camp 2	North-central Noto plateau
7 – 10 July 2008	Field survey in Noto camp 3	Airtel phone mast on the Noto Plateau

Table 16. Survey dates for nocturnal mammal survey.

The survey intensity is indicated in Table 17 below.

Survey type	Noto Site 1	Noto Site 2	Noto Site 3	Total effort
Nocturnal transects	200m x 2 nights = 400m	100m x 2 nights = 400m	100m x 4 nights = 400m	1200 m
Nocturnal opportunistic surveys around camp	8hrs x 3 nights = 24hrs	8hrs x 3 nights = 24hrs		48hrs
Live trapping	3 traps x 3 nights = 9 nights	3 traps x 3 nights = 9 nights	0	18 trap nights

Table 17. Sampling intensity for the nocturnal mammal survey.

4.5 Results

Nocturnal mammals recorded during the survey include the Rondo galago and the Central African large-spotted genet. The Rondo galago was observed; vocalisations were recorded; and photographs were taken. No animals were trapped.

4.5.1 Rondo galago vocalisation

Ten separate Rondo galago vocalisation events were recorded. They were recorded at both sample sites. A sonogram of a Rondo galago vocalisation is provided in Figure 5.

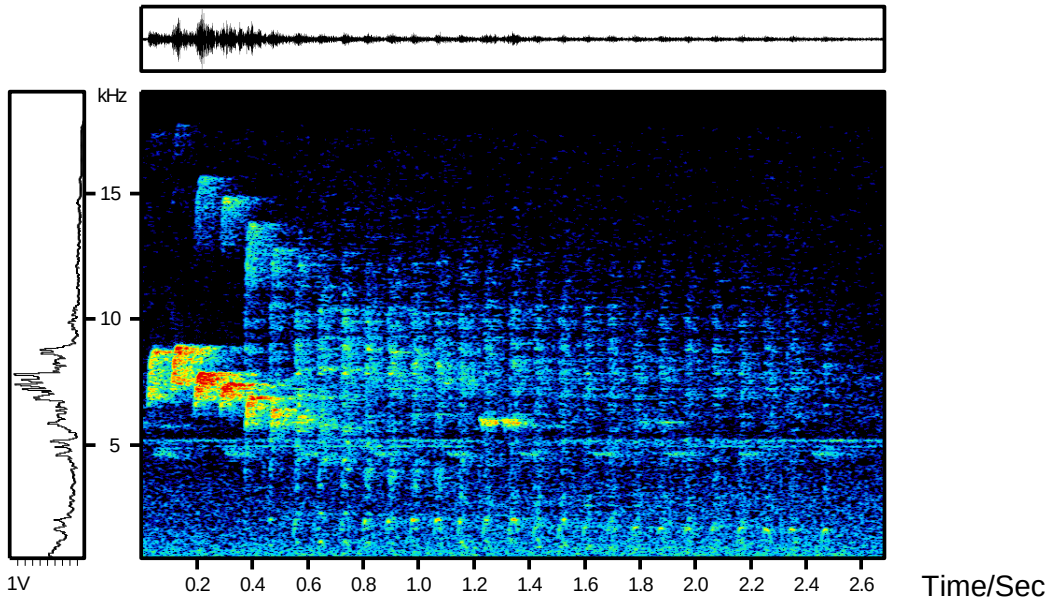


Figure 5. Sonogram showing the 'downward trill' alarm call of the Rondo galago.

4.5.2 Photographs

Photographs were taken of both the Rondo galago and the Central African large-spotted genet.

Photo 5 Rondo galago on the Noto Plateau.

Photo 6. Central African large-spotted genet.

4.6 Discussion

The most notable and important find was confirming the presence of the Rondo galago *G. rondoensis.* This galago is endemic to evergreen forest patches within the coastal forest of Tanzania and is a critically endangered species. This record extends the range of this taxa significantly. This galago appears to be at low densities. More systematic surveys should asses the abundance of the species on the pateau. The Rondo galago was detected in both survey sites indicating it may be present in suitable habitat in many parts of the Noto Plateau which can be defined as moist evergreen forest not dry coastal thicket or coastal woodland. It was not recorded around the Airtel tower. The results of this survey brings the number of sites in coastal Tanzania where the Rondo galago is found to 9 (Table 18.).

Table 18. Forests in which the Rondo galago has been recorded.

Site (from north to south)	Region	Date of last record	Habitat trend
Sadaani NP/Zareninge FR	Bagamoyo	1999	Stable
Pande GR	Pwani	2003	Uncertain/reducing
Pugu/Kazimzumbwe FR	Pwani	2002	Reducing
Ruawa FR	Lindi	2007	Uncertain/reducing
Noto proposed VFR	Lindi	2011	Stable
Chitoa FR	Lindi	2008	Stable
Litipo FR	Lindi	2007	Stable
Rondo FR	Lindi	2008	Stable
Ziwani FR	Mtwara	1995	Unknown
Newale site	Mtwara	1954	Cleared for agriculture

5) Birds

By Andrew Perkin

5.1 Literature review

Forest reserves in Lindi Rural District are known to be an important area for coastal forest birds. Rondo, Noto, Chitoa and Litipo contain populations of Spotted Ground Thrush (*Zoothera guttata*) (not known from Noto), East Coast Akalat (*Sheppardia gunningi*), Plain backed sunbird (*Anthreptes reichenowi*), white-chested Alethe *Alethe fuelleborni* (in Chitoa only, this is the only coastal forest population) and Southern-banded snake eagle (*Circaetus fasciolatus*). Other forest dependent species present in the landscape include African Broadbill *Smithornis capensis,* Little Greenbul *Andropadus virens* (only in Litipo), Tiny Greenbul (*Phyllastrephus debilis*), Yellow-streaked Greenbul (*P. flavostriatus*), The near endemic subspecies, the Rondo Green Barbet (*Stractolaema olivacea* spp. *hylophona*) is only present in Rondo and the Rondo Plateau is a breeding site for the East African population of Spotted Ground Thrush.

We found no published bird records from village land on the Noto or Chitoa Plateaux. Baker and Baker (2002) note that 'the Noto Plateau is perhaps the most important in the whole region that has not yet been visited by ornithologists and is suspected to contain important bird values.' Instead bird surveys have focused on the Chitoa and Litipo Forest Reserves on the edge of the Chitoa Plateau. These form part of the 'Lindi District Coastal Forest' Important Bird Area TZ 051 (IBA) (Baker and Baker 2001, Baker and Baker 2002). The IBA covers six forest reserves: Chitoa, Litipo, Ndimba, Nyangamara, Rondo and Ruawa. Other forests in Lindi District were not included due to a lack of data. The area is designated an important bird area due to the presence of four globally threatened species: Spotted ground thrush (Endangered), East Coast Akalat (Nearth Threatened) Southern Banded Snake Eagle (Near Threatened), and Plain-backed sunbird (Nearth Threatened). Mlingwa *et al.* 2000 list 44 forest dependent or forest associated species from the Chitoa and Litipo Forest Reserves and note that relative to its size, Litipo has high species richness when compared with other coastal forests.

5.2 Objectives

The objectives of the bird research conducted during this study were:

- To document the bird species present in the project area with a particular focus on coastal forest endemic and threatened species.

5.3 Methods

5.3.1 Observations

Observations were made by Andrew Perkin and some bird calls were recorded. See Section 4.3 for details of the recording equipment that was used.

5.4 Sampling intensity

Bird observations were made at the same time as the mammal surveys. See Section 3 for details.

5.5 Results

5.5.1 Overview of bird species in the project area

36 bird species from 24 families were recorded from the three survey sites of which three are considered near-threatened. These are listed in Table 19.

Table 19 List of bird species recorded.

Species	Common name	Author	Habitat	Range	Red list	Noto Site 1	Noto Site 2	Noto Site 3	Chitoa and Litipo*
ACCIPITRIDAE									
Circaetus fasciolatus	Southern banded snake-eagle	Kaup 1850	O	W	NT	1	1		1
Accipiter tachiro	African goshawk	(Daudin) 1800	F	W		1	1		1
Stephanoaetus coronatus	African crowned eagle	(Linnaeus) 1766	F	W		1	1		1
Hieraaetus ayresii	Ayres' hawk-eagle	Gurney, 1862	O	W					1
NUMIDIDAE									
Guttera pucherani	Crested guineafowl	(Hartlaub) 1861	FF	W		1	1		1
COLUMBIDAE									
Turtur tympanistria	Tambourine dove	(Temminck) 1809	F	W					1
PSITTACIDAE									
Poicephalus cryptoxanthus	Brown-headed parrot	(Peters) 1854	O	W					1
MUSOPHAGIDAE									
Tauraco livingstonii	Livingstone's turaco	(Gray, GR) 1864	F	W					1
CUCULIDAE									
Cercococcyx montanus	Barred long-tailed cuckoo	Chapin 1928	F	W					1
Ceuthmochares aereus	Yellowbill	(Vieillot) 1817	F	W					1
STRIGIDAE									
Strix woodfordii	African wood owl	(Smith, A) 1834	F	W		1	1		1
CAPRIMULGIDAE									
Caprimulgus pectoralis	Fiery-necked nightjar	Cuvier 1817	O	W		1	1		
APODIDAE									
Neafrapus boehmi	Bohm's spinetail	(Schalow) 1882	F	W				1	1
TROGONIDAE									
Apaloderma narina	Narina's trogon	(Stephens) 1815	F	W		1	1		1
MEROPIDAE									
Merops pusillus	Little bee-eater	Muller 1776	O	W				1	
Merops boehmi	Bohm's bee-eater	Reichenow, 1882						1	
BUCEROTIDAE									
Tockus alboterminatus	Crowned hornbill	(Buttikofer) 1889	F	W		1	1		
Bycanistes bucinator	Trumpeter hornbill	(Temminck) 1824	F	W		1	1		1
CAPITONIDAE									
Stactolaema olivacea	Green barbet	(Shelley) 1880	FF	W		1			
Pogoniulus bilineatus	Yellow-rumped tinkerbird	(Sundevall) 1850	F	W					1
Pogoniulus simplex	Eastern Green tinkerbird	(Fischer & Reichenow, 1884)	FF	W					1
INDICATORIDAE									
Indicator indicator	Greater honeyguide	(Sparrman) 1777	O	W			1		
PICIDAE									
Campethera abingoni	Golden-tailed woodpecker	(Smith) 1836	F	W		1	1	1	1
EURYLAIMIDAE									

Species	Common name	Author	Habitat	Range	Red list	Noto Site 1	Noto Site 2	Noto Site 3	Chitoa and Litipo*
Smithornis capensis	African broadbill	(Smith) 1840	F	W		1	1		1
HIRUNDINIDAE									
Psalidoprocne orientalis	Eastern roughwing	Reichenow 1889						1	
PYCNONOTIDAE									
Andropadus virens	Little greenbul	Cassin 1858	FF	W					1
Andropadus milanjensis	Striped-cheeked greenbul	(Shelley) 1894	F	W		1	1		
Phyllastrephus flavostriatus	Yellow-streaked greenbul	(Sharpe) 1876	FF	W		1	1		1
Phyllasterphus debilis	Tiny greenbul	(Sclater) 1899	FF	W					1
Phyllastrephus fischeri	Fischer's greenbul	(Reichenow) 1879	FF	W		1	1		1
Phyllastrephus terrestris	Terrestrial brownbul	Swainson, 1837	F	W					1
Nicator gularis	Eastern nicator	Hartlaub and Finsch 1870	F	W		1	1		1
TURDIDAE									
Erythropygia quadrivirgata	Eastern Bearded Scrub Robin	Reichenow, 1879				1	1		
Neocossyphus rufus	Red-tailed ant thrush	Fischer and Reichenow 1884	FF	W		1	1		1
Cossypha natalensis	Red-capped robin-chat		F	W					1
Alethe fuelleborni	White-chested alethe	Reichenow 1900	FF	W					1
SYLVIIDAE									
Apalis flavida	Yellow-breasted apalis	(Strickland) 1852	F	W		1	1		
Apalis melanocephala	Black-headed apalis	(Fischer and Reichenow) 1884	FF	W					1
MUSCICAPIDAE									
Sheppardia gunningi	East Coast akalat	Haagner, 1909	FF	CFE	NT	1	1		1
MONARCHIDAE									
Trochocercus albonotatus	White-tailed crested flycatcher	Sharpe 1891	FF	W					
Trochocercus cyanomelas	Blue-mantled flycatcher	(Vieillot) 1818	FF	W		1	1		1
Erythrocercus holochlorus	Little yellow flycatcher	Erlanger, 1901	FF	CFE			1		
Erythrocercus livingstonei	Livingstone's flycatcher	Gray, 1870	f			1	1		1
PLATYSTEIRIDAE									
Batis mixta	Forest batis	(Shelley) 1889	FF	CFN		1	1		1
NECTARINIIDAE									
Anthreptes neglectus	Uluguru violet-backed sunbird	Neumann, 1922	FF	W					1
Anthrepetes reichenowii	Plain-backed sunbird	Gunning, 1909	F	W	NT		1		1
Anthreptes collaris	Collared sunbird	(Vieillot, 1819)	F	W		1	1		1
Cyanomitra olivacea	Olive sunbird	(Smith, A) 1840	F	W		1	1		1
MALACONOTIDAE									
Telophorus quadricolor	Four-coloured Bush-shrike	(Cassin, 1851)	F	W					1
Prionops scopifrons	Chestnut-fronted helmet-shrike	(Peters, 1854)	O	W					1
Dryoscopus cubla	Black-backed puffback	(Shaw) 1809	F	W		1	1		1

Species	Common name	Author	Habitat	Range	Red list	Noto Site 1	Noto Site 2	Noto Site 3	Chitoa and Litipo*
DICRURIDAE									
Dicrurus ludwigii	Square-tailed drongo	(Smith) 1834	F	W		1	1		1
CORVIDAE									
Corvus albicollis	White-naped raven	Latham 1790	F	W				1	
STURNIDAE									
Lamprotornis corruscus	Black-bellied glossy-starling	Nordmann, 1835	F	W					1
PLOCEIDAE									
Ploceus bicolour	Forest weaver	Vieillot 1819	F	W		1	1		1
EMBERIZIDAE									
Hypargos niveoguttatus	Peter's twinspot	(Peters, W.) 1868	O	W					1
Mandingoa nitidula	Green-backed twinspot	(Hartlaub) 1865	FF	W					1
Total						**27**	**29**	**6**	**44**

* species listed in the final column 'Chitoa and Litipo' are records taken from Burgess 2000 for the contiguous Chitoa and Litipo Forest Reserves and are intended to indicate some species that may be present on the adjacent village land but were not recorded during the brief survey conducted by TFCG.

Key to Table 19

Red List (based on IUCN Red List 2011.2)
EN = Endangered, VU Vulnerable, LR/cd = Lower Risk/conservation dependent, DD = Data Deficient, LC = Least Concern, NT Near Threatened

Range
CF E – coastal forest endemic, CF N – coastal forest near endemic, W – widespread

Forest dependency
FF = Forest specialist, species that are typical of the forest interior and are likely to disappear when the forest is modified to any great extent,
F = Forest generalist, species that can occur in undisturbed forest but which are able to exist (and may even be more numerous) at the forest edge,
f = forest visitor, species that sometimes occur in forests but are more typical of other habitats especially moist woodlands and thickets.
O = non-forest species.

5.5.2 Sonograms of bird calls

Recordings were made of as many bird calls as possible. Some examples are shown graphically as sonograms. For example Figure 6 shows the call of the Forest batis, *Batis mixta*. This is considered by some to be a distinct species, *Batis reichenowi.* Here we follow the latest molecular work by Fjeldså et al (2009) which indicates this is just a subspecies of *B. mixta* however they stress the need for vocalization data. These sound recordings have been sent to other researchers to help futher resolve the taxonomy of this taxa which potentially represents an endemic species local to the Rondo/Noto/Chitoa landscape.

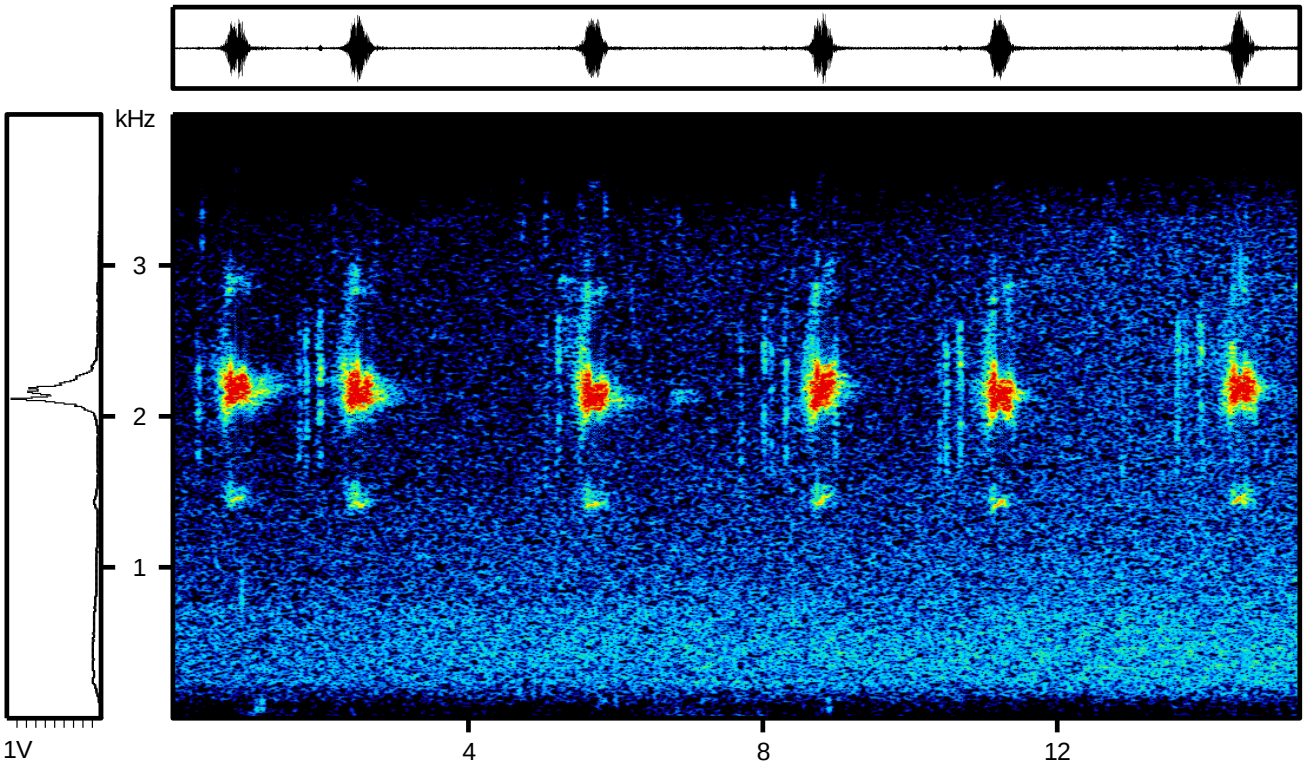


Figure 6. Sonogram of a Forest batis calling.

