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A REVIEW OF EXISTING BIODIVERSITY DATA AND THE USE OF DISTURBANCE TRANSECT, METT AND TRA AS MONITORING TOOLS FOR THE WWF LOWLAND COASTAL FORESTS PROJECT

FINAL REPORT
Consultancy Report Submitted to
WWF Tanzania Programme Office
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Executive Summary

The Eastern Africa Coastal Forests Ecoregion (EACFE) contains two WWF Global 200 ecoregions recognized by WWF. They are the Northern Zanzibar-Inhambane coastal forest mosaic ecoregion and the Southern Zanzibar-Inhambane coastal forest mosaic ecoregion. Together these two WWF ecoregions cover around 260,000 km^2. These are amongst the most important of more than 850 ecoregions in the world. The EACFE is also identical to the redefined Coastal Forests hotspot as recognized by Conservation International, and part of the same area is an 'Endemic Bird Area', as defined by BirdLife International.

WWF Tanzania Programme Office (WWF-TPO) has recently initiated a project in Matumbi / Kichi Hills and Rondo for the conservation and management of the lowland coastal forests (LCF). The project is being run by WWF TPO in collaboration with the Lindi Rural, Kilwa and Rufiji District Councils. Eight Forest Reserves are considered in this report; Kichi Hills FR, Kiwengoma FR, Namakutwa Nyamuete FR, Tong'omba FR, Nambunju VLFR, Mbwara VLFR, Nyamwage VLFR and Tawi VLFR.

As learnt through the experiences of other conservation and development projects, the success of the LCF project is linked implicitly to the involvement of communities in protecting, restoring and managing their resources. As such LCF has already started to work closely with the village governments and the communities in establishing and training the Village Natural Resource Committees for the villages surrounding Matumbi and Kichi Hills.

This consultancy was developed to address the need of the LCF project to implement a monitoring programme to measure the impact of project activities. The LCF project requires a monitoring programme that is cost effective and can be carried out by Village Natural Resource Committees and District Forest Officers as such the measuring of biological indicators that requires specialists is not suitable.

The monitoring programme includes three parts 1) the Management Effectiveness Tracking Tool (METT), designed by WWF and the World Bank and 2) the Threat Reduction Assessment (TRA) designed by the Biodiversity Support Programme 3) disturbance transects to monitor forest condition. The WWF TPO Project Executant and District Forest Officers were trained in the completion of METT and TRA. District Forest Officers and Members of four Village Natural Resource Committees Nambunju, Mbwara, Nyamwage and Tawi were trained to conduct disturbance transects, these data are fed into the TRA process.

A desktop review of existing biological data was conducted and data are included within this report. Biodiversity data are not available for all of the eight Forest Reserves considered under this consultancy.

Disturbance transect training was conducted by Trevor Jones. Whilst conducting training within VLFRs he also compiled casual observation data on fauna, these data are contained within this report.

This report provides available information in regards to biological values and instructions / guidance for the project "Forest landscape restoration in Matumbi / Kichi Hills" to monitor project impacts in terms of management effectiveness, threat reduction and forest condition.

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List of Acronyms

asl	Above Sea Level
cbh	Circumference at Breast Height
EACFE	Eastern Africa Coastal Forests Ecoregion
FO	Forest Officer
FR	Forest Reserve
LA FR	Local Authority Forest Reserve
LCF	Lowland Coastal Forest
VLFR	Village Land Forest Reserve
VNRC	Village Natural Resource Committee
WMA	Wildlife Management Area
WWF	World Wide Fund for Nature
WWF TPO	WWF Tanzania Programme Office

Acknowlegements

The consultant, Freya St John, would like to thank WWF TPO staff members particularly Peter Sumbi, Babu Matunda and Isaac Mallugu for their guidance throughout this consultancy. In addition thanks are extended to Trevor Jones who conducted training for conducting disturbance transects in addition to collecting casual faunal observations from within the Proposed Village Land Forest Reserves and the WWF TPO drivers Pascal Shamsi and Emmanuel Chilipwele.The training activities conducted under this consultancy were made possible by the collaboration of Village Government and Villlage Environmental Committess of Nambunju, Mbwara, Nyamwage and Tawi villages and District Forests Officers Paulo Fute and Francise Kiondo from Rufiji District and Richard Elibariki from Kilwa District.

Front cover photos:
Top left: Trevor Jones conducting disturbance transect training in Mbwara P. VLFR (F. St John)
Bottom left: Using binoculars in Tawi P. VLFR (T. Jones)
Top right: Mninga tree in Mbwara P. VLFR (F. St John)
Bottom right: Completing paperwork for disturbance transect, Nyamwage P. VLFR (T. Jones)

1.0 Introduction

The Eastern Africa Coastal Forests Ecoregion (EACFE) contains two WWF Global 200 ecoregions recognized by WWF. They are the Northern Zanzibar-Inhambane coastal forest mosaic ecoregion and the Southern Zanzibar-Inhambane coastal forest mosaic ecoregion. Together these two WWF ecoregions cover around 260,000 km^2. These are amongst the most important of more than 850 ecoregions in the world. The EACFE is also identical to the redefined Coastal Forests hotspot as recognized by Conservation International, and part of the same area is an 'Endemic Bird Area', as defined by BirdLife International.

The rich coastal forests of eastern Africa are under severe threat; they are becoming smaller and more fragmented over time. There are several primary threats which are resulting in this degradation the root cause analysis exercise for the WWF EACFE programme has identified the underlying causes of these threats.

Degradation and loss of coastal forests and associated habitats and the species that they support is a result of a wide range of natural and man-made causes interacting at different levels and intensities on the eastern Africa coastal forest ecosystems. An estimated 60% of natural habitats in the EACFE have been converted over time to farmland and urban areas. Stakeholders have identified three-quarters of the remaining coastal forest areas to be highly or very highly threatened. Major direct threats to the coastal forests are as follows: expanding agriculture, charcoal burning and fuel wood collection, uncontrolled fires, unsustainable logging, unplanned settlement, destructive mining practices and other minor threats e.g. invasive species.

1.1 WWF TPO Conservation & Management of the Lowland Coastal Forests Project

WWF Tanzania Programme Office (WWF-TPO) has recently initiated a project in Matumbi / Kichi Hills and Rondo for the conservation and management of the lowland coastal forests (LCF). The project is being coordinated by WWF TPO in collaboration with the Lindi Rural, Kilwa and Rufiji District Councils.

As learnt through the experiences of other conservation and development projects, the success of the LCF project is linked implicitly to the involvement of communities in protecting, restoring and managing their resources. As such LCF has already started to work closely with the village governments and the communities in establishing and training the Village Natural Resource Committees for the villages surrounding Matumbi and Kichi Hills.

1.1.1 Overall goal of the Conservation & Management of the LCF project

'To ensure that coastal forest and woodlands are managed in collaboration with local communities in a sustainable way for the benefits of people living adjacent to target forests and the overall national economy'.

1.1.2 Purpose of the project

To improve landscape conservation and governance in two landscapes in Tanzania ***Matumbi / Kichi Hills*** *(Kilwa & Rufiji Districts) and* ***Rondo Plateau*** *(Lindi District) in partnership with civil society and Government, through protection, management and restoration of the District's forests and improved community livelihoods.*

1.2 About this consultancy

The specific consultancy objectives are:

1) Desktop review and collation of biodiversity and disturbance transect data for all the relevant sites within the Matumbi / Kichi Hills landscape, namely:
    - 1.1 Kiwengoma FR
    - 1.2 Namakutwa-Nyamuete FR
    - 1.3 Tong'omba FR
    - 1.4 Kichi Hills FR
    - 1.5 Nyamwage P. VLFR
    - 1.6 Nambunju P. VLFR
    - 1.7 Mbwara P.VLFR
    - 1.8 Tawi P. VLFR

2) Train WWF TPO project staff and District Forest Officers to complete Threat Reductions Assessments (TRA).