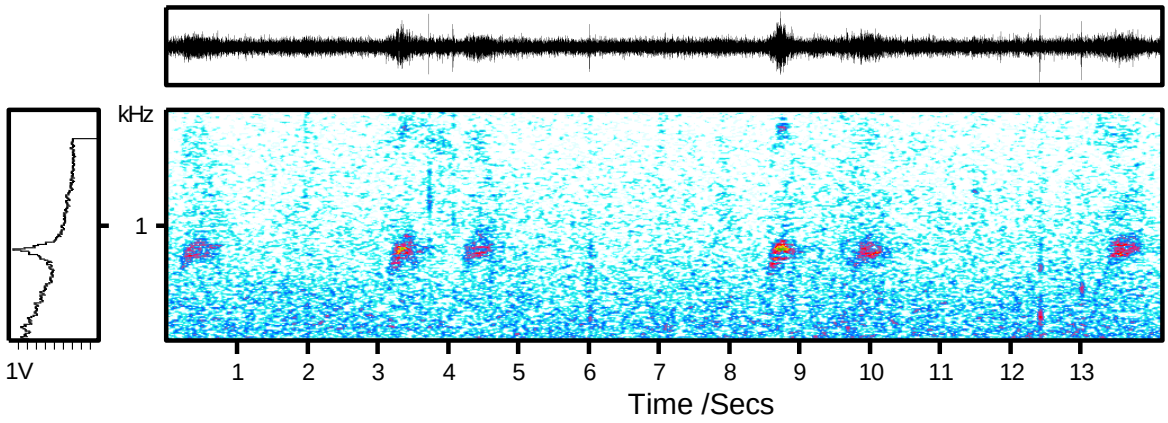


Figure 7. Sonogram of an unidentified crepuscular bird species.

An unidentified bird call that will be sent to ornithological experts for identification. This birds called at 18.30 and most resembles an owl or a nightjar species.

5.5.3 Threatened species found on the Noto plateau

Three species that are classified as near-threatened by IUCN were recorded.

Table 20. Threatened bird species recorded on the Noto Plateau.

Species	Status (IUCN 2011)
Southern banded snake eagle	Near threatened
East coast akalat	Near threatened
Plain backed sunbird	Near threatened

5.5.4 Coastal forest endemic and near endemic bird species

One coastal forest endemic species and two Coastal Forest near-endemic species were recorded during the survey (Table 21). In addition, the woodwardii race of Green barbet is found only in southern Tanzania and Mozambique (Mlingwa et al 2000).

Table 21. Coastal forest endemic and near-endemic bird species recorded on the Noto Plateau.

Species	Noto	Noto	Noto	Range

	Site 1	Site 2	Site 3	
Coastal Forest endemic				
Little Yellow flycatcher		1		Widespread north of the Rufiji (Mlingwa *et al* 2000)
Coastal Forest near- endemic				
East Coast akalat	1	1		Along the East African coast from Kenya to Mozambique with an outlying population in northern Malawi. The sub-species *S. g. sokokensis* that is found in southern Tanzania is restricted to a few coastal forest in Tanzania and Kenya.
Forest batis	1	1		Eastern Arc Mountains and coastal forest. The sub-species Reichenow's batis is endemic to the southern Tanzanian coastal forests.

5.5.5 Indigenous knowledge

A turaco species, probably Livingstone's turaco, is said to occur in the forests but was not recorded during the current survey. There are many local names for birds but ascribing them to particular species will take some time. There is active bird trapping occurring in the Noto forests, the surrounding area and on the Rondo plateau using glue. The sap of Tabernaemontana *Tabernamontana elegans* And Mvule *Milicia excelsa* is mixed and heated to make a glue which is placed on branches, especially on fig trees to catch birds.

5.6 Discussion

5.6.1 Species richness

The survey recorded 36 species. An additional 20 species are recorded as being present in the contiguous Litipo and Chitoa forests. Mlingwa *et al* 2000 note that the species richness for Litipo is above average. It is likely that the forests on village land are similarly rich in species. Additional surveys including mist netting are required to understand better the overall species richness of the area. Whilst these surveys focused on the coastal forest on the Noto plateau, additional species are likely to occur in the woodland areas. Surveys should also be carried out at different times of the year to determine the presence of migratory species such as the Spotted ground thrush and the African pitta.

5.6.2 Endemism

Of the four bird species considered to be endemic to the East African coastal forests, only one was recorded during the current surveys, the Little Yellow flycatcher. Mlingwa *et al.* 2000 also refer to *Batis reichenowi* as being a Coastal Forest endemic bird species however following genetic analysis, Fjeldsa et al 2006 found that 'The morphologically distinctive form reichenowi in south-eastern Tanzania is genetically nested within *B. mixta*, and for now we keep it as a subspecies of *B. mixta*.' And go on to state that 'The reichenowi population is best regarded as an aberrant and marginal isolate of the northern/coastal *B. mixta* populations, and therefore should be ranked as a subspecies until demonstrated otherwise.'

The distribution of *B. m. Reichenowi* is described by Fjeldsa et al 2006 as:

Distribution: recorded in several patches of coastal forest on the Rondo and Makonde Plateaus west of Mikindani in the Lindi district, and in the coastal forests of the Kilwa district, south-eastern Tanzania (Baker and Baker 2002). It may occur in other forest patches north towards the Rufiji River and presumably in the extensive forests of the plateau in north-eastern Mozambique, just south of the border.

5.6.3 Dependence on undisturbed forest

Ten of the species recorded from the Noto Plateau are classified as forest specialists. These species are vulnerable to forest disturbance and clearance. Mlingwa *et al*. 2000 list an additional seven forest specialist bird species from Chitoa and Litipo.

6) Conclusions

The coastal forests of Lindi are consistently identified as being a biodiversity conservation priority in global analyses of biologically important areas. They are part of the Coastal Forests of Eastern Africa biodiversity hotspot according to Conservation International's hotspot analysis (Mittermeier et al. 2004); they are within the Southern Zanzibar-Inhambane Coastal Forest Mosaic ecoregion according to the WWF Conservation Assessment of Terrestrial Ecoregions of Africa and Madagascar (Burgess et al. 2004). The contiguous forest reserves of Chitoa and Litipo form part of the Lindi Forests Important Bird Area Tz 051 (Baker and Baker, 2001; Baker and Baker, 2002).

The East African coastal forests are characterised as 'a chain of relict forest and thicket patches set within savannah woodlands, wetlands and increasing areas of farmland' (Mittermeier et al. 2004). Most coastal forests are small and fragmented. Most of the Tanzanian coastal forests are in the 15 – 50 km2 size class. The high levels of botanical and mammalian endemism are the main reason for the area to have been given such a high priority in global analyses. Mittermeier *et al*. recognise 1750 endemic plant species from the area; and 11 endemic mammal species.

Both Burgess *et al.* (2004) and Mittermeier et al. (2004) recognise that within the larger ecoregion / hotspot, the Lindi forests are of particular importance as centres of endemism. Much of the attention has focused in on Rondo Forest, a reserve 26 km to the south-west of the project area as this has the most single-site endemics of any of the coastal forests. This area has also received considerably more attention from scientists and fewer surveys have been made on the Noto and Chitoa plateaux with various authors highlighting the importance of conducting surveys in Noto, Chitoa and Likonde in order to document their importance (Prins and Clarke 2007; Burgess et al. 2004; Baker and Baker 2002).

The site may be considered a key biodiversity area on the basis of both vulnerability and irreplaceability.

Vulnerability

The forests contain populations of at least 19 threatened taxa including 1 Critically Endangered primate, 2 Critically Endagered plant and 5 Endangered plant species according to IUCN Red List criteria. Although not formally assessed using new IUCN Ecosystem Red List criteria, the rapid rates of deforestation in the East African Coastal Forests suggest that the East African Coastal Forests would classify for Vulnerable or Endangered status.

Irreplaceability

Within the study area there are 8 species that are found only in the Lindi Region forests including two species restricted to the Noto Plateau; 13 Coastal Forest endemic species and four species found in the Coastal Forests and in the Eastern Arc Mountains. This high number of restricted range species highlights the irreplaceability of thse forests.

Landscape values

The forests of the Noto-Chitoa plateau are an exceptional example of the Coastal Forests of Eastern Africa. Most remaining coastal forests in Tanzania are less than 50 km2. These plateau forests extend over 350 km2. The forests within the area are also part of a larger landscape that extends south west across the woodlands of the Mkangala Forest Reserve, woodlands on village land and towards the Rondo Plateau. In a study financed by UNDP the importance of maintaining ecological connectivity between these areas was highlighted (Perkin *et al.* 2008). Habitat corridors between these areas are still in place as evidenced by the substantial elephant migration across the landscape however the connectivity is threatened by habitat clearance, By conserving these plateau forests, an important part of that corridor will be protected.

Threats

The forests and their biodiversity are under pressure primarily from conversion to agricultural land. Habitat loss is the largest threat to the majority of the endemic and red-listed species found within the area. At current rates of deforestation it is likely that the populations of these species will decline towards local extinction or total extinction for those species such as *Homalium elegantulum* Sleumer and *Xylia schliebenii* Harms which are only known to occur in these village land forests.

Other threats include logging, fire and hunting. Two of the threatened species found in the landscape, the elephant and lion are primarily threatened by hunting and in the case of lions, poisoning. Working with the

communities to manage their forests more sustainably and providing communities with incentives to conserve the forests is critical to maintaining these biodiversity values. Through the REDD readiness activities supported by TFCG between 2009 to the present (June 2013), important steps have been taken to engage the adjacent communities in the sustainable management of the area and to generate incentives through REDD payments to maintain the village forest reserves.

7) Recommendations

The current study has highlighted both the need for additional research in the Lindi village forests as well as increased efforts to improve the management of the remaining forests. Recommendations for further research and conservation interventions are listed below.

7.1 Recommendations for further research

i. Conduct surveys of the reptile and amphibian fauna present in the Lindi village forests.

There are at least 24 reptile and 5 amphibian species that are endemic to the Coastal Forests of East Africa including four reptile and two amphibian species that are found in the nearby Rondo plateau and / or Litipo Forest Reserve (Broadley and Howell 2000, Poynton 2000). These include two species endemic to the Rondo Plateau: *Melanoseps rondoensis* and *Typhlops rondoensis*. Determining the herpetofauna of the Noto, Chitoa and Likonde plateaux is a research priority for the area.

ii. Conduct surveys in additional sites within the Lindi village forests to determine the extent of the Critically Endangered Rondo galago population.

Given the conservation concern around this Critically Endangered primate, it is important to determine the size of the population within the area and its extent. This would also help in management zoning of the plateau forests with a view to creating biodiversity zones in the area's where the Rondo galago is known to exist.

iii. Conduct more detailed botanical surveys in order to determine the size and extent of the populations of the threatened and restricted plant species.

More systematic botanical surveys would be useful to determine the distribution of high conservation value areas which could feed into conservation planning. In particular additional surveys are needed along the Likonde Plateau and in the northern Chitoa Plateau.

iv. Assess the mammal and bird fauna in additional sites across the plateau

Additional camera trapping and bird surveys would help to provide a clearer picture of the distribution of forest species across the plateau and would provide useful monitoring data for assessing changes in biodiversity values across the plateaux. In particular it would be useful to understand better the elephant migrations around the plateau.

v. Carry out more detailed work including collecting tissue samples for the giant sengi Given uncertainties regarding the taxonomic status of the giant sengis in southern Tanzania, it would be valuable to determine the phylogenetic distinctiveness of the Noto and Chitoa plateau populations. Further camera trapping might also help to validate the observations of the survey team's guides that there are different colour morphs living in the area.

vi. Conduct surveys of the butterfly fauna present in the Lindi Village forests.

There are at least 75 butterfly species that are endemic to the Coastal Forests of East Africa (Kielland 2000).

7.2 Recommendations on conservation interventions

i. **Establish and implement equitable and effective community based forest management for the forests:** the Forest Act 2002 allows for the establishment of village forest reserves. Establishing a village forest reserves involves the development of management and by-laws by the respective community thereby formalizing the management of the reserve.

ii. **Control hunting of forest mammals through awareness raising, community based forest management and coordination between stakeholders.**

iii. **Control illegal logging through community based forest management and awareness raising campaigns.**

iv. **Implement awareness raising campaigns on the values, threats and conservation needs of the Lindi Coastal Forests and strengthen environmental education in schools**

v. More effort is needed to raise awareness amongst the local populations regarding the values, threats and conservation needs of the Lindi coastal forests. Such awareness raising is also needed at the national level. Lindi District council, NGOs and the private sector should also strengthen support for environmental education in primary and secondary schools through training of teachers, provision of teaching materials and systematic monitoring of school's performance standards on environmental education.

vi. Support efforts to reduce local dependence on the unsustainable extraction of products from the forests particularly timber, poles and fuel wood.

vii. More effort is needed to provide local communities with sustainable alternatives to forest products, particularly timber, poles and fuel wood. Such initiatives should include tree planting and the promotion of fuel efficient stoves. Additional work is also needed to support livelihood initiatives that provide sustainable incomes from forest-related products and services such as honey and eco-tourism.

viii. Develop and implement a strategy to tackle human – wildlife conflicts

ix. The indigenous knowledge survey showed that local people are experiencing problems in preventing crop damage from wildlife. Awareness raising and training on how to resolve human – wildlife conflicts is needed to address this issue as well as ongoing support to communities from the District Wildlife Officer in order to prevent further conflict. The strategy should link with the District strategic plans in order to ensure sustainability.

x. Develop and implement a strategy to address invasive alien species

xi. Develop and implement a strategy to prevent and tackle forest fires

xii. Improved coordination of conservation activities in Lindi

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Appendices

Appendix 1. Globally threatened and near threatened plant taxa occurring in Lindi Region, Tanzania

Prepared by Roy Gereau, Missouri Botanical Garden

Geographical Scope: Lindi Region, i.e. Kilwa, Lindi Rural, Lindi Urban, Liwale, Nachingwea, and Ruangwa Districts.

Content: I went through the assessments from all six of our Eastern Africa Plant Red List Authority (EAPRLA) workshops and compiled the attached list of 156 plant taxa (species, subspecies, varieties) assessed in either threatened (VU, EN, CR) or near threatened (NT) categories with at least one occurrence in Lindi Region. For each taxon I give the full assessment (Red List category and criteria) and indicate the workshop at which it was evaluated. Note that in addition to the four categories (NT, VU, EN, CR), a special "flag", "PE" for "possibly extinct", is sometimes added to CR (19 taxa in this list); thus CR(PE) means "Critically Endangered, possibly extinct", i.e. there's good reason to suspect that the taxon is extinct, but a special search has not yet been conducted to confirm its extinction.

I compared this list with the current IUCN Red List database and highlighted in red the 56 taxa already included on the Red List. For each of these, if I have indicated just "IUCN" following the workshop at which it was evaluated (this is the case for 18 taxa), this means that the current assessment was performed at that workshop and accepted by IUCN; these assessments were all done using the current Red List Categories and Criteria version 3.1, published in 2001. If I have indicated "IUCN" plus some other categories and criteria [e.g. "IUCN: EN B1+2c (ver. 2.3)], this means that the taxon was previously evaluated using the former Categories and Criteria version 2.3, most of these in 1998, and that the new assessment from the workshop has probably been submitted to IUCN, but has not yet been processed and accepted for publication on the Red List.