3) Train WWF TPO project staff and District Forest Officers to complete the Monitoring Effectiveness Tracking Tool (METT).

4) Train WWF TPO project staff, District Forest Officers and villagers to complete disturbance transects (Trainer: Trevor Jones).

5) By utilising the TRA, METT and disturbance transects methodologies develop / design a monitoring plan that will measure management effectiveness, threat reduction and forest condition for the project.

1.2.1 Desktop review - biodiversity

It was considered appropriate to compile an historical baseline of biodiversity data as time (project interventions are already underway, thus time '0' has already passed) and financial constraints prohibit the LCF project from conducting intensive biodiversity surveys for each of the eight FRs at this time.

1.2.2 Using monitoring tools – METT and TRA

In order to assess impacts of LCF project interventions within the project site, there is a need to establish a monitoring programme.

The LCF project requires a monitoring programme that is cost effective and can be carried out by non-specialists as such the measuring of biological indicators that requires specialists is not suitable. In addition biological surveys do not effectively show the impact of conservation interventions over a short period and a recent set of biological baseline data do not exist for the FRs in question. As such, at this time for this project the use of biological indicators in measuring project impacts is not appropriate so other monitoring tools will be utilised.

A number of project monitoring tools already exist, as such it appears sensible to utilise those already tried and tested and in addition allow for comparison of management impacts between other sites. Monitoring tools that are being implemented by the Tanzania Forest Conservation Group and the Conservation and Management of the Eastern Arc Mountain Forests project of the Forest and Beekeeping Division of the Ministry of Natural Resources and Tourism have been chosen for use on the LCF project. These monitoring tools are the Management Effectiveness

Tracking Tool (METT), designed by WWF and the World Bank and the Threat Reduction Assessment (TRA) designed by the Biodiversity Support Programme. These tools if completed regularly should adequately measure impacts of the LCF project.

WWF TPO personnel and District Forest Officers will receive training to complete the METT and TRA processes.

1.2.3 Forest condition – disturbance transects

Forest condition, although measurable in many ways, is most commonly done in Tanzania by conducting disturbance transects. This involves counting the number of dead / live / old cut and new cut poles and timbers along either side of a straight line transect in addition to noting evidence of fires, charcoaling and pitsaw sites. Casual observations of fauna (actual sightings, tracks and dung) and flora can also be conducted at the same time if the human resources (i.e. persons capable of identifying fauna and flora) to do so are available at the time.

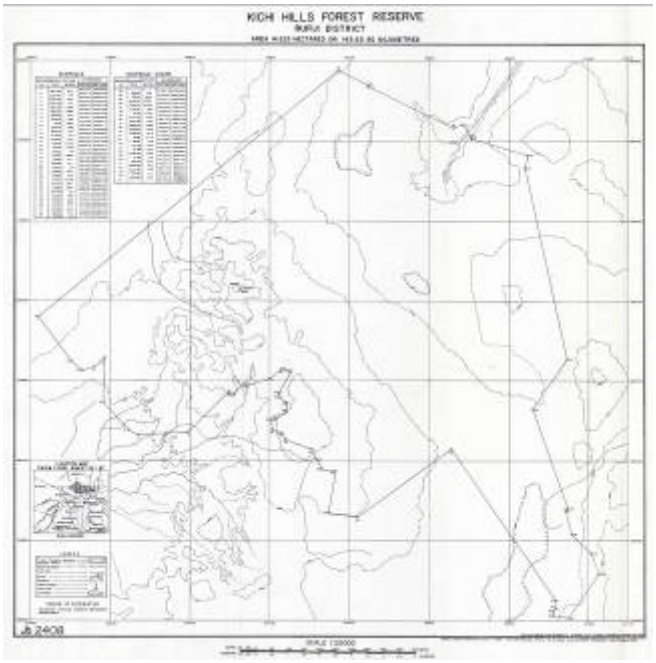
Again, some historical data (Ahrends, 2005) are available for Kiwengoma and Namakutwa-Nyamuete FRs.

WWF TPO personnel, District Forest Officers and representatives of VNRC's will be trained to conduct forest disturbance transects.

1.3 Field timetable

Date	**Activity**
	Seven days – desktop review & preparation of METT & TRA papers
23-Nov	Trevor Jones (TJ) and Freya St John (FSJ) travelled to Kibiti
24-Nov	Village briefing meeting at Mbwara for representatives of Nambunju, Mbwara, Nyamwage and Tawi villages and VLFRs
25-Nov	Training in disturbance transects for Nambunju villages in Nambunju VLFR
26-Nov	Training in disturbance transects for Mbwara villages in Mbwara VLFR
27-Nov	1) Training in disturbance transects for Nyamwage villages in Nyamwage VLFR 2) Training for District FOs and WWF TPO in METT and TRA completion
28-Nov	1) Training in disturbance transects for Tawi villages in Tawi VLFR 2) Training for District FOs and WWF TPO in METT and TRA completion
29-Nov	Training de-brief meeting for representatives of Nambunju, Mbwara, Nyamwage and Tawi villages and discussion on how to proceed Trevor Jones and Freya St John return to Dar es Salaam
	Four days report production

2.0 Forests Reserves in the Matumbi / Kichi Hills Landscape



2.1 Kichi Hills Forest Reserve

Area: 14,432 ha

Legal Status: declared a Local Authority Forest Reserve in 2003

Description: Evergreen coastal forest, woodland, miombo and thicket between 300 - 600 m asl

Location: Rufiji District. 8° 12’ S; 38° 40’ E

The Kichi Hills FR has some buffer zones extending from it that are the Wildlife Management Areas (WMA) within Ngarambe / Tapika villages near Kichi Hills. In addition, Pindiro Forest Reserve (11,795 ha) and Rondo-Noto Plateau (25,000ha) form another important biodiversity landscape further to the south of Rufiji – in Lindi Region.

2.2 Kiwengoma Forest Reserve

Area: 3,506 ha

Legal status: formerly a reserve revoked by the Government of Tanzania in 1964. Re-gazetted as a Territorial Forest Reserve in 1999.

Description: Evergreen coastal forest, scrub forest, moist groundwater forest, riverine forest, transition woodland and woodland between 250 - 740 m asl

Location: Rufiji District. 8° 20’ S - 8° 22’ S; 38° 54’ E - 38° 57’ 40” E

2.3 Namakutwa Nyamuete Forest Reserve

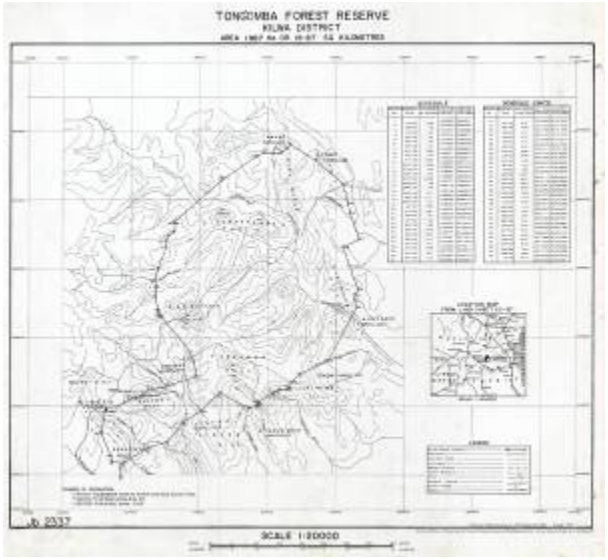
Area: 4,605 ha

Legal status: Productive Forest Reserve – Boundary variation order No. of 2000.

Description: Deciduous woodland and forest between 150 - 380 m asl

Location: Rufiji District. 8° 15’ S - 8° 19’ S; 39° 00’ E - 39° 06’ E

2.4 Tong’omba Forest Reserve



Area: 2509 ha

Legal status: Protective Forest Reserve under Central Government control. Sch.

Description: Dry forest, riverine forest, transition woodland and woodland between 150 - 540 m asl.

Location: Kilwa District. 8° 24’ S - 8° 28’ S; 38° 58’ E - 39° 02’ E

2.5 Nambunju Proposed Village Land Forest Reserve

Area 1,996 ha
Legal status: Village Land Forest Reserve managed by Nambunju village.
Location: Rufiji District. 492000 9085000 Map JB 2353

2.6 Mbwara Proposed Village Land Forest Reserve

Area: 600 ha. At the time of writing this report the village is planning to extend the boundaries of this VLFR.
Legal status: Village Land Forest Reserve managed by Mbwara Village. This reserve is currently awaiting approval of the Management Plan by the District.
Location: Rufiji District. 497400 9092800 Map: JB 2354

2.7 Nyamwage Proposed Village Land Forest Reserve

Area: 1,250 ha
Legal status: Proposed Village Land Forest Reserve. Managed by Nyamwage Village.
Location: Rufji District

2.8 Tawi Proposed Village Land Forest Reserve

Area: 2,775 ha
Legal status: Proposed Village Land Forest Reserve managed by Tawi Village.
Location: Rufiji District. 487500 9086800 Map: JB 2351

3.0 Geology and Soils

3.1 Method

Information within this section is based on a review of the relevant literature. No original research was conducted on the geology and soils of the area.

3.2 Results

3.2.1 Overview of geology

Karoo sedimentary rocks are exposed in Matumbi and the plains to the west of them (290 – 180 million years ago, lain down during the first marine incursions of Gondwanaland) Karoo rock is less nutrient rich than calcareous base-rich surface rocks found elsewhere in the coastal plain. The following breakdown is given for a 3000m section of Karoo from Matumbi (Kent P. E. *et al.* 1971);

- Massive brown sandstone;
- Red mudstones and sandstones;
- Green flaggy sandstones and silty mudstones;
- Coarse pebbly feldspathic sandstones with interbedded red and green mudstones and some calcareous nodules;
- Sandstones with fossils, probably marine;
- Coarse pebbly feldspathic sandstone;
- Pale-grey fine grained nodular limestone.

3.2.2 Overview of soils

Within the LCF Landscape tropical ferruginous sandy soils are common and support dry or semi-dry forests including areas of miombo and the Kichi Hills FR. Clayey vertisols (black cotton soil) occurs along river banks. (Mwasumbi *et al*, 2000).

Kiwengoma Forest Reserve

> 'Predominantly sandy soils varying in redness, with deep humus soils in riverine forest areas, and homogenous clay soils in woodland areas' (Clarke & Dickenson, 1995).

Namakutwa-Nyamuete Forest Reserve

> 'A fine plateau cattenary sequence occurs on the hill tops with a thin (3 – 4cm) humus layer. Soils on the hillside are coarser, shallower and better aerated, with the depth of humus related to the level of anthropogenic disturbance. Valley bottoms contain deep loamy soils underlain by fine clays which retain water. Degradation of soils following land clearance from agriculture is rapid, taking place within 15 years.' (Clarke & Dickenson, 1995).

Tong'omba Forest Reserve

> Red-brown sandy loams, alluvial deposits and vertisols, in valley bottoms support the dry evergreen forest of Tong'omba FR of the Matumbi Massif that grades to scrub forest at lower altitudes (Mwasumbi *et al*, 2000).

4.0 Climate

4.1 Method

Information within this section is based on a review of the relevant literature. No original research was conducted on the climate of the area.

4.2 Results

The lowland coastal forests are influenced by the tropical East African oceanic temperatures that become slightly modified by altitude. The rainfall station at Mohoro Dispensary between the years of 1939 and 1966 recorded an average annual rainfall of 1083 mm. The months of June, July, August, September and October had a monthly average of less than 50 mm of rainfall during this period (Clarke & Dickenson, 1995).

Mean annual rainfall ranges from 1001 – 1400 mm (FBD Harvesting Plan Kichi Hills, FBD Harvesting Plan Namakutwa-Nyamuete, 2004). No clarifications of the source or collection period of these data are given in the reports.

5.0 Vegetation

5.1 Methods

This section contains species lists of flora recorded during past surveys of Kiwengoma FR, Namakutwa-Nyamuete FR, Tong'oma FR and Kichi Hills FR. Information within this section is based on a review of the relevant literature. No original research was conducted on the vegetation of the area.

Vegetation data have been collected from Kiwengoma FR (Waters & Burgess, 1994), Namakutwa-Nyamuete FR (Clarke & Dickenson, 1995) and Tong'omba FR (Stubblefield, 1994). Each of these surveys was conducted by Frontier Tanzania with field work conducted in 1990; 1992 and 1990 respectfully.

More recently Mwasumbi *et al* (2000) conducted a floral survey of Kichi Hills FR under contract to the Rufiji Environmental Management Project, IUCN. GPS coordinates of vegetation plots exist (Table 1) for this survey thus this 2000 survey data could be used as a baseline and repeat surveys made to the same sites if the resources become available to engage a team of suitably experienced botanists, for species recorded by plot see Table 2 - Table 4. Plot size is 50 x 20 m. 143 species were recorded by this survey for Kichi Hills FR.

Ahrends (2005) conducted an MSc research thesis 'Patterns of degradation in lowland coastal forests in Coast Region, Tanzania'. Field work for this study of relevance to this report is the work conducted in Kichi Hills FR and Kiwengoma FR.

A species list compiled from the above mentioned surveys can be found below, Section 5.2.1.

5.2 Results

5.2.1 Species list - plants

Species	Red List	KH	KG	NN	Endemics	Year of survey
Abrus precatorius L.		X				* = Ahrends (2005)
Acacia adenocalyx			#			X = REMP (2000)
Acacia sieberana DC.		X				$ = Frontier (1992)
Acalypha gillmannii A. R. Smith		X				# = Frontier (1990)
Acalypha neptunica Muell. Arg.		X				
Acridocarpus alopecurus			#			
Adenia dolichosiphon Harms		X				
Afzelia quanzensis Welw.		X	*	*		
Albertisia undulata (Hiern) Forman.		X				
Albizia glaberrima (Schum. & Thonn.) Benth.		X				
Albizia gummifera			*			
Albizia petersiana		*	#			
Albizia petersiana (Bolle) Oliv.		X				
Albizia versicolor			*			
Alchornea laxiflora (Benth.) Pax. & Hoffm.		X	# *	$		
Alchornea sp.(Kitwana)		X				
Allophylus africanus			#			
Amblygonocarpus andongensis (Oliv.) Exell & Torre		X				
Annona senegalensis Pers.		X	*	*		
Antidesma venosum Tul.		X	# *			
Apporhiza paniculata			#			
Asteranthe asterias	VU		*	*	Endemic	
Asteranthe lutea			#			
Asystasia gangetica (L.) T. Anders		X				
Asystasia sp.			*			
Baphia kirkii	VU		# *	*	Endemic	
Basananthe lanceolata (Engl.) De Wilde		X				
Bauhinia tomentosa	VU		# *	$ *		
Bequaertiodendron magalismontanum			#			
Bersama abyssinica			#			
Bivinia jalbertii			#	$		
Blepharis maderaspatensis (L.) Roth.		X				
Blighia unijugata				$		
Bombax rhodognaphalon	VU		# *	$ *		
Boscia salicifolia			*			
Brachystegia microphylla			*	*		
Brachystegia spiciformis			*	*		
Brackenridgea zanguebarica				*		
Bridelia atroviridis			#			
Bridelia cathartica				*		
Bridelia micrantha			# *	$ *		
Burkea africana			*	*		