AMARANTHACEAE

Cyathula braunii Gilg ex Schinz: CR D [1st workshop]
Psilotrichum vollesenii C.C. Towns.: EN B2ab(iii) [1st workshop]

ANNONACEAE

Artabotrys modestus Diels subsp. *modestus*: CR B1ab(ii,iii,v)+2ab(ii,iii,v) [1st workshop; IUCN]
Asteranthe lutea Vollesen: EN B2ab(iii) [3rd workshop; IUCN]
Mkilua fragrans Verdc.: VU B2ab(iii) [1st workshop; IUCN]
Monanthotaxis faulknerae Verdc.: EN B2ab(ii,iii,v) [1st workshop; IUCN]
Monanthotaxis trichantha (Diels) Verdc.: VU B2ab(ii,iii,v) [1st workshop; IUCN]
Monodora carolinae Couvreur: EN B1ab(iii)+2ab(iii) [3rd workshop; IUCN]
Monodora minor Engl. & Diels: NT [1st workshop; IUCN]
Polyalthia tanganyikensis Vollesen: EN B2ab(ii,iii,iv) [1st workshop; IUCN]
Uvaria decidua Diels: CR B2ab(iii) [3rd workshop; IUCN]
Uvaria faulknerae Verdc.: VU B2ab(ii,iii,v) [1st workshop; IUCN]
Uvaria lungonyana Vollesen: VU D1 [1st workshop; IUCN]
Uvariodendron gorgonis Verdc.: EN B2ab(iii) [1st workshop; IUCN]
Xylopia collina Diels: EN B2ab(iii) [1st workshop; IUCN]

APOCYNACEAE

Landolphia watsoniana Romburgh: VU B2ab(iii) [1st workshop]
Pleioceras orientale Vollesen: VU D2 [4th workshop]

ARACEAE

Gonatopus petiolulatus (Peter) Bogner: VU B2ab(iii) [1st workshop; IUCN]
Stylochaeton crassispathus Bogner: VU D2 [1st workshop; IUCN]
Stylochaeton euryphyllus Mildbr.: VU B2ab(iii) [1st workshop; IUCN]

ASTERACEAE
Blepharispermum brachycarpum Mattf.: EN B1ab(iii)+2ab(iii) [3rd workshop]
Sphaeranthus spathulatus Peter: NT [1st workshop]
Vernonia muelleri Wild subsp. *integra* C. Jeffrey: CR B1ab(iii) [1st workshop]

BIGNONIACEAE
Fernandoa lutea (Verdc.) Bidgood: CR B2ab(iii,v); D [2nd workshop; IUCN: EN B1+2bc (ver. 2.3)]

BORAGINACEAE
Cordia faulknerae Verdc.: NT [2nd workshop]
Cordia fissistyla Vollesen: VU D2 [2nd workshop]
Cordia trichocladophylla Verdc.: CR(PE) D [2nd workshop]
Ehretia glandulosissima Verdc.: CR(PE) B2ab(iii); D [2nd workshop; IUCN: EN B1+2c (ver. 2.3)]

BURSERACEAE
Commiphora fulvotomentosa Engl.: VU B2ab(i,ii,iii,iv) [4th workshop]
Commiphora madagascariensis Jacq.: NT [4th workshop]

BUXACEAE
Buxus obtusifolia (Mildbr.) Hutch.: VU B2ab(ii,iii,iv,v) [1st workshop; IUCN: VU B1+2b (ver. 2.3)]

CANELLACEAE
Warburgia ugandensis Sprague subsp. *longifolia* Verdc.: CR B2ab(iii,iv); C2a(i,ii); D [1st workshop; IUCN: VU B1+2d (ver. 2.3)]

CAPPARACEAE
Capparis viminea Hook. f. & Thomsen ex Oliv. var. *orthacantha* (Gilg-Ben.) DeWolf: CR B2ab(iii) [4th workshop]
Maerua acuminata Oliv.: EN B2ab(iii) [4th workshop; IUCN: DD (ver. 2.3)]
Maerua schliebenii Gilg-Ben.: EN B1ab(iii)+2ab(iii) [4th workshop]
Thilachium paradoxum Gilg: EN B1ab(iii)+2ab(iii) [4th workshop]

CELASTRACEAE
Pristimera graciliflora (Welw. ex Oliv.) N. Hallé subsp. *newalensis* (Blakelock) N. Hallé: VU B1ab(iii)+2ab(iii) [4th workshop]
Salacia orientalis N. Robson: EN B2ab(iii) [4th workshop]

CLUSIACEAE
Vismia pauciflora Milne-Redh.: EN B2ab(iii) [2nd workshop; IUCN: EN B1+2c (ver. 2.3)]

COMBRETACEAE
Combretum goetzei Engl. & Diels: NT [4th workshop]
Pteleopsis apetala Vollesen: EN B1ab(iii)+2ab(iii) [4th workshop]

CONNARACEAE
Vismianthus punctatus Mildbr.: VU B1ab(iii)+2ab(iii) [2nd workshop]

CONVOLVULACEAE
Ipomoea consimilis Schulze-Menz: CR(PE) B2ab(iii) [4th workshop]

Ipomoea flavivillosa Schulze-Menz: EN B2ab(i,ii,iii,iv,v) [6th workshop]
Ipomoea kilwaensis Pilg.: CR(PE) B2ab(iii) [4th workshop]
Ipomoea lapathifolia Hallier f. var. *bussei* (Pilg.) Verdc.: CR(PE) B2ab(iii) [4th workshop]
Ipomoea ticcopa Verdc.: EN B2ab(ii,iii) [4th workshop]
Stictocardia lutambensis (Schulze-Menz) Verdc.: EN B2ab(iii) [4th workshop]

CUCURBITACEAE
Momordica glabra A. Zimm.: EN B2ab(i,ii,iii,iv,v) [1st workshop]
Momordica henriquesii Cogn.: NT [1st workshop]
Peponium leucanthum (Gilg) Cogn.: VU B1ab(iii)+2ab(iii) [1st workshop]
Thladiantha africana C. Jeffrey: EN B2ab(iii) [4th workshop]

CYPERACEAE
Cyperus holstii Kük.: VU B2ab(iii) [5th workshop]
Fuirena microcarpa Lye: NT [5th workshop]

DICHAPETALACEAE
Dichapetalum braunii Engl. & K. Krause: EN B1ab(iii)+2ab(iii) [4th workshop]
Dichapetalum edule Engl.: NT [4th workshop]
Dichapetalum macrocarpum M. Krause: VU B1ab(iii)+2ab(iii) [4th workshop]

DIPTEROCARPACEAE
Monotes lutambensis Verdc.: CR(PE) B2ab(iii); D [2nd workshop; IUCN: EN B1+2c, C2b (ver. 2.3)]

EBENACEAE
Diospyros bussei Gürke: NT [2nd workshop]
Diospyros capricornuta F. White: EN B2ab(iii,v) [2nd workshop; IUCN: DD (ver. 2.3)]
Diospyros mafiensis F. White: NT [2nd workshop]
Diospyros magogoana F. White: CR(PE) D [2nd workshop; IUCN: EN B1+2bc (ver. 2.3)]
Diospyros shimbaensis F. White: VU B2ab(iii) [2nd workshop; IUCN: EN B1+2c (ver. 2.3)]

EUPHORBIACEAE
Acalypha bussei Hutch.: EN B2ab(iii) [4th workshop]
Acalypha gillmanii Radcl.-Sm.: EN B2ab(iii) [4th workshop]
Cleistanthus beentjei Q. Luke: EN B2ab(iii) [4th workshop]
Croton kilwae Radcl.-Sm.: VU B2ab(iii) [4th workshop]
Croton longipedicellatus J. Léonard subsp. *austrotanzanicus* Radcl.-Sm.: EN B2ab(iii) [4th workshop; IUCN: VU B1+2b (ver. 2.3)]
Croton megalocarpodes Friis & M.G. Gilbert: EN B2ab(iii) [4th workshop; IUCN: LR/NT (ver. 2.3)]
Drypetes sclerophylla Mildbr.: EN B2ab(iii) [4th workshop; IUCN: VU B1+2b (ver. 2.3)]
Meineckia grandiflora (Verdc.) Brunel ex Radcl.-Sm.: CR B2ab(iii) [2nd workshop]
Oldfieldia somalensis (Chiov.) Radcl.-Sm.: NT [4th workshop]
Omphalea mansfeldiana Mildbr.: EN B2ab(iii) [4th workshop]
Phyllanthus schliebenii Mansf. ex Radcl.-Sm.: CR(PE) B2ab(iii) ; D [2nd workshop]
Shirakiopsis trilocularis (Pax & K. Hoffm.) Esser: EN B2ab(iii) [4th workshop; IUCN: VU B1+2b (ver. 2.3, as *Sapium triloculare* Pax & K. Hoffm.]

FABACEAE
Acacia latistipulata Harms: VU B2ab(iii) [3rd workshop]
Acacia taylorii Brenan & Exell: EN B1ab(iii)+2ab(iii) [3rd workshop]
Aeschynomene nematopoda Harms: NT [5th workshop]
Baikiaea ghesquiereana J. Léonard: EN B1ab(iii)+2ab(iii) [3rd workshop; IUCN: EN B1+2c (ver. 2.3)]

Baphia kirkii Baker: VU B2ab(ii,iii,iv,v) [5th workshop; IUCN: VU B1+2b (ver. 2.3)]
Baphia macrocalyx Harms: VU B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v) [6th workshop; IUCN: VU B1+2b (ver. 2.3)]
Baphia punctulata Harms subsp. *punctulata*: EN B1ab(iii)+2ab(iii) [5th workshop; IUCN: VU B1+2b (ver. 2.3)]
Bauhinia loeseneriana Harms: EN B2ab(iii) [3rd workshop; IUCN: VU B1+2b, D2 (ver. 2.3)]
Berlinia orientalis Brenan: VU B1ab(iii)+2ab(iii) [3rd workshop; IUCN: VU B1+2b (ver. 2.3)]
Bussea eggelingii Verdc. : CR(PE) B2ab(iii) [3rd workshop; IUCN: EN B1+2c (ver. 2.3)]
Cynometra filifera Harms: EN B1ab(iii)+2ab(iii) [3rd workshop; IUCN: CR B1+2abcde (ver. 2.3)]
Cynometra gillmanii J. Léonard: EN B1ab(iii)+2ab(iii) [3rd workshop; IUCN: CR B1+2abcde, C2b (ver. 2.3)]
Cynometra greenwayi Brenan: VU B2ab(iii) [3rd workshop]
Cynometra suaheliensis (Taub.) Baker f.: NT [3rd workshop; IUCN: VU B1+2b (ver. 2.3)]
Cynometra webberi Baker f.: NT [3rd workshop; IUCN: VU B1+2b (ver. 2.3)]
Dalbergia acariiantha Harms: EN B2ab(iii) [5th workshop; IUCN: VU B1+2b (ver. 2.3)]
Erythrina sacleuxii Hua: NT [5th workshop; IUCN: VU B1+2b (ver. 2.3)]
Erythrina schliebenii Harms: CR D [5th workshop; IUCN: EX (ver. 2.3)]
Galactia argentifolia S. Moore: NT [5th workshop]
Gigasiphon macrosiphon (Harms) Brenan: CR D [6th workshop; IUCN: EN B1+abcde (ver. 2.3)]
Guibourtia schliebenii (Harms) J. Léonard: VU B2ab(iii) [6th workshop; IUCN: VU B1+2b (ver. 2.3)]
Indigofera concinna Baker: EN B2ab(iii) [5th workshop]
Indigofera fulgens Baker subsp. *fulgens*: VU B2ab(iii) [5th workshop]
Indigofera viscidissima Baker subsp. *orientalis* J.B. Gillett: NT [5th workshop]
Millettia eriocarpa Dunn: EN B1ab(iii)+2ab(iii) [5th workshop; IUCN: VU B1+2b (ver. 2.3)]
Millettia impressa Harms subsp. *goetzeana* (Harms) J.B.Gillett: VU B2ab(iii) [6th workshop]
Millettia makondensis Harms: VU B2ab(iii) [5th workshop]
Millettia micans Taub.: EN B2ab(iii) [6th workshop; IUCN: VU B1+2b (ver. 2.3)]
Millettia schliebenii Harms: EN B1ab(iii)+2ab(iii) [5th workshop; IUCN: VU B1+2b (ver. 2.3)]
Millettia semseii J.B. Gillett: VU B2ab(iii) [5th workshop; IUCN: VU B1+2b (ver. 2.3)]
Newtonia paucijuga (Harms) Brenan: NT [3rd workshop; IUCN: VU B1+2b (ver. 2.3)]
Ormocarpum schliebenii Harms: EN B2ab(iii) [5th workshop]
Platysepalum inopinatum Harms: EN B2ab(iii) [6th workshop]
Pseudoprosopis euryphylla Harms subsp. *euryphylla*: VU B1ab(iii)+2ab(iii) [3rd workshop]
Rhynchosia calobotrya Harms: CR(PE) B1ab(iii)+2ab(iii) [5th workshop]
Sesbania hirtistyla J.B. Gillett var. *hirtistyla*: VU B2ab(iii) [5th workshop]
Tessmannia martiniana Harms: EN B2ab(iii) [3rd workshop]
Xylia africana Harms: EN B2ab(iii) [3rd workshop]
Xylia schliebenii Harms: EN B1ab(iii)+2ab(iii) [3rd workshop]

FLACOURTIACEAE

Homalium elegantulum Sleumer: CR(PE) B2ab(iii) [3rd workshop]

HYDROPHYLLACEAE

Hydrolea sansibarica Gilg: VU B2ab(iii) [5th workshop]

LAMIACEAE

Clerodendrum lutambense Verdc.: CR D [2nd workshop]
Clerodendrum robustum Klotzsch var. *latilobum* Verdc.: VU D2 [2nd workshop]
Karomia gigas (Faden) Verdc.: CR D [2nd workshop; IUCN: CR B1+2abcde, D (ver. 2.3, as *Holmskioldia gigas* Faden)]

Leucas subarcuata Sebald: EN B1ab(iii)+2ab(iii) [5th workshop]
Orthosiphon hanningtonii (Baker) A.J. Paton: EN B2ab(iii) [5th workshop]
Orthosiphon scedastophyllus A.J. Paton: CR(PE) B2ab(iii) [5th workshop]
Orthosiphon schliebenii A.J. Paton: CR(PE) B2ab (iii) [5th workshop]

LINACEAE
Hugonia grandiflora N. Robson: EN B2ab(iii) [3rd workshop]

LOGANIACEAE
Mostuea microphylla Gilg: NT [3rd workshop]

LORANTHACEAE
Agelanthus longipes (Baker & Sprague) Polhill & Wiens: VU B2ab(iii) [6th workshop]
Agelanthus rondensis (Engl.) Polhill & Wiens: CR(PE) B2ab(iii) [6th workshop]
Englerina macilenta Polhill & Wiens: EN B2ab(iii) [6th workshop]
Erianthemum lindense (Sprague) Danser: VU B2ab(iii) [6th workshop]
Oncella curviramea (Engl.) Danser: VU B2ab(iii) [6th workshop]
Oncella schliebeniana Balle ex Polhill & Wiens: EN B1ab(iii)+2ab(iii) [6th workshop]

LYTHRACEAE
Nesaea aurita Koehne: EN B2ab(iii) [6th workshop]
Nesaea linearis Hiern: EN B2ab(iii) [6th workshop]
Nesaea maxima Koehne: EN B1ab(iii)+2ab(iii) [6th workshop]

MALPIGHIACEAE
Acridocarpus pauciglandulosus Launert: EN B2ab(iii) [6th workshop]
Triaspis schliebenii A. Ernst: CR(PE) B2ab(iii) [6th workshop]

MELASTOMATACEAE
Dissotis aprica Engl.: EN B1ab(iii)+2ab(iii) [6th workshop]

MELIACEAE
Pseudobersama mossambicensis (Sim) Verdc.: NT [6th workshop]

MENISPERMACEAE
Anisocycla blepharosepala Diels subsp. *tanzaniensis* Vollesen: VU B2ab(iii) [6th workshop]
Cissampelos nigrescens Diels var. *cardiophylla* Troupin: CR(PE) B2ab(iii) [6th workshop]

MONTINIACEAE
Grevea eggelingii Milne-Redh. var. *echinocarpa* Mendes: EN B2ab(iii) [6th workshop]
Grevea eggelingii Milne-Redh. var. *eggelingii*: NT [6th workshop]

MYRISTICACEAE
Cephalosphaera usambarensis (Warb.) Warb.: NT [3rd workshop; IUCN: VU B1+2b (ver. 2.3)]

OCHNACEAE
Gomphia lutambensis (Sleumer) Verdc.: EN B1ab(iii)+2ab(iii) [3rd workshop]
Ochna apetala Verdc.: VU B2ab(iii) [3rd workshop]
Ochna braunii Sleumer: CR B2ab(iii) [3rd workshop]
Ochna citrina Gilg: CR(PE) B2ab(iii) [3rd workshop]
Ochna pseudoprocera Sleumer: VU B1ab(iii)+2ab(iii) [3rd workshop]
Ochna schliebenii Sleumer: CR(PE) B2ab(iii) [3rd workshop]

OLACACEAE
Olax pentandra Sleumer: NT [3rd workshop]

PANDANACEAE

Pandanus rabaiensis Rendle: NT [3rd workshop; IUCN]

PLUMBAGINACEAE

Plumbago ciliata Engl. ex Wilmot-Dear: CR(PE) B2ab(iii) [3rd workshop]

POLYGONACEAE

Oxygonum subfastigiatum R.A. Graham: CR B2ab(iii) [3rd workshop]

RUBIACEAE

Coffea costatifructa Bridson: EN B2ab(iii) [3rd workshop; IUCN: VU D2 (ver. 2.3)]

Coffea schliebenii Bridson: EN B1ab(iii)+2ab(iii) [3rd workshop]

ZAMIACEAE

Encephalartos hildebrandtii A. Braun & Bouché: NT [2nd workshop; IUCN]

Appendix 2. Plant taxa endemic to the Lindi Landscape.

Family/Taxon	Habit	Locality	No.	Data source
Acanthaceae				
**Streptosiphon hirsutus* Mildbr.	Herb	Rondo, Lutamba	7	Frontier coll.; *Kew Bull.* **49**: 401-407; FTEA
Annonaceae				
Artabotrys modestus Diels subsp. *modestus*	Climber	Noto, Rondo	2	FTEA
Uvaria decidua Diels	Climber	Rondo, Mlinguru	3	FTEA; Voll. & Bid. 1992
Asclepiadaceae				
Ceropegia furcata Werderm.	Climber	Rondo	1	FTEA
Secamone clavistyla T. Harris & Goyder	Climber	Rondo	1	Voll. & Bid. 1992; FTEA
Asteraceae				
**Hystricophora macrophylla* Mattf.	Herb	Rondo	1	*Kew Bull.* **43**: 249; FTEA
Vernonia muelleri Wild subsp. *integra* C. Jeffrey	Herb	Rondo	3	FTEA
Bignoniaceae				
Fernandoa lutea (Verdc.) Bidgood	Tree	Rondo	4	*Kew Bull.* **49**: 383; FTEA
Boraginaceae				
Cordia trichocladophylla Verdc.	Shrub	Mlinguru	1	FTEA
Ehretia glandulosissima Verdc.	Small tree	Rondo	1	FTEA
Canellaceae				
Warburgia ugandensis Sprague subsp. *longifolia* Verdc.	Tree	Rondo	2	FTEA
Capparaceae				
Capparis viminea Hook.f. & Thomsen ex Oliv. var. *orthacantha* (Gilg-Ben.) DeWolf	Climber	Rondo, Litipo	6	FTEA
Convolvulaceae				
Ipomoea kilwaensis Pilg.	Climber	Kilwa-Ngerengere	1	FTEA
Ipomoea lapathifolia Hallier f. var. *bussei* (Pilg.) Verdc.	Climber	Singino Mt.	1	FTEA
Dipterocarpaceae				
Monotes lutambensis Verdc.	Tree	Lutamba	1	FTEA
Ebenaceae				
Diospyros magogoana F.White	Tree	Rondo	1	FTEA
Euphorbiaceae				
Phyllanthus schliebenii Mansf. ex A.R.-Sm.	Shrub	Lutamba	2	FTEA

Family/Taxon	Habit	Locality	No.	Data source
Fabaceae				
Bussea eggelingii Verdc.	Shrub, tree	Rondo	2	FTEA
Cynometra filifera Harms	Tree	Mlinguru, Lindi Creek & Mchinga	4	FTEA; Clarke 1995
Cynometra gillmanii J. Léonard	Tree	Mkoe, Namatimbili	2	FTEA
Erythrina schliebenii Harms	Tree	Lutamba, Namatimbili	4	FTEA
?Indigofera bussei J.B. Gillett	Herb	'Near Lindi'	1	FTEA
Rhynchosia calobotrya Harms	Herb	Lutamba	2	FTEA
Xylia schliebenii Harms	Tree	Noto, Simara-Kitunda, Ngarama North	3	FTEA
Flacourtiaceae				
Homalium elegantum Sleumer	Shrub	Noto	1	FTEA
Lamiaceae				
Verbenaceae				
Clerodendrum lutambense Verdc.	Herb	Lutamba	2	FTEA
Karomia gigas (Faden) Verdc.	Tree	Namatimbili (described from Kenya but extirpated there)	3	FTEA
Orthosiphon scedastophyllus A.J. Paton	Herb	Tendaguru	4	FTEA
Orthosiphon schliebenii A.J. Paton	Herb	Rondo	1	FTEA
Loranthaceae				
Agelanthus rondensis (Engl.) Polhill & Wiens	Parasite	Rondo	1	FTEA
Malphigiaceae				
Triaspis schliebenii A. Ernst	Climber	Lutamba, Chitoa	2	FTEA
Melastomaceae				
Cincinnobotrys pulchella (Brenan) Jacq.-Fél.	Herb	Rondo	2	Voll. & Bid. 1992; Notes; FTEA
Meliaceae				
Trichilia sp. nov. aff. *lovettii* Cheek det. K (= Clarke 55)	Tree	Chitoa	1	Vollesen, pers comm.
Menispermaceae				
Cissampelos nigrescens Diels var. *cardiophylla* Troupin	Climber	Lutamba, Mandawa	2	FTEA
Ochnaceae				

Family/Taxon	Habit	Locality	No.	Data source
Ochna braunii Sleumer	Shrub	Rondo, Rondo-Lutamba	3	FTEA
Ochna citrina Gilg	Subshrub	near Mtama	1	FTEA
Ochna pseudoprocera Sleumer	Shrub or tree	Malemba, Nakilala, Sudi	6	FTEA
Ochna schliebenii Sleumer	Shrub	Mlinguru	1	FTEA
Gomphia lutambensis (Sleumer) Verdc.	Shrub	Rondo, Noto	3	Voll. & Bid. 1992; FTEA
Plumbaginaceae				
Plumbago ciliata Wilmot-Dear	Herb	Rondo	1	*Kew Bull.* **31:** 848-849; FTEA
Polygonaceae				
Oxygonum subfastigiatum R.A. Graham	Herb	Orero to Kilwa Kivinje	1	FTEA
Rubiaceae				
Afrocanthium rondoense (Bridson) Lantz	Shrub	Rondo, Makangara	5	*Kew Bull.* **47**: 3; FTEA
Coffea schliebenii Bridson	Shrub	Rondo, Lutamba, Ruawa	4	*Kew Bull.* **49**: 331
Cuviera migeodii Verdc.	Shrub	Tendaguru	1	FTEA
Keetia sp. nov. det K (= Clarke 34)	Tree	Rondo	2	Vollesen, pers comm.
Oldenlandia patula Bremek.	Herb	Tendaguru	2	FTEA
Pavetta lindina Bremek.	Shrub	Rondo	2	FTEA
Pavetta schliebenii Bremek.	Shrub	Lutamba	2	FTEA
Pavetta diversipunctata Bridson	Shrub	Rondo	1	Voll. & Bid. 1992; *Kew Bull.* 56: 579-580.
Vangueria schliebenii (Verdc.) Lantz	Small tree	Lutamba	1	FTEA
Rutaceae				
Vepris schliebenii Mildbr.	Shrub	Mlinguru	1	FTEA
Sapotaceae				
Mimusops acutifolia Mildbr.	Shrub, tree	Rondo, Noto	2	FTEA
Tiliaceae				
Grewia meizophylla Burret	Tree	Lutamba, Rondo	2	FTEA
Vitaceae				
Cissus rondoensis Verdc.	Climber	Rondo	2	FTEA
Cyphostemma bidgoodiae Verdc.	Climber	Rondo	1	FTEA

***Abbreviations**: B. & al., Bidgood & al.; FTEA, Flora of Tropical East Africa; FZ, Flora Zambesiaca; No., Cited number of collections; Notes, collection notes; Voll. & Bid., Vollesen & Bidgood; *, genus endemic to the Lindi Landscape.*

Appendix 3. List of plant species recorded during the botanical survey in Lindi.

Genus	Species	Habit	Habitat	Kiwawa	Nandambi	Likonde	Noto West	Noto East / Lidoho	Kinyope	Rutamba ya Sasa	Specimen
ACANTHACEAE											
Elytraria	*sp*	H	W	1	1						S
Justicia	*scandens*	H	AG	1	1						S
Justicia	*sp*	H	W	1							S
Pseuderanthemum	*sp.*	L	F			1					S
Whitfieldia	*elongata*	S	F			1					S
ADIANTACEAE											
Vittaria	*sp*	FERN	F			1					S
AMARANTHACEAE											
Celosia	*sp*	T?	F				1				S
ANACARDIACEAE											
Anacardium	*occidentale (Exotic)*	T	F			1					O
Lannea	*schimperi*	T	W	1		1	1	1			O
Ozoroa	*obovata*	T	F			1	1				O
Sclerocarya	*birrea subsp caffra*	T	F	1		1	1	1			O
Sorindeia	*madagascariensis*	T	F			1					O
ANNONACEAE											
Annona	*senegalensis*	T	F				1				O
Lettowianthus	*stellatus*	T	F	1			1	1			O
Monanthotaxis	*sp*	T	F			1		1			S
Monodora	*sp*	T	F			1	1				S
Uvaria	*acuminata*	L	F			1	1	1			S
Uvaria	*sp*	T	F					1			S
Xylopia	*aethiopica*	T	F				1				O
Xylopia	*arenaria*	T	W	1							S
Xylopia	*sp*	T	F				1	1			S
ANTHERICAEAE											
Chlorophytum	*sp*	H	W	1			1				S
APOCYNACEAE											
Carlvahoa	*campanulata*	T	W	1			1	1			S
Dictyophleba	*lucida*	L	F				1	1			S
Dictyophleba	*sp*	L	W	1		1		1			S
Diplorrhyochus	*condylocapon*	T	W	1							O
Holarrhena	*pubescens*	T	F	1		1	1	1			S
Landlophia	*buchananii*	L	F					1			S
Rauvolfia	*mombasiana*	T	F				1	1			S
Tabernaemontana	*elegans*	T	F			1	1	1			S
ARACEAE											
Culcasia	*orientalis*	L	F			1					O
ARALIACEAE											
Cussonia	*arborea*	T	W	1							O
Cussonia	*zimmermannii*	T	F			1					O
ASCLEPIADACEAE											
Secamone	*sp*	C	W	1							S
ASPARAGACEAE											
Asparagus	*falcatus*	C	F			1	1	1			O
Asparagus	*setaceus*	C	W	1							S
Asparagus	*sp*	L	F			1					S

Genus	Species	Habit	Habitat	Kiwawa	Nandambi	Likonde	Noto West	Noto East / Lidoho	Kinyope	Rutamba ya Sasa	Specimen
ASPLENIACEAE											
Asplenium	*sp*	FERN	F			1					S
ASTERACEAE											
Brachylaena	*hutchinsii*	T	F			1	1				S
BEGONIACEAE											
Begonia	*oxyloba*	H	F			1					S
BIGNONIACEAE											
Kigelia	*africana*	T	F					1			O
Markhamia	*lutea*	T	F	1				1			O
Markhamia	*obtusifolia*	T	F	1		1	1	1			O
Stereospermum	*kunthianum*	T	W	1							O
BOMBACACEAE											
Adansonia	*digitata*	T	F					1			O
Bombax	*rhodognaphalon*	T	F			1	1	1			O
BORAGINACEAE											
Cordia	*sp*	T	W	1							S
BURSERACEAE											
Commiphora	*africana*	T	F	1				1			O
Commiphora	*sp*	T	F			1	1	1			S
Commiphora	*eminii subsp. zimmermannii*	T	F					1			S
FABACEAE* subfamily *CAESALPINIOIDEAE											
Afzelia	*quanzensis*	T	F	1		1	1	1			O
Bauhinia	*loeseneriana*	T	F					1			O
Bauhinia	*thonningii*	T	F	1				1			O
Brachystegia	*spiciformis*	T	W	1							O
Cynometra	*sp*	T	F			1					S
Dialium	*holtzii*	T	F			1	1	1			O
Erythrophleum	*suaveolens*	T	F		1		1	1			S
Hymenaea	*verrucosa*	T	F			1	1	1			O
Pterolobium	*stellatum*	L	F			1	1				O
Cassia	*abbreviata*	T	W	1							O
Tamarindus	*indica*	T	F	1		1	1	1			O
Bauhinia	*fassoglensis*	L	F					1			S
CAPPARACEAE											
Boscia	*mossambiscensis*	T	W	1							S
Cladostemon	*kirkii*	T	F				1	1			O
CELASTRACEAE											
Pristimera	*sp*	L	F					1			S
Hippocratea	*sp*	L	F			1	1				S
Salacia	*madagascariensis*	T	F			1		1			O
CLUSIACEAE											
Psorospermum	*febrifugum*	T	F				1				O
Vismia	*sp*	T	F					1			S
COMBRETACEAE											
Combretum	*collinum*	T	W	1							O
Combretum	*molle*	T	W	1			1				O
Combretum	*pentagonum*	L	W	1		1					S
Combretum	*schumannii*	T	F				1				O
Pteleopsis	*apetala (E)*	T	F				1				O

Genus	Species	Habit	Habitat	Kiwawa	Nandambi	Likonde	Noto West	Noto East / Lidoho	Kinyope	Rutamba ya Sasa	Specimen
Pteleopsis	*myrtifolia*	T	F	1				1			S
Terminalia	*sambesiaca*	T	F	1		1	1	1			O
Terminalia	*sericea*	T	W	1			1				O
COMMELINACEAE											
Aneilema	*sp*	H	W	1							S
Commelina	*sp*	H	W	1							S
CONVOLVULACEAE											
Bonamia	*mossambicensis*	L	F			1	1	1			O
Ipomoea	*sp*	L	ON FARMS		1				1		S
CONNARACEAE											
Rourea	*sp*	T	W	1							S
Rourea	*sp*	T	F	1			1	1			S
CUCURBITACEAE											
Coccinia	*sp*	C	W	1				1			S
Lagenaria	*sp*	C	F			1					S
Momordica	*sp*	C	W	1							S
Peponium	*leucanthum*	C	F					1			O
CYPERACEAE											
Cyperus	*involucratus*	Sedge	F					1			O
Cyperus	*sp*	Sedge	AG		1				1		S
Scleria	*sp*	Sedge	F			1					S
DICHAPETALACEAE											
Dichapetalum	*sp*	S	W	1			1	1			S
Dichapetalum	*braunii(E)*	L	F				1				O
DILLENIACEAE											
Tetracera	*boiviniana*	S	F			1					O
DIOSCORACEAE											
Dioscorea	*sp*	C	W	1		1	1				S
DRACAENACEAE											
Dracaena	*mannii*	T	F			1	1	1			O
EBENACEAE											
Diospyros	*mespiliformis*	T	F	1		1	1	1			O
Diospyros	*sp*	T	F			1					O
ERYTHROXYLACEAE											
Erythroxylum	*emarginatum*	T	F				1				S
EUPHORBIACEAE											
Acalypha	*neptunica*	S	F			1	1				S
Acalypha	*racemosa*	S	F			1	1	1			O
Acalypha	*sp*	S	W	1							S
Acalypha	*sp*	S	F				1				S
Acalypha	*sp*	S	F				1				S
Alchornea	*hirtella*	T	F			1		1			S
Antidesma	*membranaceum*	T	F			1					O
Antidesma	*venosum*	T	F	1		1	1	1			S
Bridelia	*cathartica*	T	W	1							O
Dalechampia	*scandens*	C	F			1					S
Drypetes	*sp*	T	F			1					O
Erythrococca	*sp*	S	W	1		1	1				S
Flueggea	*virosa*	S	F	1		1	1				S
Margaritaria	*discoidea*	T	F	1		1	1	1			O

Genus	Species	Habit	Habitat	Kiwawa	Nandambi	Likonde	Noto West	Noto East / Lidoho	Kinyope	Rutamba ya Sasa	Specimen
Phyllanthus	*muellerianus*	T	F				1				S
Phyllanthus	*sp*	H	W	1							S
Pseudolachnostylis	*maprouneifolia*	T	W	1							O
Ricinodendron	*heudelotii*	T	F			1	1				O
Shirakiopsis	*sp*	T	F				1				S
Shirakiopsis	*trilocularis*	T	F			1					S
Suregada	*sp*	T	F					1			S
Suregada	*zanzibariensis*	T	F			1					O
Synadenium	*sp*	T	F			1					O
Tragia	*sp*	C	W	1							S
ZYGOPHYLLACEAE											
Tribulus	*sp*	H	AG						1		S
FLACOURTIACEAE											
Caloncoba	*welwitschii*	T	F			1	1	1			S
Flacourtia	*indica*	T	F			1	1				O
Grandidiera	*boivinii*	T	F			1					S
Oncoba	*spinosa*	T	F			1					S
Xylotheca	*tettensis*	S	F	1		1	1	1			O
HUGONIACEAE											
Hugonia	*castaneifolia*	L	F	1			1				O
HYMENOCARDIACEAE											
Hymenocardia	*ulmoides*	T	F			1	1	1			S
ICACINACEAE											
Iodes	*sp*	L	W	1		1					S
Leptaulus	*holstii*	T	F				1				S
IRIDACEAE											
Gladiolus	*sp*	H	F				1				S
LAMIACEAE											
Ocimum	*sp*	H	W	1							O
Hoslundia	*opposita*	S	W	1		1	1	1			O
Hyptis	*suaveolens*	H	AG						1		S
Plectranthus	*sp*	H	F			1					S
Rotheca	*myricoides*	S	F	1			1				S
Vitex	*buchananii*	T	W	1							O
Vitex	*ferruginea*	L	W	1		1	1				S
Vitex	*sp*	T	W	1							O
FABACEAE subfamily FABOIDEAE											
Baphia	*sp*	T	F			1					S
LOGANIACEAE											
Mostuea	*brunonis?*	S	W	1							S
Mostuea	*sp*	S	F					1			S
Strychnos	*innocua*	T	W	1		1	1				O
Strychnos	*madagascariensis*	T	F	1				1			O
Strychnos	*sp*	T	F					1			S
LORANTHACEAE											
Agelanthus	*sp*	Parasite	W	1							S
MALVACEAE											
Gossypium	*sp*	L	F			1	1	1			S
Thespesia	*garckeana*	T	F	1				1			S
MELASTOMATACEAE											

Genus	Species	Habit	Habitat	Kiwawa	Nandambi	Likonde	Noto West	Noto East / Lidoho	Kinyope	Rutamba ya Sasa	Specimen
Cincinnobotrys	*pulchella(E)*	H	F			1					S
Dissotis	*sp*	T	F			1					S
Memecylon	*sp*	T	F			1		1			S
MELIACEAE											
Trichilia	*emetica*	T	F				1				O
Turraea	*sp*	T	F			1					S
MENISPERMACEAE											
Cissampelos	*sp*	L	W	1							S
FABACEAE* subfamily *MIMOSOIDEAE											
Acacia	*polyacantha*	T	F			1		1			O
Acacia	*seyal*	T	W	1							O
Acacia	*sp*	T	W	1							O
Albizia	*petersiana*	T	F	1				1			O
Albizia	*schimperiana*	T	F					1			O
Albizia	*versicolor*	T	F	1			1	1			O
Dichrostachys	*cinerea*	T	F	1		1		1			O
Entada	*rheedei*	L	F			1					O
Entada	*sp*	L	AG		1						S
Tetrapleura	*tetraptera*	T	F	1				1			O
MORACEAE											
Dorstenia	*sp*	H	W	1							S
Ficus	*exasperata*	T	F					1			O
Ficus	*sycomorus*	T	F			1		1			S
Maclura	*africana*	L	FW	1				1			SO
Milicia	*excelsa*	T	F	1		1	1	1			O
Bosqueiopsis	*gilletii*	T	W	1							S
MYRTACEAE											
Syzygium	*cuminii*	T	F					1			O
OCHNACEAE											
Ochna	*afzelii*	T	F				1				O
Ochna	*sp*	T	F					1			S
OLACACEAE											
Ximenia	*caffra*	T	W	1							O
OLEACEAE											
Schrebera	*trichoclada*	T	F				1				O
ORCHIDACEAE											
Eulophia	*sp*	H	F			1					S
FABACEAE subfamily FABOIDEAE											
Abrus	*precatorius*	C	W	1		1					O
Crotalaria	*sp*	S	F				1				S
Crotalaria	*sp*	S	F			1					S
Dalbergia	*melanoxylon*	T	W	1			1				O
Dalbergia	*sp*	L	F			1	1				S
Indigofera	*sp*	S	F			1	1	1			S
Millettia	*stuhlmanniii*	T	W	1		1					S
Millettia	*usaramensis*	T	F			1	1	1			O
Mucuna	*gigantea*	C	AG		1						S
Pterocarpus	*angolensis*	T	W	1			1				O
Pterocarpus	*tinctorius*	T	F					1			O