Species	Red List	KH	KG	NN	Endemics	Year of survey
Burrtdavya nyasica			#			* = Ahrends (2005)
Byttneria glabra K Schum		X				X = REMP (2000)
Caloncoba welwitschii (Oliv.) Gilg.		X	#	$		$ = Frontier (1992)
Canthium sp.				*		# = Frontier (1990)
Capparis sepiaris L.		X				
Carpodiptera africana Mast.		X				
Cassia abbreviata Oliv.		X	# *	*		
Cassia burrtii			#	$		
Cassia petersiana			#			
Cassipourea malosana (Bak.) Alston		X				
Catunaregam obovata				*		
Caturanegan spinosa (Thunb.) Tirven		X				
Celtis africana			*	*		
Cetaria sp.			*			
Chassalia sp.			*			
Chazaliella abrupta (Hiern) Petit & Verdc.		X				
Clausena anisata			#			
Cleistochlamys kirkii (Benth.) Oliv.		X				
Clerodendrum sp.				*		
Cola discoglypremnophylla Brenan & Jones		X				
Cola microcarpa			#			
Combretum adenogonium			#			
Combretum molle G. Don.		X	*	*		
Combretum pentagonum Laws.		X				
Combretum zeyheri Sond.		X	*	*		
Commelina benghalensis L.		X				
Commiphora africana			*	$ *		
Commiphora eminii Engl.		X				
Commiphora serrata Engl.		X				
Commiphora sp.			*			
Commiphora zanzibarica (Baill.) Engl.		X				
Commiphora zimmermannii			#			
Craibia zimmermannii			#			
Cremaspora triflora				*		
Crossopteryx febrifuga (G. Don.) Benth.		X	*	*		
Crotolaria goodiiformis Vatke		X				
Croton pseudopulchellus			*			
Croton sylvaticus			#	$		
Cussonia zimmermannii Harms		X	# *	*	Endemic	
Cynometra sp.			# *	*		
Dalbergia melanoxylon				*		
Dalbergia nitidula			*			
Dalbergia obovata			#			
Dalbergia sp.			*			
Dalbergia vaccinifolia	VU		*			
Deinbollia borbonica			# *	$		

Species	Red List	KH	KG	NN	Endemics	Year of survey
Dialium holtzii Harms	VU	X	# *	$ *	Endemic	* = Ahrends (2005)
Dichapetalum edule		X				X = REMP (2000)
Dichapetalum stuhlmannii Engl.		X		$ *		$ = Frontier (1992)
Dichrostachys cinerea (L.) Wight & Arn.		X				# = Frontier (1990)
Diospyros brucei			#			
Diospyros kabuyeana F. White				$		
Diospyros lycioides			*			
Diospyros mafiensis			*	*	Endemic	
Diospyros mespiliformis DC.		X	*	*		
Diospyros squarrosa			*	$		
Diospyros usambarensis			#			
Diospyros verrucosa			# *	$ *		
Diospyros zombensis			#			
Diplorhynchus condilocapum			*			
Diplorhynchus sp.				*		
Dombeya cincinnata K. Schum.		X	*	*		
Dracaena deremensis			#			
Dracaena sp.				*		
Drypetes arguta (Muell. Arg.) Hutch.		X				
Drypetes natalensis (Harv.) Hutch.		X				
Drypetes sp.			*			
Englerophytum natalense		X				
Entandophragma deiningeri			*			
Erythrina sacleuxii Hua		X				
Eugenia capensis (Eckl. & Zeyh.) Sond.		X				
Euphorbia tirucalli			#			
Fernandoa magnifica Seem		X				
Ficus bussei Mildbr.		X				
Flacourtia indica			*	*		
Garcinia buchananii			#			
Garcinia livingstonei			*			
Gardenis ternifolia ssp. jovis-tonantis		X				
Gossypioides kirkii (Mast.) Hutch.		X				
Grevia eggelingii			#			
Grewia bicolor				*		
Grewia conocarpa			*	*	Endemic	
Grewia goetzeana			#	$		
Grewia holstii Burret.		X				
Grewia monticola			#			
Haplocoelum foliolosum			*	*		
Harrisonia abyssinica			#			
Harungana madagascariensis Poir		X				
Heritiera sp.			*	*		
Hippocratea sp.			*	*		
Holarrhena pubescens			#			
Hugonia castaneifolia Engl.		X	*	*	Endemic	
Hymenaea verrucosa			# *	$ *		

Species	Red List	KH	KG	NN	Endemics	Year of survey
Hymenocardia ulmoides Oliv.		X	# *	*		* = Ahrends (2005)
Hyparrhenia filipendula (Hochst.) Stapf		X				X = REMP (2000)
Inhambanella henriquesii			#			$ = Frontier (1992)
Isoberlinia scheffleri			#			# = Frontier (1990)
Isoglossa lactea		X				
Isolona heinsenii			#			
Julbernardia globiflora			*	*		
Khaya anthotheca	VU		# *	*		
Kigelia africana (Lam.) Benth.		X	#			
Kyllinga sp.				*		
Landolphia kirkii				*		
Landophia kirki Dyeri		X				
Lannea antiscorbutica			#			
Lannea schimperi			*	*		
Lannea schweinfurthii (Engl. (Engl)		X				
Lannea schweinfurthii var. stuhlmannii			*	*		
Lepisanthes senegalensis			#			
Leptactina oxyloba			#			
Leptactina platyphylla (Hiern) Wernhi		X	#	$		
Leptactina sp.				*		
Leptochloa chinensis (l.) Nees		X				
Lettowianthus stellatus Diels	VU	X	*	$ *		
Lindackeria bukobensis Gilg		X				
Lippia javanica (Burm.f.)Spreng.		X				
Lonchocarpus capassa Roffe		X				
Maclura africana			#			
Maerua triphylla			#			
Majidea zanguebarica				*		
Malacantha alnifolia			#	$		
Malcantha alnifolia				$		
Mallotus oppositifolius			#	$		
Manilkara sansibarensis			# *	*		
Manilkara sulcata			*	*		
Maprounea africana			*			
Margaritaria discoidea (Baill.) Webster		X	*	*		
Margaritaria sp.			*			
Mariscus hemisphaericus (Boeck.) C.B. Cl.		X				
Markhamia acuminata sp.				$ *		
Markhamia obtusifolia (Bak.) Sprague		X	# *	$ *		
Memecylon sansibaricum Taub.		X				
Milbraedia carpinifolia (Pax) Hutch.		X				
Milicia excelsa (Welw.) C.C. Berg		X		$		
Millettia bussei				$		
Millettia impressa			#			
Millettia sp.			*	*		
Millettia stuhlmannii Taub.		X	*	*		
Mimusopsis fruticosa A.DC.		X				

Species	Red List	KH	KG	NN	Endemics	Year of survey
Monodora angolensis			*	*		* = Ahrends (2005)
Monodora junodii			#			X = REMP (2000)
Multidentia crassa			*	*		$ = Frontier (1992)
Newtonia buchananii (Bak.) Gilb. & Bout.		X				# = Frontier (1990)
Newtonia paucijuga			#			
Ochna atropurpurea				*		
Ochna holstii			*	*		
Ochna mossambicensis				*	Endemic	
Olax obtusifolia			#			
Olax pentandra Sleumer		X				
Olax sp.			*			
Olinia sp.			*	*		
Oncoba spinosa				*		
Ophrypetalum odoratum Diels		X				
Orphrypetalum odoratum			#			
Oxyanthus pyriformis (Hochst.) Skeels		X				
Oxyanthus speciosus			*	*		
Oxyanthus zanguebaricus Hiern) Brids.		X	#			
Ozoroa insignis Del.		X				
Pachystela msolo			*			
Pachystela sp.			*			
Pancovia holtzii Gilg		X				
Panicum comorense Mez		X				
Panicum laticomum Nees		X				
Panicum maximum Jacq.		X		*		
Panicum trichocladum K. Schum.		X				
Parkia filicoides			#			
Paulinia pinnata L		X				
Pavetta sp.			*	*		
Pentas bussei K. Krause		X				
Pericorpsis angolensis			*	*		
Phyllanthus leucanthus Pax		X				
Phyllanthus nummulariifolius			#			
Phyllanthus reticulatus				*		
Polyalthia tanganyikensis Vollesen		X				
Polysphaeria multiflora			#	$		
Polysphaeria parviflora				*	Endemic	
Pseudolachnostylis maprouneaefolia			*	*		
Pseudolachnostylis maprouneifolia Pax		X				
Psilotricum scleranthum Thw.		X				
Psorospernum febrifugum			#			
Psychotria lauracea			#			
Psychotria punctata Vatke		X				
Pteleopis myrtifolia (Laws.) Engl. Diels		X				
Pteleopsis apetala			#			
Pteleopsis myrtifolia			*	*		
Pterocarpus angolensis			*	*		