Genus	Species	Habit	Habitat	Kiwawa	Nandambi	Likonde	Noto West	Noto East / Lidoho	Kinyope	Rutamba ya Sasa	Specimen
Tephrosia	*interrupta*	S	F					1			S
PASSIFLORACEAE											
Adenia	*gummifera*	L	F			1					O
POACEAE											
Bambusa	*sp*	G	F			1					O
Panicum	*sp*	G	AG		1		1		1	1	S
Panicum	*trichocladum*	G	F			1					S
Imperata	*cylindrica*	G	AG							1	S
POLYGALACEAE											
Polygala	*sp*	H	AG		1						S
Securidaca	*longependunculata*	T	F				1				O
RHIZOPHORACEAE											
Cassipourea	*gummiflua*	T	F			1	1				S
RUBIACEAE											
Pyrostria	*bibracteata*	T	F	1		1		1			S
Canthium	*sp*	T	F				1				S
Catunaregam	*spinosa*	T	F			1	1				S
Chassalia	*sp*	S	F			1					S
Chassalia	*umbraticola*	S	F	1		1	1	1			S
Chazaliella	*abrupta*	T	W	1			1	1			S
Chazaliella	*sp*	T	F				1				S
Coffea	*sp*	T	F			1					S
Crossopteryx	*febrifuga*	T	W	1							O
Heinsia	*bussei(E)*	S	W	1		1	1	1			S
Leptactina	*papyrophloea*	T	W	1							O
Leptactina	*platyphylla*	T	F				1	1			S
Multidentia	*crassa*	T	W	1		1	1				O
Oxyanthus	*sp*	T	F			1	1	1			S
Pavetta	*sp*	T	W	1			1				S
Rhodopentas	*bussei*	S	F			1					S
Pentas	*sp*	S	W	1							S
Pentodon	*sp*	H	AG							1	S
Polysphaeria	*sp*	T	F				1				S
Polysphaeria	*parviflora*	T	F					1			O
Psychotria	*lauracea*	T	W	1							S
Rothmannia	*sp*	T	W	1							S
Rytigynia	*sp*	T	W	1		1	1				S
Spermacoce	*sp*	H	W	1							S
Tricalysia	*sp*	T	F				1				S
Vangueria	*infausta*	T	F			1					S
RUTACEAE											
Clausena	*anisata*	T	F					1			O
Harrisonia	*abyssinica*	T	F			1	1				O
Zanthoxylum	*chalybeum*	T	F			1	1	1			O
Zanthoxylum	*holtzianum*	T	F				1				S
SAPINDACEAE											
Allophylus	*pervillei*	T	F			1	1				S
Allophylus	*sp*	T	W	1			1				S
Blighia	*unijugata*	T	F			1	1				O
Deinbollia	*borbonica*	T	W	1			1				O
Sapindus	*sp*	T	F					1			S

Genus	Species	Habit	Habitat	Kiwawa	Nandambi	Likonde	Noto West	Noto East / Lidoho	Kinyope	Rutamba ya Sasa	Specimen
SAPOTACEAE											
Manilkara	*mochisia*	C	F			1					S
Manilkara	*sulcata*	T	F			1					O
Mimosops	*acutifolia (E)*	T	F			1					S
Mimosops	*sp*	T	W	1							S
Pouteria	*sp*	T	F			1					O
SOLANACEAE											
Solanum	*sp*	S	F				1				S
STERCULIACEAE											
Cola	*sp*	T	F					1			O
Cola	*sp*	T	F			1		1			S
Dombeya	*kirkii*	T	F				1				O
Dombeya	*mupangae*	T	F			1		1			O
Sterculia	*appendiculata*	T	F					1			O
Sterculia	*quinqueloba*	T	F	1			1				O
Waltheria	*sp*	H	F		1			1			S
TILIACEAE											
Carpodiptera	*africana*	T	F			1	1	1			O
Grewia	*bicolor*	T	W	1							O
Grewia	*conocarpa*	T	F			1	1	1			O
Grewia	*forbesii*	L	F			1		1			O
Grewia	*sp*	T	F				1	1			S
ULMACEAE											
Trema	*orientalis*	T	F			1	1	1			O
APIACEAE											
Steganotaenia	*araliacea*	T	F	1		1		1			O
VERBENACEAE											
Lippia	*javanica*	S	F			1					O
VIOLACEAE											
Rinorea	*ferruginea*	T	F			1					O
Rinorea	*ilicifolia*	T	F			1	1				O
Rinorea	*sp*	T	W	1		1	1				S
VITACEAE											
Cyphostemma	*sp*	C	W	1							S
Rhoicissus	*sp*	C	F			1					S
Rhoicissus	*tridentata*	C	F			1					S
ZINGIBERACEAE											
Aframomum	*sp*	H	F			1					S

Appendix 4. List of all specimens and observations from the TFCG botanical surveys in Lindi in February 2011.