Species	Red List	KH	KG	NN	Endemics	Year of survey
Pterocarpus stolzii			*			* = Ahrends (2005)
Pterocarpus tinctorius			#			X = REMP (2000)
Pyrostria bibracteata (Bak.) Cavaco		X				$ = Frontier (1992)
Rauvolfia mombasiana			#			# = Frontier (1990)
Rhamnus prinoides			*			
Ricinodendron heudelottii			#	$		
Rinorea angustifolia			#			
Rinorea elliptica			#			
Rinorea ilicifolia			*			
Rinorea welwitchii			#			
Rothmannia macrosiphon (Engl.) Bridson				$		
Rothmannia manganjae			#			
Rothmannia ravae (Chiov.) Brids.		X	#			
Rourea orientalis Baill.		X	# *	*		
Rytigynia binata (K. Schum.) Robyns		X				
Rytigynia cf. lenticellata				*		
Rytigynia pergracilis Verdc.		X	#			
Saba comorensis (Bojer) Pichon		X				
Salacia leptoclada Tul.		X				
Salacia madagascariensis (Lam.) DC.		X				
Salacia sp.			*			
Sapium armatum Pax & K. Schum.		X	#	$		
Sapium ellipticum			#			
Sapium sp.			*	*		
Schefflera sp.				*		
Schlechterina mitostemmatoides Harms		X				
Schrebera alata			*	*		
Scolopia rhamniphylla				$		
Scorodophloeos fischeri			*			
Scorodophloeus fischeri (Taub.) J. Leon.		X	#			
Securidaca longipedunculata			*			
Setaria homonyma (Steud) Chiov.		X				
Sideroxylom inerme L.		X				
Sloetiopsis usambarensis			#			
Sorindeia madagascariensis			# *	$ *		
Spermacoce sinensis (Klotzsch) Hiern		X				
Sterculia appendiculata K. Schum.		X	#			
Sterculia quinqueloba (Garcke) K. Schum.		X				
Sterculia sp.			*	*		
Stereospermum kunthianum			*	*		
Strychnos cocculoides			*	*		
Strychnos henningsii Gilg		X				
Strychnos madagascariensis Poir		X				
Strychnos panganensis				*		
Strychnos sp.			*	*		
Strychnos spinosa			*			
Suregada zanzibariensis Baill		X	# *	$ *		

Species	Red List	KH	KG	NN	Endemics	Year of survey
Swartzia madagascariensis			*			* = Ahrends (2005)
Synaptolepis kirkii Oliv.		X				X = REMP (2000)
Tabernaemontana elegans			*	*		$ = Frontier (1992)
Tamarindus indica			# *	*		# = Frontier (1990)
Tarenna drummondii Brids.		X				
Tarenna graveolens				*		
Teclea nobilis			*	*		
Teclea simplicifolia			*	*		
Terminalia mollis			*			
Terminalia sericea DC.		X	*	*		
Tessmannia densiflora Harms			#			
Tetracera boiviniana Baill.		X				
Tetrapleura tetraptera			#			
Tragia furialis Prain		X				
Tricalysia ovalifolia Hiern		X				
Tricalysia pallens			#			
Trichilia emetica			# *	*		
Triumfetta rhomboidea Jacq.		X				
Turraea nilotica Kotschy & Peyr.		X				
Uvaria acuminata Oliv.		X				
Uvaria kirkii				*	Endemic	
Uvariodendron gorgonis Verdc.			#			
Uvariodendron sp.			*			
Vangueria infausta Burch.		X	*	*		
Vangueria madagascariensis				$		
Vismia orientalis			# *	$	Endemic	
Vitex buchananii Gurke		X	#			
Vitex keniensis	VU					
Vitex mombassae			*	*		
Vitex zanzibarensis	VU		*		Endemic	
Voacanga thouarsii Stapf		X				
Xeroderris stuhlmannii			*	*		
Xerroderis stuhlmannii (Taub.) Mend. & Souza		X				
Ximenia americana var. caffra			*	*		
Ximenia caffra Sond.		X				
Xylopia parviflora (A. Rich.) Benth.		X	#			
Xylotheca tettensis (Klotzsch) Gilg			#	*		
Zanha africana			*	*		
Zanthoxylum chalybeum Engl.		X				
Zanthoxylum holtizianum (Engl.) Waterm.		X				
Zanthoxylum holtzianum	VU		*	*	Endemic	
Zanthoxylum lindense			#			
Ziziphus mucronata				*		
Ziziphus pubescens			#			
Ziziphus sp.				*		

VU = Red List of threatened species 'Vulnerable'. Status from Ahrends (2005)
Endemic. From Ahrends (2005)

5.2.2 Vegetation plot coordinates

Table 1 Vegetation plot coordinates (Mwasumbi et al, 2000)

Kichi Hills	GPS	
	S	**E**
Transect 1, Plot 1	08°14'18.5"	038° 39'02.7"
Transect 2, Plot 2	08°14 25.5"	038° 39'05.5"
Transect 2, Plot 9	08°13'53.8"	038° 38'48.3"

5.2.3 Vegetation plot data

Table 2 Kichi Hills Transect 1, Plot 1 (Mwasumbi et al, 2000)

No.	Species	CBH (cm)	Height (m)	Remarks
1	*Pteleopsis myrtifolia*	152	25	
2	*Rothmannia ravae*	60	13	
3	*Turraea nilotica*	40	10	
4	*Zanthoxylum holtizianum*	65	14	
5	*Millettia usaramensis*	52	14	2 stemmed
6	*Millettia usaramensis*	61	14	
7	*Markhamia obtusifolia*	60	14	
8	*Markhamia obtusifolia*	60	13	
9	*Ozoroa insignis*	120	20	
10	*Tarenna drummondii*	60	15	
11	*Drypetes natalensis*	40	12	
12	*Tarenna drummondii*	70	20	
13	*Commiphora serrata*	70	20	
14	*Tarenna drummondii*	60	12	
15	*Xylopia parviflora*	120	12	
16	*Markhamia obtusifolia*	60	18	
17	*Afzelia quanzensis*	50	9	
18	*Xylopia parviflora*	70	15	
19	*Xylopia parviflora*	80	15	
20	*Tarenna drummondii*	40	10	
21	*Markhamia obtusifolia*	51	11	
22	*Millettia usaramensis*	140	18	
23	*Markhamia obtusifolia*	51	11	
24	*Markhamia obtusifolia*	36	10	
25	*Diospyros verrucosa*	55	13	2 stemmed
26	*Diospyros verrucosa*	69	-	
27	*Commiphora serrata*	172	20	
28	*Markhamia obtusifolia*	44	19	
29	*Tarenna drummondii*	40	14	
30	*Diospyros mespiliformis*	50	10	
31	*Dialium holtzii*	152	25	
32	*Diospyros mespiliformis*	50	14	2 stemmed
33	*Diospyros mespiliformis*	42	12	
34	*Millettia usaramensis*	84	16	
35	*Markhamia obtusifolia*	60	13	

36	*Dichapetalum stuhlmannii*	46	10	
37	*Markhamia obtusifolia*	64	16	
38	*Markhamia obtusifolia*	50	14	
39	*Millettia usaramensis*	49	11	
40	*Millettia usaramensis*	64	15	
41	*Fernandoa magnifica*	43	12	
42	*Markhamia obtusifolia*	50	14	
43	*Millettia usaramensis*	45	15	
44	*Hymenocardia ulmoides*	48	9	
45	*Markhamia obtusifolia*	40	15	
46	*Millettia usaramensis*	47	10	
47	*Sapium armatum*	57	17	
48	*Mildbraedia carpinifolia*	48	18	
49	*Markhamia obtusifolia*	56	16	
50	*Hymenocardia ulmoides*	56	12	
51	*Millettia usaramensis*	67	20	
52	*Millettia usaramensis*	46	17	
53	*Lettowianthus stellatus*	42	13	

Table 3 Kichi Hills Transect 2, Plot 2 (Mwasumbi et al, 2000)

No.	Species	CBH (cm)	Height (m)	Remarks
1	*Cola discoglypremnophylla*	38	12	
2	*Cola discoglypremnophylla*	48	16	
3	*Commiphora serrata*	310	31	
4	*Cola discoglypremnophylla*	40	12	
5	*Cola discoglypremnophylla*	40	12	
6	*Tricalysia ovalifolia*	37	10	
7	*Haplocoelopsis africana*	36	11	
8	*Haplocoelopsis africana*	56	15	
9	*Cola discoglypremnophylla*	41	12	
10	*Haplocoelopsis africana*	48	13	
11	*Tarenna drummondii*	92	25	
12	*Millettia usaramensis*	66	14	
13	*Cola discoglypremnophylla*	54	14	
14	*Commiphora serrata*	234	27	
15	*Markhamia obtusifolia*	73	18	
16	*Cola discoglypremnophylla*	38	12	
17	*Haplocoelepsis africana*	40	15	
18	*Millettia usaramensis*	100	28	
19	*Diospyros mespiliformis*	45	11	
20	*Tarenna drummondii*	45	14	
21	*Haplocoelopsis africana*	98	9	
22	*Commiphora serrata*	183	32	
23	*Commiphora serrata*	147	32	
24	*Diospyros mespiliformis*	47	14	
25	*Dialium holtzii*	140	30	
26	*Sapium armatum*	75	22	
27	*Tarenna drummondii*	37	14	
28	*Lettowianthus stellatus*	63	13	

29	*Tarenna drummondii*	53	17	
30	*Tarenna drummondii*	56	17	
31	*Lettowianthus stellatus*	43	17	
32	*Millettia usaramensis*	100	28	
33	*Haplocoelopsis africana*	42	12	
34	*Haplocoelopsis africana*	36	8	
35	*Diospyros mespiliformis*	46	13	
36	*Millettia usaramensis*	90	32	
37	*Millettia usaramensis*	120	26	
38	*Tarenna drummondii*	54	17	
39	*Pteleopsis myrtifolia*	148	33	
40	*Tarenna drummondii*	57	22	
41	*Commiphora serrata*	160	31	

Table 4 Kichi Hills Transect 2, Plot 9 (Mwasumbi et al, 2000)

No.	Species	CBH (cm)	Height (m)	Remarks
1	*Scorodophloeus fischeri*	50	29	
2	*Scorodophloeus fischeri*	43	13	
3	*Scorodophloeus fischeri*	115	26	
4	*Scorodophloeus fischeri*	108	25	
5	*Scorodophloeus fischeri*	115	29	
6	*Mimusops fruticosa*	44	11	
7	*Scorodophloeus fischeri*	50	13	
8	*Newtonia buchananii*	240	30	
9	*Scorodophloeus fischeri*	45	17	
10	*Scorodophloeus fischeri*	45	17	
11	*Scorodophloeus fischeri*	85	22	
12	*Scorodophloeus fischeri*	72	19	
13	*Cola discoglypremnophylla*	44	17	
14	*Rinorea angustifolia*	40	10	
15	*Scorodophloeus fischeri*	48	17	
16	*Pteleopsis myrtifolia*	65	18	
17	*Newtonia buchananii*	130	22	
18	*Sterculia appendiculata*	96	23	
19	*Scorodophloeus fischeri*	83	18	
20	*Cassia abbreviata*	72	17	
21	*Scorodophloeus fischeri*	88	19	
22	*Newtonia buchananii*	150	21	
23	*Tarenna drummondii*	47	13	
24	*Tarenna drummondii*	85	21	
25	*Tarenna drummondii*	46	15	
26	*Mimusops fruticosa*	39	9	
27	*Scorodophloeus fischeri*	120	22	
28	*Scorodophloeus fischeri*	59	20	
29	*Scorodophloeus fischeri*	90	21	
30	*Scorodophloeus fischeri*	65	22	
31	*Scorodophloeus fischeri*	42	19	
32	*Markhamia obtusifolia*	117	22	
33	*Scorodophloeus fischeri*	63	21	2 stemmed

34	*Scorodophloeus fischeri*	58	-	
35	*Mimusops fruticosa*	47	17	
36	*Scorodophloeus fischeri*	87	22	
37	*Mimusops fruticosa*	87	20	
38	*Scorodophloeus fischeri*	140	19	

5.3 Discussion

A total of 322 species have so far been recorded within the three FRs where survey data are available, summarised by FR in Table 5. Endemic and Conservation Status are taken from Ahrends (2005).

Table 5 Number of plant species - by Forest Reserve

Forest Reserve	No. of species	Red List (EN or VU)	Endemic
Kichi Hills FR	131	VU x 2	Endemic x 2
Kiwengoma FR	190	VU x 11	Endemic x 10
Namakutwa Nyamuete FR	126	VU x 8	Endemic x 4

Endemic & Red List status from Ahrends (2005)
VU = vulnerable – IUCN Red List of Threatened Species

6.0 Fauna

6.1 Method

This section contains species lists of fauna recorded during past surveys of Kiwengoma FR, Namakutwa-Nyamuete FR, Tong'oma FR and Kichi Hills FR in addition to casual observations of fauna for Mbwara VLFR, Tawi VLFR, Nambunju VLFR and Nyamwage VLFR made under the framework of this ToR.

Faunal data using a variety of trapping techniques, including, but not limited to, bucket pitfall traps, UV light-trapping, sweep-netting and casual observations have been conducted in Kiwengoma FR (Waters & Burgess, 1994), Namakutwa-Nyamuete FR (Clarke & Dickenson, 1995) and Tong'omba FR (Stubblefield, 1994). Each of these surveys was conducted by Frontier Tanzania with field work conducted in 1990; 1992 and 1990 respectfully. Data for birds, mammals, reptiles, amphibians and butterflies exist as a result of these surveys. GPS coordinates for trapping sites are not available as this technology was not being utilised by Frontier Tanzania at the time of the surveys, as such it is hard to repeat these surveys precisely but the species lists can still be considered relevant.

Andrew Perkin conducted a survey of galago and nocturnal mammals within the Rufiji Environmental Management Project Area, for which the full survey report can be found in Doody & Hamerlynck, 2003. Of relevance to this report Perkin collected data from Kiwengoma FR, Namakutwa-Nyamuete FR and Kichi Hills FR.

Kichi Hills FR (Howell *et al*, 2000) was surveyed by Howell *et al* of the University of Dar es Salaam under contract to the Rufiji Environmental Management Project, IUCN. Field work was conducted during February – March 2000. Data for mammals, reptiles and amphibians exist for this survey. GPS coordinates of the trapping sites for this survey are shown in Table 12. As trap location data are available this 2000 survey data could be used as a baseline and repeat surveys made to the same sites if the funding becomes available to engage a team of suitably experienced biologists.