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*COMBRETACEAE*	*Pteleopsis*	*apetala (E)*	T	F	NOTO WEST	054330/8903559	367M
R	*FLACOURTIACEAE*	*Xylotheca*	*tettensis*	S	F	NOTO WEST	054330/8903559	368M
R	*BIGNONIACEAE*	*Markhania*	*obtusifolia*	T	F	NOTO WEST	054330/8903559	369M
R	*CAESALPINIACEAE*	*Afzelia*	*quanzensis*	T	F	NOTO WEST	054330/8903559	370M
R	*PAPILIONACEAE*	*Pterocarpus*	*angolensis*	T	F	NOTO WEST	054330/8903559	371M
R	*HYMENOCARDIACEAE*	*Hymenocardia*	*ulmoides*	T	F	NOTO WEST	054330/8903559	372M
R	*TILIACEAE*	*Grewia*	*conocarpa*	T	F	NOTO WEST	0543334/8903579	367M
R	*LOGANIACEAE*	*Strychnos*	*innocua*	T	F	NOTO WEST	0543355/8903592	367M
R	*DICHAPETALACEAE*	*Dichapetalum*	*brownii (E)*	L	F	NOTO WEST	0543358/8903599	367M
R	*POLYGALACEAE*	*Securidaca*	*longipendunculata*	T	F	NOTO WEST	0543382/8903611	369M
R	*MIMOSACEAE*	*Albizia*	*petersiana*	T	F	NOTO WEST	0543403/8903627	372M
R	*TILIACEAE*	*Capordiptera*	*africana*	T	F	NOTO WEST	0543411/9803632	373M
R	*MORACEAE*	*Milicia*	*excelsa*	T	F	NOTO WEST	0543420/8903666	377M
R	*OLEACEAE*	*Scherebera*	*trichocladum*	T	F	NOTO WEST	0543420/8903667	378M
R	*COMBRETACEAE*	*Terminalia*	*sericeae*	T	F	NOTO WEST	0543448/8903654	379M
R	*RUBIACEAE*	*Heinsia*	*bussei(E)*	S	F	NOTO WEST	0543479/8903615	385M
R	*PAPILIONACEAE*	*Dalbergia*	*melenoxylon*	T	F	NOTO WEST	0543550/8903713	393M
R	*APOCYNACEAE*	*Tabernaemontana*	*elegans*	T	F	NOTO WEST	0543662/8903776	402M
R	*ANACARDIACEAE*	*Ozoroa*	*obovata*	T	F	NOTO WEST	0543586/8903789	402M
R	*STERCULIACEAE*	*Sterculia*	*quingiloba*	T	F	NOTO WEST	0543586/8903790	420M
R	*RUTACEAE*	*Zanthoxylum*	*chalybeum*	T	F	NOTO WEST	0543586/8903791	424M
R	*EBENACEAE*	*Diospyros*	*mespiliformis*	T	F	NOTO WEST	0543586/8903789	402M
R	*COMBRETACEAE*	*Combretum*	*molle*	T	F	NOTO WEST	0543586/8903789	402M
R	*PAPILIONACEAE*	*Milletia*	*usaramensis*	T	F	NOTO WEST	0543714/8903970	420M
R	*EUPHORBIACEAE*	*Antidesma*	*venosum*	T	F	NOTO WEST	0543734/8904051	424M
R	*CLUSIACEAE*	*Psorospermum*	*febrifuga*	T	F	NOTO WEST	0543750/9804136	426M
R	*FLACOURTIACEAE*	*Calancoba*	*welwitschii*	T	F	NOTO WEST	0543750/9804136	426M
R	*HUGONIACEAE*	*Hugonia*	*castaneifolia*	L	F	NOTO WEST	0543772/8904293	438M
R	*CONVULVULACEAE*	*Bonamia*	*mossambiscensis*	L	F	NOTO WEST	0543772/8904293	438M
R	*CAESALPINIACEAE*	*Hymenaea*	*verrucosa*	T	F	NOTO WEST	0543813/8904407	443M
R	*CAESALPINIACEAE*	*Tamarindus*	*indica*	T	F	NOTO WEST	0543910/8904575	459M
R	*MIMOSACEAE*	*Albizia*	*vescolar*	T	F	NOTO WEST	0543941/8904649	468M
R	*SAPINDACEAE*	*Blighia*	*unijugata*	T	F	NOTO WEST	0543944/8904665	470M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*EUPHORBIACEAE*	*Margaritaria*	*discoidea*	T	F	NOTO WEST	0543954/8904674	471M
R	*CAESALPINIACEAE*	*Bauhinia*	*loeseneriana (E)*	T	F	NOTO WEST		
R	*ALARIACEAE*	*Cussonia*	*zimmermanii*	T	F	NOTO WEST	0543969/8904728	474M
R	*RUBIACEAE*	*Multidentia*	*crassa*	T	F	NOTO WEST	0543970/8904725	474M
R	*ANNONACEAE*	*Annona*	*senegalensis*	T	F	NOTO WEST	0543971/3904727	474M
R	*EUPHORBIACEAE*	*Acalypha*	*racemosa*	S	F	NOTO WEST	0544029/8904314	476M
R	*SAPINDACEAE*	*Deinbolia*	*borbonica*	T	F	NOTO WEST	0544236/8904976	493M
R	*APOCYNACEAE*	*Holarrhena*	*pubescens*	T	F	NOTO WEST	0544297/8905031	499M
R	*STERCULIACEAE*	*Dombeya*	*kirkii*	T	F	NOTO WEST	0544482/8905156	513M
R	*FLACOURTIACEAE*	*Flacourtia*	*indica*	T	F	NOTO WEST	0544491/8905158	514M
R	*BOMBACACEAE*	*Bombax*	*rhodognophalon*	T	F	NOTO WEST	0545894/8905351	520M
R	*MALVACEAE*	*Cossypiun*	*sp*	L	F	NOTO WEST	0545474/8905776	520M
R	*ULMACEAE*	*Trema*	*orientalis*	T	F	NOTO WEST	0545493/8905791	521M
R	*EUPHORBIACEAE*	*Fluggea*	*virosa*	S	F	NOTO WEST	0545515/8905798	518M
R	*VERBENACEAE*	*Vitex*	*ferrugirea*	L	F	NOTO WEST	0545572/8905558	519M
R	*OCHNACEAE*	*Ochna*	*afzelii*	T	F	NOTO WEST	0545579/8905861	520M
R	*ANNONACEAE*	*Lettowianthus*	*stellatus*	T	F	NOTO WEST	0545673/8905444	518M
R	*LAMIACEAE*	*Hoslundia*	*opposita*	S	F	NOTO WEST	0545749/8906000	516M
R	*EUPHORBIACEAE*	*Ricinodendrum*	*heudelotii*	T	F	NOTO WEST	0545787/8906031	519M
R	*RUTACEAE*	*Zanthoxyllum*	*holtzianum*	T	F	NOTO WEST	0545789/8906033	519M
R	CAESALPINIACEAE	*Erythrophloem*	*suaveolens*	T	F	NOTO WEST	0545910/8906103	516M
R	MELIACEAE	*Trichilia*	*emetica*	T	F	NOTO WEST	0546239/8905968	514M
R	DRACAENACEAE	*Dracaena*	*mannii*	T	F	NOTO WEST	0546536/8905913	518M
R	ANACARDIACEAE	*Sclerocarya*	*birrea subsp cattra*	T	F	NOTO WEST	0546606/8905912	514M
R	COMBRETACEAE	*Terminalia*	*sambesiaca*	T	F	NOTO WEST	0546749/8905966	522M
R	*RUTACEAE*	*Harrissonia*	*abyssinica*	T	F	NOTO WEST	0546749/8905966	522M
R	ANNONACEAE	*Xylopia*	*aethiopicum*	T	F	NOTO WEST	0547114/8906096	516M
R	ARALIACEAE	*Steganotaemia*	*lauraceae*	T	F	NOTO WEST	0547260/8906405	515M
R	*APOCYNACEAE*	*Holarrhena*	*pubescens*	T	F	NOTO WEST	0547710/8906784	510M
R	*ASPARAGACEAE*	*Asparagus*	*falcatus*	L	F	NOTO WEST	0547989/8906926	499M
R	*ANACARDIACEAE*	*Lannea*	*stuhlmanniii*	T	F	NOTO WEST	0548254/8906874	499M
R	*VIOLACEAE*	*Rinorea*	*iliicifolia*	T	F	NOTO WEST	0548383/8906882	497M
R	*RAIZOPHORACEAE*	*Cassipourea*	*gummiflua*	T	F	NOTO WEST	0548404/8906844	499M
R	*CAESALPINIACEAE*	*Dialium*	*holtzii*	T	F	NOTO WEST	0548472/8906940	504M
R	*COMBRETACEAE*	*Combretum*	*schummanii*	T	F	NOTO WEST	0547880/8906882	501M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*SAPINDACEAE*	*Allophylus*	*parvillei*	T	F	NOTO WEST	0547654/8906721	499M
7234	*RUBIACEAE*	*Leptactina*	*platyphylla*	T	F	NOTO WEST	0543298/8903555	368M
7235	*EUPHORBIACEAE*	*Sloetiopsis*	*sp*	T	F	NOTO WEST	0543298/8903555	368M
7236	*ANNONACEAE*	*Uvaria*	*acuminata*	T	F	NOTO WEST	0543318/8903570	367M
7237	*MIMUSACEAE*	*Pterolobium*	*sp*	L	F	NOTO WEST	0543318/8903570	367M
7238	*DICHAPETALACEAE*	*Dichapetalam*	*sp*	L	F	NOTO WEST	0543318/8903570	367M
7239	*CAPPARIDACEAE*	*Cladostermon*	*kirkii*	T	F	NOTO WEST	0543428/8903664	376M
7240	*RUBIACEAE*	*?*	*?*	S	F	NOTO WEST	0543428/8903664	376M
7241	*RUBIACEAE*	*?*	*?*	L	F	NOTO WEST	0543428/8903664	376M
7242	*RUBIACEAE*	*Chassalia*	*umbraticola*	S	F	NOTO WEST	0543428/8903664	376M
7243	*RUBIACEAE*	*Chazalliera*	*abrupta*	S	F	NOTO WEST	0543428/8903664	376M
7244	*CONNARACEAE*	*Rourea*	*sp*	T	F	NOTO WEST	0543669/8903847	409M
7245	*ANNONACEAE*	*Monodora*	*sp*	T	F	NOTO WEST	0543669/8903847	409M
7246	*RUBIACEAE*	*Oxyanthus*	*lepidus*	T	F	NOTO WEST	0543669/8903847	409M
7247	*PAPILIONACEAE*	*Indigofera*	*sp*	S	F	NOTO WEST	0543669/8903847	409M
7248	*EUPHORBIACEAE*	*Acalypha*	*neptunica*	S	F	NOTO WEST	0543753/8904190	433M
7249	*IRIDACEAE*	*Gladiolus*	*sp*	H	F	NOTO WEST	0543753/8904190	433M
7250	*PAPILIONACEAE*	*Clotalaria*	*sp*	S	F	NOTO WEST	0543753/8904190	433M
7251	*SAPINDACEAE*	*Allophylus*	*sp*	T	F	NOTO WEST	0543813/8904413	445M
7252	*VIOLACEAE*	*Rinorea*	*sp*	S	F	NOTO WEST	0543813/8904413	445M
7253	*APOCYNACEAE*	*Carvalhoa*	*campanulata*	S	F	NOTO WEST	0543813/8904413	445M
7254	*CELASTRACEAE*	*Hippocratea/pristimela sp*		L	F	NOTO WEST	0543813/8904413	445M
7255	*RUBIACEAE*	*Rytigynia*	*sp*	T	F	NOTO WEST	0543813/8904413	445M
7256	*RUBIACEAE*	*Rytigynia*	*sp*	T	F	NOTO WEST	0544135/8904890	485M
7257	*RUBIACEAE*	*Rytigynia*	*sp*	T	F	NOTO WEST	0544135/8904890	485M
7258	*EUPHORBIACEAE*	*Erythrococca*	*sp*	S	F	NOTO WEST	0544135/8904890	485M
7259	*APOCYNACEAE*	*Rauvolfia*	*mombasiana*	T	F	NOTO WEST	0544135/8904890	485M
7260	*RUBIACEAE*	*Catunaregan*	*spinosa*	T	F	NOTO WEST	0544135/8904890	485M
7261	*APOCYNACEAE*	*Dictyophleba*	*acida*	L	F	NOTO WEST	0545586/8905867	519M
7262	*?*	*?*	*?*	FERN	F	NOTO WEST	0545586/8905867	519M
7263	*EUPHORBIACEAE*	*?*	*?*	T	F	NOTO WEST	0545586/8905867	519M
7264	*RUBIACEAE*	*Pavetta*	*sp*	T	F	NOTO WEST	0545666/8905933	517M
7265	*VERBENACEAE*	*Clerodendrum*	*myricoides*	S	F	NOTO WEST	0545684/8905943	511M
7266	*EUPHORBIACEAE*	*Acalypha*	*neptunica*	S	F	NOTO WEST	0545684/8905943	511M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
7267	*EUPHORBIACEAE*	*Shirakiopsis*	*sp*	T	F	NOTO WEST	0546255/8905955	516M
7268	*BURSARACEAE*	*Commiphora*	*sp*	T	F	NOTO WEST	0546300/8905932	515M
7269	*RUBIACEAE*	*Chazalliera*	*sp*	T	F	NOTO WEST	0546396/8905915	515M
7270	*DIOSCORACEAE*	*Dioscorea*	*sp*	L	F	NOTO WEST	0546396/8905915	515M
7271	*FLACOURTIACEAE*	*Calancoba*	*welwitschii*	T	F	NOTO WEST	0546517/8905916	518M
7272	*APOCYNACEAE*	*?*	*?*	L	F	NOTO WEST	0546932/8906143	511M
7273	*EUPHORBIACEAE*	*Acalypha*	*sp*	S	F	NOTO WEST	0547027/8906227	521M
7274	*POLYGALACEAE*	*?*	*?*	T	F	NOTO WEST	0547103/8906294	520M
7275	*EUPHORBIACEAE*	*Erythrococca*	*sp*	S	F	NOTO WEST	0547103/8906294	520M
7276	*PAPILIONACEAE*	*Dalbergia*	*sp*	L	F	NOTO WEST	0547166/8906338	514M
7277	*SAPINDACEAE*	*Allophylus*	*sp*	T	F	NOTO WEST	0547231/8906382	514M
7278	*RUBIACEAE*	*Polysphacria*	*sp*	T	F	NOTO WEST	0547231/8906382	514M
7279	*EUPHORBIACEAE*	*Acalypha*	*sp*	S	F	NOTO WEST	0547508/8906596	503M
7280	*RUBIACEAE*	*Canthium*	*sp*	T	F	NOTO WEST	0547508/8906596	503M
7281	*CUCURBITACEAE*	*?*	*?*	L	F	NOTO WEST	0547582/8906663	509M
7282	*RUBIACEAE*	*Tricalysia*	*sp*	T	F	NOTO WEST	0547707/8906779	512M
7283	*DICHAPETALACEAE*	*Dichapetalam*	*sp*	T	F	NOTO WEST	0547895/8906888	504M
7284	*DIOSCORACEAE*	*Discorea*	*sp*	L	F	NOTO WEST	05485096/8906901	504M
7285	*ANNONACEAE*	*Xylopia*	*sp*	L	F	NOTO WEST	05485096/8906901	504M
7286	*RUBIACEAE*	*Chazalliera*	*abrupta*	S	F	NOTO WEST	0548147/8906882	502M
7287	*RUBIACEAE*	*Gardenia*	*sp*	T	F	NOTO WEST	0548147/8906882	502M
7288	*RUBIACEAE*	*Rytigynia*	*sp*	S	F	NOTO WEST	0548428/8906840	501M
7289	*RUBIACEAE*	*Chassalia*	*sp*	S	F	NOTO WEST	0548467/8906224	499M
7290	*RUBIACEAE*	*Pavetta*	*sp*	T	F	NOTO WEST	0548450/8906752	500M
7291	*ASTERACEAE*	*Brachylaena*	*hutchunsii*	H	F	NOTO WEST	0548421/8906757	503M
7292	*ANTHERICAEAE*	*Chlorophytum*	*sp*	H	F	NOTO WEST	0548418/8906681	504M
7293	*AMARANTHACEAE*	*Celosia*	*sp*	T	F	NOTO WEST	0548418/8906681	504M
7294	*EUPHORBIACEAE*	*Phyllanthus*	*muelerianus*	T	F	NOTO WEST	0548442/8906597	504M
7295	*ICACINACEAE*	*Leptaulus*	*holstii*	T	F	NOTO WEST	0548428/8906861	505M
7296	*RUTACEAE*	*Zanthoxylum*	*holtzianum*	T	F	NOTO WEST	0548417/8906891	504M
7297	*ERYTHROXYLACEAE*	*Erythroxylum*	*emarginatum*	T	F	NOTO WEST	0548510/8906901	496M
7298	*RUBIACEAE*	*Rytigynia*	*sp*	T	F	NOTO WEST	0548533/8907062	482M
7299	*SOLANACEAE*	*Solanum*	*sp*	S	F	NOTO WEST	0548249/8906869	495M
7300	*CAPPARIDACEAE*	*Cladostermon*	*kIrkii*	T	F	NOTO WEST	0547609/8906696	502M
7301	*TILIACEAE*	*Grewia*	*sp*	T	F	NOTO WEST	0547491/8906585	512M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
7302	*RUBIACEAE*	*Pavetta*	*sp*	T	W	KIWAWA	0532929/8910261	312M
7303	*ANTHERICAEAE*	*Chlorophytum*	*sp*	H	W	KIWAWA	0532929/8910261	312M
7304	*RUBIACEAE*	*Chassalia*	*umbraticola*	S	W	KIWAWA	0532929/8910261	312M
7305	*BORAGINACEAE*	*Cordia*	*sp*	T	W	KIWAWA	0532929/8910261	312M
R	*RUBIACEAE*	*Leptactina*	*papyphloea (E)*	T	W	KIWAWA	0532929/8910261	312M
7306	*VERBENACEAE*	*Ricinodendron*	*sp*	T	W	KIWAWA	0532929/8910261	312M
7307	*EUPHORBIACEAE*	*Fluggea*	*virosa*	S	W	KIWAWA	0532474/8910566	310M
7308	*PAPILIONACEAE*	*Milletia*	*kirkii*	T	W	KIWAWA	0531994/8910510	300M
7309	*MALVACEAE*	*Thespesia*	*garckeana*	T	W	KIWAWA	0531994/8910510	300M
7310	*COMBRETACEAE*	*Pteleopsis*	*myrtifolia*	T	W	KIWAWA	0531273/8911085	304M
7311	*PAPILIONACEAE*	*Milletia*	*stuhlmanniii*	T	W	KIWAWA	0531273/8911085	304M
7312	*ANNONACEAE*	*Xylopia*	*arenaria (E)*	T	W	KIWAWA	0531844/8907167	385M
7313	*CUCURBITACEAE*	*Momordica*	*sp*	C	W	KIWAWA	0532859/8910658	309M
7314	*ASPARAGACEAE*	*Asparagus*	*setaceus*	C	W	KIWAWA	0532859/8910658	309M
7315	*RUBIACEAE*	*Psychotria*	*lauraceae*	T	W	KIWAWA	052948/8910678	306M
7316	*CONNARACEAE*	*Bysocarpus*	*sp*	T	W	KIWAWA	052948/8910678	306M
7317	*ANTHERICAEAE*	*Chlorophytum*	*sp*	H	W	KIWAWA	0533041/8910682	306M
7318	*EUPHORBIACEAE*	*Tragia*	*sp*	C	W	KIWAWA	0533250/8910718	319M
7319	*COMMELINACEAE*	*Commelina*	*sp*	H	W	KIWAWA	0533507/8910718	316M
7320	*EUPHORBIACEAE*	*Phyllanthus*	*sp*	H	W	KIWAWA	0533507/8910718	316M
7321	*ACANTHACEAE*	*Justicia*	*sp*	H	W	KIWAWA	0533528/8910722	315M
7322	*RUBIACEAE*	*Heinsia*	*bussei(E)*	S	W	KIWAWA	0533528/8910722	315M
7323	*RUBIACEAE*	*Canthium*	*bibracteaum*	T	W	KIWAWA	0533572/8910700	307M
7324	*VITACEAE*	*Cyphostemma*	*sp*	C	W	KIWAWA	0533572/8910700	307M
7325	*EUPHORBIACEAE*	*Acalypha*	*sp*	S	W	KIWAWA	0533572/8910700	307M
7326	*ACANTHACEAE*	*Elytraria*	*sp*	H	W	KIWAWA	0533572/8910700	307M
7327	*COMMELINACEAE*	*Aneilema*	*sp*	H	W	KIWAWA	0533610/8910689	314M
7328	*DICHAPETALACEAE*	*Dichapetalam*	*sp*	S	W	KIWAWA	0557002/8901655	244M
7329	*VERBENACEAE*	*Vitex*	*ferruginea*	L	W	KIWAWA	0557002/8901655	244M
7330	*RUBIACEAE*	*CHazalliera*	*abrupta*	S	W	KIWAWA	0557002/8901655	244M
7331	*DIOSCORACEAE*	*Dioscorea*	*sp*	C	W	KIWAWA	0556927/8901639	257M
7332	*RUBIACEAE*	*?*	*?*	S	W	KIWAWA	0556834/8901674	272M
7333	*RUBIACEAE*	*Rytigynia*	*sp*	T	W	KIWAWA	0556834/8901674	272M
7334	*SAPINDACEAE*	*Allophylus*	*sp*	T	W	KIWAWA	0556662/8901741	297M
7335	*APOCYNACEAE*	*Holarrhena*	*pubescens*	T	W	KIWAWA	0556529/8901862	313M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
7336	*RUTACEAE*	*?*	*?*	T	W	KIWAWA	0556529/8901862	313M
7337	*LORANTHACEAE*	*Agelanthus*	*sp*	Parasite	W	KIWAWA	0556529/8901862	313M
7338	*ICACINACEAE*	*Iodes*	*sp*	L	W	KIWAWA	0556529/8901862	313M
7339	*LOGANIACEAE*	*Mostuea*	*brunonis?*	S	W	KIWAWA	0556486/8901901	312M
7340	*VIOLACEAE*	*Rinorea*	*sp*	T	W	KIWAWA	0556403/8901963	314M
7341	*MORACEAE*	*Sloetiopsis*	*gilletii*	T	W	KIWAWA	0556270/8902014	317M
7342	*APOCYNACEAE*	*Carlvahoa*	*campanulata*	T	W	KIWAWA	0556205/8902058	317M
7343	*VIOLACEAE*	*Rinorea*	*sp*	T	W	KIWAWA	0556205/8902062	316M
7344	*RUBIACEAE*	*Rytigynia*	*sp*	T	W	KIWAWA	0556206/8902087	316M
7345	*RUBIACEAE*	*Rothmania*	*sp*	T	W	KIWAWA	0556218/8902210	316M
7346	*?*	*?*	*?*	T	W	KIWAWA	0556218/8902210	316M
7347	*RUBIACEAE*	*Rytigynia*	*sp*	T	W	KIWAWA	0556218/8902210	316M
7348	*ASCLEPIADACEAE*	*Secomone*	*sp*	C	W	KIWAWA	0556218/8902210	316M
7349	*MORACEAE*	*Cardiogyne*	*sp*	L	W	KIWAWA	0558095/8903564	207M
7350	*COMBRETACEAE*	*Combretum*	*pentagonum*	L	W	KIWAWA	0558095/8903564	207M
7351	*RHAMNACEAE*	*?*	*?*	L	W	KIWAWA	0558037/8903603	206M
7352	*MENISPERMACEAE*	*Cissampelos*	*sp*	L	W	KIWAWA	0557898/8903799	222M
7353	*LILIACEAE*	*?*	*?*	H	W	KIWAWA	0557897/8903801	222M
7354	*ACANTHACEAE*	*Justicia*	*sp*	H	W	KIWAWA	0557893/8903810	219M
7355	*RUBIACEAE*	*Spermacoce*	*sp*	H	W	KIWAWA	0557890/8903818	219M
7356	*SAPINDACEAE*	*Allophylus*	*sp*	T	W	KIWAWA	0557881/8903828	222M
7357	*NECTAGYNACEAE*	*?*	*?*	H	W	KIWAWA	0557878/8903829	224M
7358	*RUBIACEAE*	*Chazalliera*	*abrupta*	T	W	KIWAWA	0557878/8903829	224M
7359	*APOCYNACEAE*	*Dictyophleba*	*sp*	L	W	KIWAWA	0557847/8903927	247M
7360	*RUBIACEAE*	*Pentas*	*sp*	S	W	KIWAWA	0557841/8903929	246M
7361	*ACANTHACEAE*	*Celosia*	*sp*	H	W	KIWAWA	0557841/8903929	246M
7362	*MORACEAE*	*Dorstenia*	*sp*	H	W	KIWAWA	0557789/8903963	239M
7363	*MORACEAE*	*?*	*?*	T	W	KIWAWA	0557746/8903966	241M
7364	*RUBIACEAE*	*Pavetta*	*sp*	S	W	KIWAWA	0557733/8903980	246M
7365	*EUPHORBIACEAE*	*Erythrococca*	*sp*	S	W	KIWAWA	0557733/8903980	246M
7366	*SAPOTACEAE*	*Mimosopsis*	*sp*	T	W	KIWAWA	0557726/8903998	252M
7367	*CUCURBITACEAE*	*Coccinia*	*sp*	C	W	KIWAWA	0557632/8904965	270M
7368	*RUBIACEAE*	*Pavetta*	*sp*	T	W	KIWAWA	0557601/8904104	329M
R	*CAESALPINIACEAE*	*Brachystegia*	*spiciformis*	T	W	KIWAWA	0432927/8910263	313M
R	*APOCYNACEAE*	*Diplorrhyochus*	*candylocapon*	T	W	KIWAWA	0432927/8910263	313M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*HUGONIACEAE*	*Hugonia*	*casteneifolia*	L	W	KIWAWA	0432927/8910263	313M
R	*LOGANIACEAE*	*Strychnos*	*madagascariensis*	T	W	KIWAWA	0432927/8910263	313M
R	*PAPILIONACEAE*	*Milletia*	*stuhlmanniii*	T	W	KIWAWA	0532926/8910265	313M
R	*RUBIACEAE*	*Pavetta*	*sp*	S	W	KIWAWA	0532926/8910265	313M
R	*ANACARDIACEAE*	*Lannea*	*schimperi*	T	W	KIWAWA	0532922/8910284	315M
R	*MIMOSACEAE*	*Dichrostachyrus*	*cinerea*	T	W	KIWAWA	0532915/8910315	317M
R	*COMBRETACEAE*	*Combretum*	*molle*	T	W	KIWAWA	0532912/8910332	317M
R	*STERCULIACEAE*	*Sterculia*	*guingiloba*	T	W	KIWAWA	0532916/8910331	316M
R	*RUBIACEAE*	*Crossopterax*	*frebrifuga*	T	W	KIWAWA	0532911/8910339	316M
R	*COMBRETACEAE*	*Combretum*	*collinum*	T	W	KIWAWA	0532911/8910339	316M
R	*EUPHORBIACEAE*	*Pseudolachnostylis*	*maproneifolia*	T	W	KIWAWA	0532914/8910368	317M
R	*PAPILIONACEAE*	*Pterocarpus*	*angolensis*	T	W	KIWAWA	0532912/8910371	318M
R	*SAPINDACEAE*	*Deinbolia*	*borbonica*	T	W	KIWAWA	0532910/8910373	317M
R	*VERBENACEAE*	*Vitex*	*buchananii*	T	W	KIWAWA	0532900/8910379	317M
R	*ANACARDIACEAE*	*Sclerocarya*	*birrea subsp cattra*	T	W	KIWAWA	0532901/8910396	315M
R	*PAPILIONACEAE*	*Dalbergia*	*melanoxylon*	T	W	KIWAWA	0532902/8910404	315M
R	*CONNARACEAE*	*Rourea*	*sp*	T	W	KIWAWA	0532902/8910404	315M
R	*MIMOSACEAE*	*Acacia*	*sp*	T	W	KIWAWA	0532901/8910407	315M
R	*COMRETACEAE*	*Pteleopsis*	*myrtifolia*	T	W	KIWAWA	0532888/8910417	314M
R	*UMBELLIFERAE*	*Steganotaemia*	*araliacea*	T	W	KIWAWA	0532885/8910452	312M
R	*PAPILIONACEAE*	*Pericopsis*	*angolensis*	T	W	KIWAWA	0532879/8910499	310M
R	*APOCYNACEAE*	*Holarrhena*	*pubescens*	T	W	KIWAWA	0532874/8910516	309M
R	*BIGNONIACEAE*	*Markhania*	*obtusifolia*	T	W	KIWAWA	0532871/8910529	312M
R	*CAESALPINIACEAE*	*Senna*	*abbreviata*	T	W	KIWAWA	0532869/8910554	311M
R	*BURSARACEAE*	*Commiphora*	*africana*	T	W	KIWAWA	0532867/8910574	312M
R	*EUPHORBIACEAE*	*Bridelia*	*cathartica*	T	W	KIWAWA	0532860/8910583	310M
R	*ASPARAGACEAE*	*Asparagus*	*setaceus*	L	W	KIWAWA	0532866/8910583	309M
R	*EUPHORBIACEAE*	*Tragia*	*sp*	C	W	KIWAWA	0532864/8910595	307M
R	*LAMIACEAE*	*Hoscundia*	*opposita*	S	W	KIWAWA	0532801/8910770	306M
R	*ARALIACEAE*	*Cussonia*	*arborea*	T	W	KIWAWA	0532800/8910774	306M
R	*RUBIACEAE*	*Gardenia*	*sp*	T	W	KIWAWA	0532800/8910774	306M
R	*FLACOURTIACEAE*	*Tetracera*	*boiviniana*	S	W	KIWAWA	0532780/8910797	306M
R	*VERBENACEAE*	*Vitex*	*sp*	T	W	KIWAWA	0532780/8910797	306M
R	*TILIACEAE*	*Grewia*	*bicolar*	T	W	KIWAWA	0532750/8910823	308M
R	*COMBRETACEAE*	*Terminalia*	*sericeae*	T	W	KIWAWA	0532752/8910831	308M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*ANNONACEAE*	*Annona*	*senegambiensis*	T	W	KIWAWA	0532724/8910862	308M
R	*CAPPARIDACEAE*	*Boscia*	*mossambiscensis*	T	W	KIWAWA	0532681/8910950	307M
R	*EBENACEAE*	*Diospyros*	*mespiliformis*	T	W	KIWAWA	0532663/8910930	306M
R	*PAPILIONACEAE*	*Tetrapleura*	*tetraptera*	T	W	KIWAWA	0532558/8910627	318M
R	*MIMOSACEAE*	*Albizia*	*vescolar*	T	W	KIWAWA	0534241/8910717	317M
R	*RUBIACEAE*	*Rothmania*	*sp*	T	W	KIWAWA	0532746/8910627	313M
R	*RUBIACEAE*	*Multidentia*	*crassa*	T	W	KIWAWA	0532873/8910659	311M
R	*VERBENACEAE*	*Clerodendrum*	*myricoides*	S	W	KIWAWA	0532873/8910659	311M
R	*FLACOURTIACEAE*	*Xylotheca*	*tettensis*	T	W	KIWAWA	0533505/8910720	316M
R	*CAESALPINIACEAE*	*Tamarindus*	*indica*	T	W	KIWAWA	0534569/8910758	330M
R	*EUPHORBIACEAE*	*Antidesma*	*venosum*	T	W	KIWAWA	0534569/8910758	330M
R	*EUPHORBIACEAE*	*Margaritaria*	*discoidea*	T	W	KIWAWA	0534766/8910780	335M
R	*LOGANIACEAE*	*Strychnos*	*innocua*	T	W	KIWAWA	0535014/8910768	344M
R	*COMBRETACEAE*	*Terminalia*	*sambesiaca*	T	W	KIWAWA	0534166/8910981	317M
R	*BIGNONIACEAE*	*Stereospermum*	*kunthianum*	T	W	KIWAWA	0534094/8910976	312M
R	*ANNONACEAE*	*Lettowianthus*	*stellatus*	T	W	KIWAWA	0534075/8910977	308M
R	*OLACACEAE*	*Ximea*	*caffra*	T	W	KIWAWA	0533772/8910880	305M
R	*TILIACEAE*	*Grewia*	*buolar*	T	W	KIWAWA	0533663/8910877	315M
R	*MORACEAE*	*Milicia*	*excelsa*	T	W	KIWAWA	0533653/8910874	313M
R	*BIGNONIACEAE*	*Markhania*	*hidebrandhii*	T	W	KIWAWA	0533653/8910874	313M
R	*MIMOSACEAE*	*Acacia*	*seyal*	T	W	KIWAWA	0533653/8910874	313M
R	*CAESALPINIACEAE*	*Afzelia*	*quazensis*	T	W	KIWAWA	0533353/8911020	301M
R	*LAMIACEAE*	*Becium*	*sp*	H	W	KIWAWA	0533353/8911020	301M
R	*CAESALPINIACEAE*	*Bauhinia*	*thonnongii*	T	W	KIWAWA	0532951/8911210	288M
R	*PAPILIONACEAE*	*Abrus*	*precatorius*	C	W	KIWAWA	0532621/8911332	297M
R	*VERBENACEAE*	*Vitex*	*buchananii*	T	W	KIWAWA	0532121/8911464	297M
7369	*ANNONACEAE*	*Monanthotaxis*	*sp*	T	F	LIDOHO (N.EAST)	0557591/8904144	321M
7370	*DICHAPETALACEAE*	*Dichapetalam*	*sp*	S	F	LIDOHO (N.EAST)	0557591/8904144	321M
7371	*SAPINDACEAE*	*Sapindus*	*sp*	T	F	LIDOHO (N.EAST)	0558232/8903633	235M
7372	*ANNONACEAE*	*Uvaria*	*sp*	T	F	LIDOHO (N.EAST)	0558242/8903686	243M
7373	*APOCYNACEAE*	*Landlophia*	*buchananii*	L	F	LIDOHO (N.EAST)	0558242/8903686	243M
7374	*LOGANIACEAE*	*Strychnos*	*sp*	T	F	LIDOHO (N.EAST)	0558249/8903723	253M
R	*CAESALPINIACEAE*	*Bauhinia*	*loeseneriana(E)*	T	F	LIDOHO (N.EAST)	0558249/8903723	253M
7375	*OCHNACEAE*	*Ochna*	*sp*	T	F	LIDOHO (N.EAST)	0558249/8903723	253M
7376	*TILIACEAE*	*Grewia*	*sp*	T	F	LIDOHO (N.EAST)	0558289/8903953	313m