6.2 Results

6.2.1 Species lists

Information contained in the following species lists combine data resultant of the above mentioned surveys. Casual observation data collected during the field visits made under this consultancy are also included.

6.2.2 Species list – mammals

Classification	Genus	Species	Common name	Red List	Forest depend.	KH FR	KG FR	TO FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
Larger mammals														X = Howell et al (2000)
BOVIDAE	*Aepyceros*	*melampus*	Impala			X								# = Frontier (1990)
	Cephalophus	*natalensis/harveyi*	Red' duiker			{}	{}		{}	x				{} = Perkin (2002)
	Cephalophus	*monticolor*	Blue duiker			{}	{}		{}					x = Jones (2006)
	Neotragus	*moschatus*	Suni		F	{}	# {}		{}					
			No ID small antelope							x	x			
	Syncerus	*caffer*	African buffalo		F		#	#			x			
	Tragelaphus	*scriptus*	Bushbuck				{}	{}	{}					
	Alcephalus	*busephalus*	Kongoni							x		x		
	Hippotragus	*niger*	Sable		F		#		$	x		x		
HIPPOPOTAMIDA	*Hippopotamus*	*amphibius*	Hippo	VU	f	X								
SUIDAE	*Phacochoerus*	*africanus*	Common warthog		f	X		#	$	x	x		x	
	Potamochoerus	*larvatus*	Bush pig		F	X {}	# {}	#	$ {}			x		
HYAENIDAE	*Crocuta*	*crocuta*	Spotted hyaena		F	X								
ELEPHANTIDAE	*Loxodonta*	*africana*	Elephant	VU	F	X {}	# {}	#	$ {}		x	x		
Hyraxes, Lagomorphs & Rodents														
GERBILLIDAE	*Tatera*	*sp.*				X								
MURIDAE	*Acomys*	*spinosissimus*			f	X		#	$					
	Arvicanthis	*niloticus*				X								
	Grammomys	*dolichurus*			F	X			$					

Con't

Classification	Genus	Species	Common name	Red List	Forest depend.	KH FR	KG FR	TO FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
	Lemniscomys	*rosalia*	Single-striped grass mouse		f	X								
	Praomys	*natalensis*				X								
	Mus	*minutoides*	Pygmy mouse		F	X	#							
	Rattus	*rattus*	House rat		f		#							
	Beamys	*hindei*	Lesser hamster-rat		F	X			$					
	Cricetomys	*gambianus*	Giant-pouched rat		F	{}	{}		$ {}					
	Tetera	*valida*			f				$					
Squirrels														
SCIURIDAE	*Heliosciurus*	*rufobrachium*			F		#	#	$					
	Heliosciurus	*undulatus*	Zanj sun squirrel			{}	{}		{}					
	Paraxerus	*flavovittis*			F				$					
	Paraxerus	*palliatus*			FF				$					
			Un-ID squirrel									x		
THRYONOMYIDAE	*Thryonomys*	*swinderianus*	Savannah cane-rat		f		#							
Porcupines														
HYSTRICIDAE	*Hystrix*	*sp.*			F		#	#						
	Athrerus	*africanus*	Brush-tailed porcupine			{}	{}		{}			x		
Bats														
Megachiroptera														
Fruit bats														

Con't

Classification	Genus	Species	Common name	Red List	Forest depend.	KH FR	KG FR	TO FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
PTEROPIDAE	*Epomophorus*	*wahlbergi*	Wahlberg's epauletted fruit bat		F		#		$					
	Rousettus	*aegyptiacus*	Egyptian fruit bat		f		#							
	Myonycteris	*relicta*	EA little collared fruit bat	VU	FF		#	#						
Microchiroptera														
Slit faced bats														
NYCTERIDEA	*Nycteris*	*grandis*	Large slit-faced bat		F			#						
Horseshoe bats														
RHINOLOPHIDAE	*Rhinolophus*	*deckenii*	Decken's horseshoe bat		F		#	#	$					
	Rhinolophus	*sp.*						#						
	Hipposideros	*ruber*			F				$					
Leaf-nosed bats														
HIPPOSIDERIDAE	*Hipposideros*	*ruber*	Noack's roundleaf bat		F		#	#						
	Triaenops	*persicus*	Persian trident bat		F			#						
Vesper bats														
VESPERTILIONIDAE	*Chalinolobus*	*variegatus*	Butterfly bat		f				$					
	Eptesicus	*capensis*	Cape serotine		F				$					
	Pipistrellus	*nanus*	Banana pipistrelle		F		#							
	Pipistrellus	*sp.*						#						
	Scotophilus	*viridis*	Greenish yellow bat		f		#		$					

Con't

Classification	Genus	Species	Common name	Red List	Forest depend.	KH FR	KG FR	TO FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
	Kerivoula	*africana*	Tanzania woolly bat	EN	FF			#						
free-tailed bats														
MOLOSSIDAE	*Mops*	*brachypterus*	Sierra Leone free-tailed bat		f		#							
Elephant shrews														
MACROSCELIDAE	*Petrodromus*	*tetradactylus*	Four toed elephant shrew		F	{}	# {}		$ {}					
	Rhynchocyon	*cirnei*	Chequered elephant shrew		f		#							
	Rhynchocyon	*petersi*	Black and rufous elephant shrew	VU	FF	{}	# {}	#	{}					
Shrews														
Insectivora														
SORICIDAE	*Crocidura*	*sp.*					#		$					
	Crocidura	*jacksoni*	Jackson's shrew		F		#							
	Crocidura	*hirta*	Lesser red musk shrew		f				$					
	Shrew sp. e				FF?			#						
Primates														
CERCOPITHECIDAE	*Cercopithecus*	*aethiops*	Vervet			X								
	Cercopithecus	*mitis*	Syke's monkey		FF	X {}	# {}	#	$ {}					
	Papio	*cynocephalus*	Yellow baboon			X	#							
	Colobus	*angolensis*	Black and white colobus			{}	{}		{}					

Con't

Classification	Genus	Species	Common name	Red List	Forest depend.	KH FR	KG FR	TO FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
GALAGONIDAE	*Galagoides*	*zanzibaricus*	Zanzibar galago		FF			#	$					
	Otelemur	*garnetti*	Garnett's galago		F	{}	{}	#	$ {}					
	Galago	*moholi*	Mohol galago			{}								
	otolemur	*crassicaudatus*	Large eared greater galago				{}							
	Galagoides	*granti*	Grant's galago			{}	{}		{}					
Mongooses														
HERPESTIDAE	*Mungos*	*mungo*	Banded mongoose				#							
	Atilax	*paludinosus*	Marsh mongoose		f		#							
	Herpestes	*ichneumon*	Egyptian mongoose		F		#							
	Nandinia	*binotata*	African palm civet		FF			#						
	Bdeogale	*crassicauda*	Dog mongoose			{}	{}		{}					
Weasels														
MUSTELIDAE	*Aonyx*	*capensis*	African clawless otter		f		#	#						
Cats														
FALIDAE	*Panthera*	*leo*	Lion	VU	f		#							
	Panthera	*pardus*	Leopard		F	{}	# {}	#	$ {}					
Ant bears														
ORYCTEROPODIDAE	*Orycteropus*	*afer*	Aardvark		f	{}	#	#		x				
Scaly ant eaters														

Con't

Classification	Genus	Species	Common name	Red List	Forest depend.	KH FR	KG FR	TO FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
PHOLODOTA	*Manis*	*temmenikii*	Ground pangolin			{}	{}		{}					

Forest dependency taken from Burgess & Clarke, 2000
FF = Forest specialist
F = Found in forest & other habitats
f = normally regarded as non-forest sp. (as assessed by NDB from Wilson & Reeder, 1993)

Key to locations:

KH Kichi Hills FR
KG Kiwengoma FR
TO Tong'omba FR
NN Namakutwa Nyamuete FR
Nam Nambunju VLFR
Mb Mbwara VLFR
Ny Nyamwage VLFR
Ta Tawi VLFR

The following data regarding the presence of mammal species within four VLFRs are the result of group interviews with the trainees conducting disturbance transects (Section 6.0 of this report). Participants' lists can be found in Appendix 5.