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
7377	*CYPERACEAE*	*?*	*?*	Sedge	F	LIDOHO (N.EAST)	0558259/8904037	316M
7378	*PAPILIONACEAE*	*Tephrosia*	*interrupta*	S	F	LIDOHO (N.EAST)	0558242/8904053	316M
7379	*DICHAPETALACEAE*	*Dichapetalam*	*sp*	L	F	LIDOHO (N.EAST)	0558242/8904053	316M
7380	*EUPHORBIACEAE*	*Alchorrea*	*hirtella*	S	F	LIDOHO (N.EAST)	0558242/8904053	316M
7381	*APOCYNACEAE*	*Tabernaemontana*	*elegas*	T	F	LIDOHO (N.EAST)	0549709/8915385	468M
7382	*CAESALPINIACEAE*	*Tylosema*	*fagrescence*	L	F	LIDOHO (N.EAST)	0549709/8915385	468M
7383	*RUBIACEAE*	*Chazalliera*	*abrupta*	S	F	LIDOHO (N.EAST)	0549709/8915385	468M
7384	*CUCURBITACEAE*	*?*	*?*	L	F	LIDOHO (N.EAST)	0549682/8915318	473M
7385	*POLYGALACEAE*	*?*	*?*	T	F	LIDOHO (N.EAST)	0549698/8915280	474M
7386	*CONNARACEAE*	*Rourea*	*sp*	T	F	LIDOHO (N.EAST)	0549698/8915280	474M
7387	*RUBIACEAE*	*?*	*?*	S	F	LIDOHO (N.EAST)	0549736/8915038	444M
7388	*PAPILIONACEAE*	*Indigofera*	*sp*	S	F	LIDOHO (N.EAST)	0549735/8915037	443M
7389	*APOCYNACEAE*	*Dictyophleba*	*sp*	L	F	LIDOHO (N.EAST)	0549735/8915037	443M
7390	*MORACEAE*	*?*	*?*	T	F	LIDOHO (N.EAST)	0549744/8915000	443M
7391	*LOGANIACEAE*	*Mostuea*	*sp*	S	F	LIDOHO (N.EAST)	0549743/8914988	442M
7392	*STERCULIACEAE*	*Cola*	*sp*	T	F	LIDOHO (N.EAST)	0549742/8914984	442M
7393	*VERBENACEAE*	*Suregada*	*sp*	T	F	LIDOHO (N.EAST)	0549720/8914206	453M
7394	*ANNONACEAE*	*Monanthotaxis*	*sp*	L	F	LIDOHO (N.EAST)	0549709/8914928	453M
7395	*EUPHORBIACEAE*	*Suregada*	*sp*	T	F	LIDOHO (N.EAST)	0549715/8914936	453M
7396	*ANNONACEAE*	*Xylopia*	*sp*	T	F	LIDOHO (N.EAST)	0549715/8914936	453M
7397	*MELASTOMATACEAE*	*Memecylon*	*sp*	T	F	LIDOHO (N.EAST)	0549715/8914936	453M
7398	*RUBIACEAE*	*?*	*?*	S	F	LIDOHO (N.EAST)	0549715/8914936	453M
7399	*CELASTRACEAE*	*Hippocratea*	*prostimera*	L	F	LIDOHO (N.EAST)	0549542/8914952	459M
7400	*CLUSIACEAE*	*Vismia*	*sp*	T	F	LIDOHO (N.EAST)	05495067/8914955	460M
7401	*STERCULIACEAE*	*Waltheria*	*sp*	H	F	LIDOHO (N.EAST)	0549545/8914962	459M
7402	*CUCURBITACEAE*	*Coccinia*	*sp*	c	F	LIDOHO (N.EAST)	0549289/8914998	463M
7403	*CAESALPINIACEAE*	*Erythrophloem*	*suaveolens*	T	F	LIDOHO (N.EAST)	0549126/8914984	464M
7404	*BURSARACEAE*	*Commiphora*	*zimmermanii*	T	F	LIDOHO (N.EAST)	0548437/8915052	466M
R	*APOCYNACEAE*	*Tabernaemontana*	*elegans*	T	F	LIDOHO (N.EAST)	0557021/8901660	243M
R	*TILIACEAE*	*Capordiptera*	*africana*	T	F	LIDOHO (N.EAST)	0557020/8901661	241M
R	*COMBRETACEAE*	*Pteleopsis*	*myrtifolia*	T	F	LIDOHO (N.EAST)	0557015/8901660	242M
R	*EUPHORBIACEAE*	*Acalypha*	*racemosa*	S	F	LIDOHO (N.EAST)	0557006/8901659	244M
R	*HYMENOCARDIACEAE*	*Hymenocardia*	*ulmoides*	T	F	LIDOHO (N.EAST)	0557006/8901659	244M
R	*ANNONACEAE*	*Uvaria*	*acuminata*	L	F	LIDOHO (N.EAST)	0556991/8901650	246M
R	*TILIACEAE*	*Grewia*	*conocarpa*	T	F	LIDOHO (N.EAST)	0556991/8901650	246M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*FLACOURTIACEAE*	*Xylotheca*	*tettensis*	S	F	LIDOHO (N.EAST)	0556972/8901659	241M
R	*RUBIACEAE*	*Polysphaeria*	*parviflora*	T	F	LIDOHO (N.EAST)	0556972/8901659	241M
R	*MIMOSACEAE*	*Dichrostachyrus*	*cinerea*	T	F	LIDOHO (N.EAST)	0556959/8901638	254M
R	*EUPHORBIACEAE*	*Margaritaria*	*discoidea*	T	F	LIDOHO (N.EAST)	0556959/8901638	254M
R	*CAPPARIDACEAE*	*Cladostemon*	*kirkii*	T	F	LIDOHO (N.EAST)	0556948/8901634	253M
R	*BURSARACEAE*	*Commiphora*	*sp*	T	F	LIDOHO (N.EAST)	0556945/8901635	252M
R	*CAESALPINIACEAE*	*Afzelia*	*quazensis*	T	F	LIDOHO (N.EAST)	0556945/8901635	252M
R	*RUBIACEAE*	*Heinsia*	*bussei (E)*	S	F	LIDOHO (N.EAST)	0556945/8901635	252M
R	*DICHAPETALACEAE*	*Dichapetalum*	*sp*	L	F	LIDOHO (N.EAST)	0556921/8901645	259M
R	*STERCULIACEAE*	*Dombeya*	*mupangae*	T	F	LIDOHO (N.EAST)	0556907/8901655	259M
R	*BIGNONIACEAE*	*Markhamia*	*hidebrandtii*	T	F	LIDOHO (N.EAST)	0556358/8901667	263M
R	*RUTACEAE*	*Zanthoxylum*	*chalybeaum*	T	F	LIDOHO (N.EAST)	0556351/8901873	267M
R	*CONNARACEAE*	*Rourea*	*sp*	T	F	LIDOHO (N.EAST)	0551819/8901677	274M
R	*APOCYNACEAE*	*Carvalhoa*	*campanulata*	S	F	LIDOHO (N.EAST)	0556787/8901699	276M
R	*RUBIACEAE*	*Canthium*	*bibracteaum*	T	F	LIDOHO (N.EAST)	0556786/8901702	276M
R	*PAPILIONACEAE*	*Indigofera*	*sp*	S	F	LIDOHO (N.EAST)	0556786/8901702	276M
R	*CAESALPINIACEAE*	*Hymenaea*	*verrucosa*	T	F	LIDOHO (N.EAST)	0556742/8901724	282M
R	*PAPILIONACEAE*	*Milletia*	*usaramensis*	T	F	LIDOHO (N.EAST)	0556733/8901730	283M
R	*EBENACEAE*	*Diospyros*	*mespiliformis*	T	F	LIDOHO (N.EAST)	0556733/8901930	383M
R	*MORACEAE*	*Milicia*	*excelsa*	T	F	LIDOHO (N.EAST)	0556709/8901737	288M
R	*RUBIACEAE*	*Chassalia*	*umbraticola*	S	F	LIDOHO (N.EAST)	0556706/8901736	289M
R	*APOCYNACEAE*	*Holarrhena*	*pubescens*	T	F	LIDOHO (N.EAST)	0556688/8901742	293M
R	*BIGNONIACEAE*	*Markhania*	*obtusifolia*	T	F	LIDOHO (N.EAST)	0556687/8901742	293M
R	*POLYGALACEAE*	*Polygalaceae*	*sp*	H	F	LIDOHO (N.EAST)	0556686/8901742	293M
R	*CONVULVULACEAE*	*Bonania*	*mossambiascensis*	C	F	LIDOHO (N.EAST)	0556653/8901745	299M
R	*RUBIACEAE*	*Oxyanthus*	*lepidus*	T	F	LIDOHO (N.EAST)	0556653/8901745	299M
R	*ANNONACEAE*	*Lettowianthus*	*stellatus*	T	F	LIDOHO (N.EAST)	0556632/8901745	299M
R	*FLACOURTIACEAE*	*Calancoba*	*welwistchii*	T	F	LIDOHO (N.EAST)	0556629/8901748	299M
R	*COMBRETACEAE*	*Terminalia*	*sambesiaca*	T	F	LIDOHO (N.EAST)	0556629/8901748	299M
R	*CAESALPINIACEAE*	*Dialium*	*holtzii*	T	F	LIDOHO (N.EAST)	0556597/8901766	303M
R	*BOMBACACEAE*	*Bombax*	*rhodognophalon*	T	F	LIDOHO (N.EAST)	0556563/8901799	309M
R	*RUBIACEAE*	*Leptactina*	*platyphylla*	T	F	LIDOHO (N.EAST)	0556557/8901815	309M
R	*ANACARDIACEAE*	*Lannea*	*stuhlmanniii*	T	F	LIDOHO (N.EAST)	0556557/8901815	309M
R	*APOCYNACEAE*	*Rauvolfia*	*mombasiana*	T	F	LIDOHO (N.EAST)	0556505/8901878	313M
R	*CAPPARIDACEAE*	*Cladostermon*	*kirkii*	T	F	LIDOHO (N.EAST)	0556496/8901882	312M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*DRACAENACEAE*	*Dracaena*	*mannii*	T	F	LIDOHO (N.EAST)	0556486/8901907	313M
R	*MIMOSACEAE*	*Albizia*	*vescolar*	T	F	LIDOHO (N.EAST)	0556362/8901983	315M
R	*LOGANIACEAE*	*Strychnos*	*madagascariensis*	T	F	LIDOHO (N.EAST)	0550333/8901997	312M
R	*CELASTRACEAE*	*Salacia*	*madagascariensis*	T	F	LIDOHO (N.EAST)	0556203/8902078	316M
R	*MIMOSACEAE*	*Albizia*	*petersiana*	T	F	LIDOHO (N.EAST)	0556234/8902226	317M
R	*STERCULIACEAE*	*Cola*	*clavata*	T	F	LIDOHO (N.EAST)	0556247/8902230	313M
R	*ULMACEAE*	*Trema*	*orientalis*	T	F	LIDOHO (N.EAST)	0558094/8903564	207M
R	*MORACEAE*	*Gardiogyne*	*sp*	L	F	LIDOHO (N.EAST)	0558094/8903564	207M
R	*ANACARDIACEAE*	*Sclerocarya*	*birrea subsp cattra*	T	F	LIDOHO (N.EAST)	0558094/8903564	207M
R	*TILIACEAE*	*Grewia*	*forbesii*	L	F	LIDOHO (N.EAST)	0558068/8903579	205M
R	*STERCULIACEAE*	*Sterculia*	*appendiculata*	T	F	LIDOHO (N.EAST)	0558068/8903579	205M
R	*CAESALPINIACEAE*	*Bauhinia*	*thonningii*	T	F	LIDOHO (N.EAST)	0558035/8903601	204M
R	*MIMOSACEAE*	*Albizia*	*schimperi*	T	F	LIDOHO (N.EAST)	0557915/8903730	212M
R	*MORACEAE*	*Ficus*	*exasperata*	T	F	LIDOHO (N.EAST)	0557914/8903763	213M
R	*APOCYNACEAE*	*Rauvolfia*	*mombasiana*	T	F	LIDOHO (N.EAST)	0557902/8903802	220M
R	*EUPHORBIACEAE*	*Antidesma*	*venosum*	T	F	LIDOHO (N.EAST)	0557866/8903851	222M
R	*CYPERACEAE*	*Cyperus*	*involcratus*	Sedge	F	LIDOHO (N.EAST)	0557866/8903851	222M
R	*ANNONACEAE*	*Uvaria*	*acuminata*	L	F	LIDOHO (N.EAST)	0557873/8903851	224M
R	*MORACEAE*	*Ficus*	*sycomurus*	T	F	LIDOHO (N.EAST)	0557876/8903855	223M
R	*APOCYNACEAE*	*Dictyophleba*	*acida*	L	F	LIDOHO (N.EAST)	0557876/8903899	232M
R	*PAPILIONACEAE*	*Pterocarpus*	*tinctorius*	T	F	LIDOHO (N.EAST)	0557871/8903905	236M
R	*BIGNONIACEAE*	*Kiggelia*	*africana*	T	F	LIDOHO (N.EAST)	0557797/8903950	247M
R	*MIMOSACEAE*	*Acacia*	*polyacantha*	T	F	LIDOHO (N.EAST)	0557797/8903950	247M
R	*MYRTACEAE*	*Syzygium*	*cuminii*	T	F	LIDOHO (N.EAST)	0557763/8903957	239M
R	*ASPARAGACEAE*	*Asparagus*	*falcatus*	C	F	LIDOHO (N.EAST)	0557704/8904025	262M
R	*MALVACEAE*	*Gossypium*	*sp*	L	F	LIDOHO (N.EAST)	0550902/8904146	358M
R	*PAPILIONACEAE*	*Tetrapleura*	*tetraptera*	T	F	LIDOHO (N.EAST)	0553739/8904366	355M
R	*CUCURBITACEAE*	*Peponium*	*leucanthum*	C	F	LIDOHO (N.EAST)	0553739/8904366	355M
R	*BURSARACEAE*	*Commiphora*	*africana*	T	F	LIDOHO (N.EAST)	0558165/8903555	224M
R	*MALVACEAE*	*Thespesia*	*garckeana*	T	F	LIDOHO (N.EAST)	0558165/8903555	224M
R	*BOMBACACEAE*	*Adansonia*	*digitata*	T	F	LIDOHO (N.EAST)	0558190/8903589	229M
R	*RUTACEAE*	*Clausena*	*anisata*	T	F	LIDOHO (N.EAST)	0558190/8903589	229M
R	*CAESALPINIACEAE*	*Tamarindus*	*indica*	T	F	LIDOHO (N.EAST)	0558215/8903621	230M
R	*LAMIACEAE*	*Hoslundia*	*opposita*	S	F	LIDOHO (N.EAST)	0558226/8903629	234M
R	*UMBELLIFERAE*	*Steganotaenia*	*araliaceae*	T	F	LIDOHO (N.EAST)	0558238/8903696	246M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
7405	*TILIACEAE*	*Grewia*		T	F	LIKONDE	0548396/8915065	468M
7406	*EUPHORBIACEAE*	*Shirakiopsis*	*trilocure*	T	F	LIKONDE	0548129/8917192	482M
7407	*PAPILIONACEAE*	*Dalbergia*	*sp*	L	F	LIKONDE	0548089/8917030	462M
7408	*EUPHORBIACEAE*	*Dalechampia*	*scandens*	C	F	LIKONDE	0548060/8917037	468m
7409	*SAPOTACEAE*	*Manilkala*	*mochisia*	C	F	LIKONDE	0547942/8916958	471M
7410	*CAESALPINIACEAE*	*?*	*?*	L	F	LIKONDE	0547860/8916794	480M
7411	*MELIACEAE*	*Turraea*	*sp*	T	F	LIKONDE	0547794/8916620	479M
7412	*DIOSCORACEAE*	*Dioscorea*	*sp*	C	F	LIKONDE	0547794/8916622	477M
7413	*CONVULVULACEAE*	*?*	*?*	C	F	LIKONDE	0547750/8916242	469M
7414	*CELASTRACEAE*	*Hippocratea*	*sp*	L	F	LIKONDE	0547063/8916449	470M
7415	*HYMENOCARDIACEAE*	*Hymenocardia*	*ulmoides*	T	F	LIKONDE	0547058/8916450	472M
7416	*NALVACEAE*	*Gossypium*	*sp*	L	F	LIKONDE	0546896/8916588	473M
7417	*CUCURBITACEAE*	*Laggenaria*	*sp*	C	F	LIKONDE	0546898/8916612	475M
7418	*SAPINDACEAE*	*Allophylus*	*parvillei*	T	F	LIKONDE	0546850/8916732	475M
7419	*EUPHORBIACEAE*	*?*	*?*	T	F	LIKONDE	0546851/8916742	474M
7420	*VITACEAE*	*Rhoicissus*	*tridentata*	C	F	LIKONDE	0546886/8916755	474M
7421	*FLACOURTIACEAE*	*Oncoba*	*spinosa*	T	F	LIKONDE	0546797/8916903	473M
7422	*VITACEAE*	*Rhoicissus*	*sp*	C	F	LIKONDE	0546669/8917085	477M
7423	*VERBENACEAE*	*Vitex*	*ferrugirea*	L	F	LIKONDE	0546732/8917096	478M
7424	*RUBIACEAE*	*Vangueria*	*infausta*	T	F	LIKONDE	0546732/8917096	478M
7425	*FABACEAE*	*Erythrophloem*	*suaveolens*	T	F	LIKONDE	0546904/8917142	483M
7426	*MIMOSACEAE*	*?*	*?*	L	F	LIKONDE	0549756/8915358	449M
7427	*SAPOTACEAE*	*Mimosopsis*	*acutifolia (E)*	T	F	LIKONDE	0549764/8915352	448M
7428	*RUBIACEAE*	*Oxyanthus*	*lepidus*	T	F	LIKONDE	0549779/8915358	441M
7429	*LEGUMINASAE*	*Baphia*	*sp*	T	F	LIKONDE	0549778/8915356	441M
7430	*EUPHORBIACEAE*	*Acalypha*	*neptunica*	S	F	LIKONDE	0549778/8915356	441M
7431	*RUBIACEAE*	*Chassalia*	*umbraticola*	S	F	LIKONDE	0549957/8915347	373M
7432	*EUPHORBIACEAE*	*Antidesma*	*venosum*	T	F	LIKONDE	0549957/8915347	373M
7433	*MORACEAE*	*Ficus*	*sycomorus*	T	F	LIKONDE	0549963/8915355	370M
7434	*ORCHDACEAE*	*Eulophia*	*sp*	H	F	LIKONDE	0549966/8915356	371M
7435	*CYPERACEAE*	*Scleria*	*sp*	Sedge	F	LIKONDE	0549968/8915407	380M
7436	*ANNONACEAE*	*Monanthotaxis*	sp	T	F	LIKONDE	0549968/8915407	380M
7437	*FLACOURTIACEAE*	*Grandidiera*	boiviniana	T	F	LIKONDE	0550032/8915551	392M
7438	*RHIZOPHORACEAE*	*Cassipourea*	*gummiflua*	T	F	LIKONDE	0550032/8915551	392M
7439	*RUBIACEAE*	*Pentas*	*bussei (E)*	S	F	LIKONDE	0550059/8915572	395M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
7440	*ASTERACEAE*	*Pseuderanthemum*	*zanzibaricum*	L	F	LIKONDE	0550092/8915606	410M
7441	*RUBIACEAE*	*Chassalia*	*sp*	S	F	LIKONDE	0550174/8915742	393M
7442	*VIOLACEAE*	*Rinorea*	*sp*	T	F	LIKONDE	0550207/8915791	404M
7443	*EUPHORBIACEAE*	*Erythrococca*	*sp*	S	F	LIKONDE	0550207/8915797	404M
7444	*CAESALPINIACEAE*	*Cynometra*	*sp*	T	F	LIKONDE	0550206/8915805	410M
7445	*BEGONIACEAE*	*Begonia*	*oxyloba*	H	F	LIKONDE	0550213/8915830	422M
7446	*MELASTOMATACEAE*	*Dissotis*	*sp*	T	F	LIKONDE	0550217/8915860	449M
7447	*LAMIACEAE*	*Pretranthus*	*sp*	H	F	LIKONDE	0549760/8915001	440M
7448	*ICACINACEAE*	*Ioides*	*sp*	L	F	LIKONDE	0549765/8915002	438M
7449	*ZINGEBARACEAE*	*Aframomum*	*sp*	H	F	LIKONDE	0549825/8914945	415M
7450	*RUBIACEAE*	*Gresiola*	*sp*	H	F	LIKONDE	0549825/8914945	415M
7451	*ASTERACEAE*	*Brachylaena*	*hutchunsii*	T	F	LIKONDE	0549803/8914891	418M
7452	*MELASTOMATACEAE*	*Memecylon*	*sp*	T	F	LIKONDE	0549788/8914891	416M
7453	*MELASTOMATACEAE*	*Cincinobotrys*	*pulchella (E)*	H	F	LIKONDE	0549788/8914890	415M
7454	*STERCULIACEAE*	*Cola*	*sp*	T	F	LIKONDE	0549768/8914879	416M
7455	*ASPLENIACEAE*	*Asplenium*	*sp*	FERN	F	LIKONDE	0549768/8914879	416M
7456	*PAPILIONACEAE*	*Crotalaria*	*sp*	S	F	LIKONDE	0549585/8914718	361M
7457	*POACEAE*	*Panicum*	*trichodadum*	G	F	LIKONDE	0549585/8914718	361M
7458	*PAPILIONACEAE*	*Indigofera*	*sp*	S	F	LIKONDE	0549517/8914708	363M
7459	*LORANTHACEAE*	*?*	*?*	Parasite	F	LIKONDE	0549407/8914734	376m
7460	*RUBIACEAE*	*?*	*?*	T	F	LIKONDE	0549407/8914734	376m
7461	*ADIANTACEAE*	*Vittaria*	*sp*	FERN	F	LIKONDE	0549370/8914733	375M
7462	*ACANTHACEAE*	*Whitfieldia*	*elongata*	S	F	LIKONDE	0549352/8914717	374M
7463	*APOCYNACEAE*	*?*	*?*	L	F	LIKONDE	0549295/8914738	386M
7464	*VIOLACEAE*	*Rinorea*	*sp*	T	F	LIKONDE	0549287/8914768	393M
7465	*ASPARAGACEAE*	*Asparagus*	*sp*	L	F	LIKONDE	0549286/8914787	400M
7466	*RUBIACEAE*	*Rytigynia*	*sp*	T	F	LIKONDE	0549281/8914785	402M
7467	*RUBIACEAE*	*Coffea*	*sp*	T	F	LIKONDE	0549281/8914785	402M
R	*CAESALPINIACEAE*	*Afzelia*	*quazensis*	T	F	LIKONDE	0549709/8915385	468M
R	*TILIACEAE*	*Grewia*	*conocarpa*	T	F	LIKONDE	0549709/8915385	468M
R	*MORACEAE*	*Milicia*	*excelsa*	T	F	LIKONDE	0549706/8915375	469M
R	*HYMENOCARDIACEAE*	*Hymenocardia*	*ulmoides*	T	F	LIKONDE	0549706/8915369	471M
R	*CONVULVULACEAE*	*Bonania*	*mossambiscensis*	L	F	LIKONDE	0549706/8915369	471M
R	*APOCYNACEAE*	*Dictyophleba*	*sp*	L	F	LIKONDE	0549706/8915369	471M
R	*EUPHORBIACEAE*	*Alchornea*	*hirtella*	T	F	LIKONDE	0549706/8915369	471M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*UMBELLIFERAE*	*Steganotaemia*	*araliaceae*	T	F	LIKONDE	0549689/8915354	472M
R	*RUTACEAE*	*Zanthoxylum*	*chalybeaum*	T	F	LIKONDE	0549608/8915352	472M
R	*APOCYNACEAE*	*Tabernaemontane*	*elegans*	T	F	LIKONDE	0549686/8915349	473M
R	*FLACORTIACEAE*	*Xylotheca*	*tettensis*	S	F	LIKONDE	0549686/8915349	473M
R	*BURSARACEAE*	*Commiphora*	*sp*	T	F	LIKONDE	0549686/8915349	473M
R	*ANNONACEAE*	*Uvaria*	*acuminata*	L	F	LIKONDE	0549677/8915333	471M
R	*RUBIACEAE*	*Heinsia*	*bussei (E)*	S	F	LIKONDE	0549677/8915333	471M
R	*ANNONACEAE*	*Monodora*	*sp*	T	F	LIKONDE	0549677/8915333	471M
R	*ARALIACEAE*	*Cussonia*	*zimmermanii*	T	F	LIKONDE	0549683/8915314	475M
R	*ASPARAGACEAE*	*Asparagus*	*falcatus*	C	F	LIKONDE	0549683/8915314	475M
R	*TILIACEAE*	*Capordiptera*	*africana*	T	F	LIKONDE	0549700/8915271	473M
R	*BIGNONIACEAE*	*Markhamia*	*obtusifolia*	T	F	LIKONDE	0549708/8915265	470M
R	*RUBIACEAE*	*Oxyanthus*	*lepidus*	T	F	LIKONDE	0549723/8915247	467M
R	*EBENACEAE*	*Diospyros*	*mespiliformis*	T	F	LIKONDE	0549736/8915228	467M
R	*BOMBACACEAE*	*Bombax*	*rhodognophalon*	T	F	LIKONDE	0549743/8915207	467M
R	*APOCYNACEAE*	*Holarrhena*	*pubescens*	T	F	LIKONDE	0549737/8915181	465M
R	*CELASTRACEAE*	*Salacia*	*madagascariensis*	L	F	LIKONDE	0549741/8915110	456M
R	*VIOLACEAE*	*Rinorea*	*iliicifolia*	T	F	LIKONDE	0549736/8915025	442M
R	*EUPHORBIACEAE*	*Suregada*	*zanzibaricum*	T	F	LIKONDE	0549744/8914003	443M
R	*SAPOTACEAE*	*Manilkala*	*sulcata*	T	F	LIKONDE	0549744/8914003	443M
R	*RUBIACEAE*	*Chassalia*	*umbraticola*	S	F	LIKONDE	0549713/8914930	453M
R	*EUPHORBIACEAE*	*Drypetes*	*Sp.*[1]	T	F	LIKONDE	0549713/8914930	453M
R	*CAESALPINIACEAE*	*Pterolobium*	*stellatus*	L	F	LIKONDE	0549699/8914943	454M
R	*EUPHORBIACEAE*	*Antidesma*	*venosum*	T	F	LIKONDE	549662/8914955	459M
R	*ULMACEAE*	*Trema*	*orientalis*	T	F	LIKONDE	0549487/8914959	463M
R	*ANACARDIACEAE*	*Lannea*	*stuhlmanniii*	T	F	LIKONDE	0549146/8914994	463M
R	*EUPHORBIACEAE*	*Margaritaria*	*discoidea*	T	F	LIKONDE	0548683/8915037	465M
R	*DRACAENACEAE*	*Dracaena*	*mannii*	T	F	LIKONDE	0548252/8915399	460M
R	*PAPILIONACEAE*	*Milletia*	*usaramensis*	T	F	LIKONDE	0548237/8915415	461M
R	*LOGANIACEAE*	*Strychnos*	*innocua*	T	F	LIKONDE	0548201/8915532	470M
R	*ANNONACEAE*	*Annona*	*senegambiensis*	T	F	LIKONDE	0548196/8915543	471M
R	*ARACEAE*	*Culcasia*	*orientalis (E)*	L	F	LIKONDE	0548196/8915543	471M

[1] This was originally listed as Drypetes gerradinoides. This species is listed as endemic to Lulanda and Uzungwa Scarp. Until a confirmed specimen has been collected, it is just listed as Drypetes sp. In this report.

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*ANACARDIACEAE*	*Anacardium*	*occidentale(Exotic)*	T	F	LIKONDE	0548196/8915543	471M
R	*RUBIACEAE*	*Multidentia*	*crassa*	T	F	LIKONDE	0548185/8915566	470M
R	*TILIACEAE*	*Grewia*	*forbesii*	L	F	LIKONDE	0548055/8915607	470M
R	*SAPOTACEAE*	*Pouteria*	*leucantha*	T	F	LIKONDE	0548055/8915607	470M
R	*VIOLACEAE*	*Rinorea*	*ferruginea*	T	F	LIKONDE	0548054/8915608	471M
R	*PASSIFLORACEAE*	*Adenia*	*gummifera*	L	F	LIKONDE	0548030/8915627	472M
R	*EBENACEAE*	*Diospyros*	*sp*	T	F	LIKONDE	0548030/8915627	472M
R	*EUPHORBIACEAE*	*Fluggea*	*virosa*	S	F	LIKONDE	0548030/8915627	472M
R	*EUPHORBIACEAE*	*Acalypha*	*racemosa*	S	F	LIKONDE	0548030/8915627	472M
R	*RUBIACEAE*	*Catunaregan*	*spinosa*	S	F	LIKONDE	0547733/8915786	474M
R	*CAESALPINIACEAE*	*Dialium*	*holtzii*	T	F	LIKONDE	0547699/8915835	470M
R	*FLACOURTIACEAE*	*Flacourtia*	*indica*	T	F	LIKONDE	0547781/8916521	479M
R	*ANACARDIACEAE*	*Ozoroa*	*obovata*	T	F	LIKONDE	0547943/8916996	487M
R	*EUPHORBIACEAE*	*Shirakiopsis*	*trilocure*	T	F	LIKONDE	0548038/8917029	485M
R	*RUTACEAE*	*Harrissonia*	*abyssinica*	T	F	LIKONDE	0548109/8917026	482M
R	*ANACARDIACEAE*	*Sclerocarya*	*birrea subsp cattra*	T	F	LIKONDE	0548123/8917111	486M
R	*COMBRETACEAE*	*Combretum*	*pentagonum*	L	F	LIKONDE	0548125/8917143	487M
R	*MIMOSACEAE*	*Dichrostachyus*	*cinerea*	T	F	LIKONDE	0548124/8917162	489M
R	*LAMIACEAE*	*Hoslundia*	*opposita*	S	F	LIKONDE	0548124/8917162	489M
R	*CAESALPINIACEAE*	*Entada*	*pathuetha*	L	F	LIKONDE	0548121/8917174	488M
R	*EUPHORBIACEAE*	*Antidesma*	*membranaecium*	T	F	LIKONDE	0547005/8916018	482M
R	*POACEAE*	*Bamboos*	*sp*	G	F	LIKONDE	0547247/8916085	477M
R	*MIMOSACEAE*	*Acacia*	*polyacantha*	T	F	LIKONDE	0547676/8916190	472M
R	*VERBENACEAE*	*Lippia*	*javanica*	S	F	LIKONDE	0546885/8916478	474M
R	*STERCULIACEAE*	*Dombeya*	*mupangae*	S	F	LIKONDE	0546875/8916684	476M
R	*PAPILIONACEAE*	*Abrus*	*precatorius*	C	F	LIKONDE	0546859/8916703	475M
R	*PAPILIONACEAE*	*Milletia*	*stuhlmanniii*	T	F	LIKONDE	0546716/8917090	478M
R	*CAESALPINIACEAE*	*Tamarindus*	*indica*	T	F	LIKONDE	0546927/8917150	483M
R	*CAESALPINIACEAE*	*Hymenaea*	*verrucosa*	T	F	LIKONDE	0547128/8917244	495M
R	*DILLENIACEAE*	*Tetracera*	*boiviniana*	S	F	LIKONDE	0547244/8917318	493M
R	*COMBRETACEAE*	*Terminalia*	*sambesiaca*	T	F	LIKONDE	0549763/8915349	447M
R	*RUBIACEAE*	*Canthium*	*bibracteaum*	T	F	LIKONDE	0549873/8915337	406M
R	*SAPINDACEAE*	*Blighia*	*unijugata*	T	F	LIOKNDE	0549961/8915348	373M
R	*FLACOURTIACEAE*	*Calancoba*	*welwistschii*	T	F	LIKONDE	0550214/8915827	423M
R	*ANACARDIACEAE*	*Sorindeia*	*madagascariensis*	T	F	LIKONDE	0550222/8915829	423M

Coll. No./R	FAMILY	GENUS	SPECIES	HABIT	HABITAT	FOREST	COORDINATES	ALTITUDE
R	*ACANTHACEAE*	*Whitfieldia*	*elongata*	S	F	LIKONDE	0550208/8915846	429M
R	*EUPHORBIACEAE*	*Synedenium*	*glascens*	T	F	LIKONDE	0549825/8914940	414M
R	*EUPHORBIACEAE*	*Ricinodendrom*	*heudelotii*	T	F	LIKONDE	0549697/8914868	405M
7468	*CONVULVULACEAE*	*Ipomoea*	*sp*	C	FARMS	NANDAMBI	0557804/8998322	274M
7469	*NACTINAGYNACEAE*	*?*	*?*	H	FARMS	NANDAMBI	0557804/8998322	274M
7470	*STERCULIACEAE*	*Waltheria*	*sp*	S	FARMS	NANDAMBI	0557804/8998322	274M
7471	*ACANTHACEAE*	*Justicia*	*scandens*	H	FARMS	NANDAMBI	0557804/8998322	274M
7472	*PAPILIONACEAE*	*Mucuna*	*gigantea*	C	FARMS	NANDAMBI	0557804/8998322	274M
7473	*CYPERACEAE*	*Cyperus*	*sp*	Sedge	FARMS	NANDAMBI	0557804/8998322	274M
7474	*CONVULVULACEAE*	*Ipomoea*	*sp*	H	FARMS	NANDAMBI	0557804/8998322	274M
7475	*POLYGALACEAE*	*Polygala*	*sp*	H	FARMS	NANDAMBI	0557804/8998322	274M
7476	*POACEAE*	*Panicum*	*sp*	G	FARMS	NANDAMBI	0557804/8998322	274M
7477	*MIMOSACEAE*	*Entada*	*sp*	L	FARMS	NANDAMBI	0557804/8998322	274M
7478	*CONVULVULACEAE*	*Ipomoea*	*sp*	FERN	FARMS	KINYOPE	0543790/8897090	201M
7479	*CYPERACEAE*	*Cyperus*	*sp*	Sedge	FARMS	KINYOPE	0543790/8897090	201M
7480	*GRAMINAE*	*Panicum*	*sp*	G	FARMS	KINYOPE	0543790/8897090	201M
7481	*LAMIACEAE*	*Hypitis*	*suave*	H	FARMS	KINYOPE	0543790/8897090	201M
7482	*EUPHORBIACEAE*	*Tribulus*	*sp*	H	FARMS	KINYOPE	0543790/8897090	201M
7483	*RUBIACEAE*	*Pentodon*	*sp*	H	FARMS	R YA SASA	0549151/8891822	160M
7484	*GRAMINAE*	*Imperata*	*cyrindrica*	G	FARMS	R. YA SASA	0549151/8891822	160M
7485	*GRAMINAE*	*Panicum*	sp	G	FARMS	R. YA SASA.	0549151/8891822	160M

Key to Appendix 4

Collection Number / R

R=Recorded but not collected

Habit

T = Tree S = Shrub L = Liana F = Forest G = Grass H = Herb C = Climber

Habitat

F = Forest W = Woodland

(E)=Endemic to Tanzanian coastal forest