Table 6 Mammal species present in VLFR - data from group interviews (Nov 2006)

Common name	Nambunju VLFR interviews	Mbwara VLFR interviews	Nyamwage VLFR interviews	Tawi VLFR interviews
Red' duiker	x	x		
Unidentified small antelope	x	x	x	x
Buffalo	x	x	x	x
Bushbuck		x	x	
Kongoni	x	x	x	x
Dik-dik	x			
Greater kudu	x		x	
Sable	x	x	x	x
Eland	x	x	x	x
Wildebeest		x	x	
Zebra		x	x	
Common warthog	x	x	x	
Bush pig	x	x	x	
Wild Dog		x		
Side-striped jackal	x	x		
Spotted hyaena	x	x	x	
African civet	x	x		
Elephant	x	x	x	x
Giant pouched rat	x			
Scrub hare	x	x		x
Lord Derby's anomalure		x		
Brush-tailed porcupine	x	x		
Un-ID bats	x	x	x	x
Black and rufous elephant shrew	x	x		
Vervet		x	x	x
Syke's monkey	x	x		x
Yellow baboon	x	x	x	x
Un-ID galago		x		
Banded mongoose		x		
Lion	x	x	x	x
Leopard	x	x	x	x
Aardvark	x	x		
Ground pangolin			x	
Monitor lizard		x		
TOTAL	**24**	**30**	**19**	**13**

6.2.3 species list – birds

Classification	Genus	Species	Common name	Forest depend.	KH FR	KG FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
Hawks, eagles, vultures												# = Frontier (1990)
ACCIPITRIDAE	*Circaetus*	*fasciolatus*	Southern banded snake eagle	F	{}	# {}						$ = Frontier (1992)
	Accipiter	*tachiro*	African goshawk	F		#						? - Burgess & Clarke (published 2000). Data source / year unknown
	Accipiter	*minullus*	Little sparrowhawk		{}	#						{} = Perkin (2002)
	Gypowierax	*angolensis*	Palm-nut vulture			#			x			x = Jones (2006)
	Tetrathopius	*ecaudatus*	Bateleur		{}	# {}						
	Stephanoaetus	*coronatus*	Crowned eagle		{}	{}#	{}					
	Polyboroides	*typus*	African harrier hawk		{}							
Guinea fowl												
NUMIDIDAE	*Guttera*	*pucherani*	Crested guinea fowl	F	{}	# {}	{}		x	x	x	
Doves & pigeons												
COLUMBIDAE	*Turtur*	*tympanistria*	Tambourine dove	F		#			x			
	Turtur	*chalcospilos*	Emerald-spotted wood dove		{}	# {}	{}	x		x	x	
	Treron	*calva*	African green pigeon		{}							
Parrots & lovebirds												
PSITTACIDAE	*Poicephalus*	*cryptoxanthus*	Brown-headed parrot	F	{}	?						
Turacos												
MUSOPHAGIDAE	*Tauraco*	*livingstonii*	Livingstone's turaco	F	{}	# {}	{}		x			
	Tauraco	*porphyreolophus*	Purple-crested turaco						x			

Con't

Classification	Genus	Species	Common name	Forest depend.	KH FR	KG FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
Cuckoos & coucals												
CUCULIDAE	*Cercococcyx*	*montanus**	Barred long-tailed cuckoo	FF	{}	?			x	x	x	
	Ceuthmochares	*aereus*	Yellowbill			#						
	Centropus	*superciliosus*	White-browed coucal			#						
	Chrysococcyx	*cupreus*	African emerald cuckoo			{}	{}					
Owls												
STRIGIDAE	*Strix*	*woodfordii*	African wood owl	F		#						
	Glaucidium	*perlatum*	Pearl-spotted owl			#						
Nightjars												
CAPRIMULGIDAE	*Caprimulgus*	*pectoralis*	Fiery-necked nightjar			#		x				
	Caprimulgus	*poliocephalus*	Montane nightjar			{}						
Swifts & spinetails												
APODIDAE	*Cypsiurus*	*parvus*	Palm swift			#						
	Neofrapus	*boehmi*	Boehm's spinetail	F	{}	#						
Swallows, martins, rough-wings												
HIRUNDINIDAE	*Hirundo*	*abyssinica*	Striped swallow		{}	#						
Kingfishers												
ALCEDINIDAE	*Halcyon*	*albiventris*	Brown-hooded kingfisher			#			x		x	
	Halcyon	*chelicuti*	Striped kingfisher			#						
	Halcyon	*senegalensis*	Woodland kingfisher			#						

Con't

Classification	Genus	Species	Common name	Forest depend.	KH FR	KG FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
	Halcyon	*senegaloides*	Mangrove kingfisher						x	x		
	Ispidina	*picta*	Pygmy kingfisher			#						
Bee-eaters												
MEROPIDAE	*Merops*	*boehmi*	Boehmi's bee-eater			#						
Hoopoe												
PHOENICULIDAE	*Phoeniculus*	*purpureus*	Green wood hoopoe		{}	# {}	{}		x	x		
Trogons												
TROGONIDAE	*Apaloderma*	*narina*	Narina's trogon	F	{}	# {}	{}		x			
Hornbills												
BUCEROTIDAE	*Bycanistes*	*bucinator*	Trumpeter hornbill	F	{}	# {}	{}		x			
	Tockus	*alboterminatus*	Crowned hornbill		{}	# {}	{}				x	
	Bucorvus	*leadbeateri*	Southern ground-hornbill							x	x	
Barbets & tinckerbirds												
CAPITONIDAE	*Poganiulus*	*bilineatus*	Yellow-rumped tinkerbird	F		#						
	Poganiulus	*simplex*	Eastern green tinkerbird	FF		#						
	Poganiulus	*leucomystax*	Moustached green tinkerbird		{}							
	Buccanodon	*leucotis*	White-eared barbet			#		x				

Con't

Classification	Genus	Species	Common name	Forest depend.	KH FR	KG FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
Honeyguides												
INDICATORRIDAE	*Indicator*	*minor*	Lesser honeyguide			#						
	Indicator	*variegatus*	Scaly-throated honeyguide									
Woodpeckers												
PICIDAE	*Campethera*	*abingoni*	Golden-tailed woodpecker	F	{}	?	{}					
	Campethera	*caillianti*	Little-spotted woodpecker			#						
Broadbills												
EURYLAIMIDAE	*Smithornis*	*capensis*	African broadbill	FF	{}	# {}						
Pittas												
PITTIDAE	*Pitta*	*angolensis***	African pitta	FF		?						
Bulbuls												
PYCNONOTIDAE	*Andropadus*	*virens*	Little greenbul			#						
	Chlorocichla	*flaviventris*	Yellow-bellied greenbul	F	{}	# {}	{}					
	Nicator	*gularis*	Eastern nicator	F		?						
	Phyllastrephus	*debilis*	Tiny greenbul	FF		#						
	Phyllastrephus	*fischeri*	Fischer's greenbul	FF		#	$					
	Phyllastrephus	*flavostriatus*	Yellow-streaked greenbul	FF		#						
	Pycnonotus	*barbatus*	Commmon bulbul		{}	# {}	{}					
	Pyconotus	*barbatus*	Yellow-vented bulbul						x			

Con't

Classification	Genus	Species	Common name	Forest depend.	KH FR	KG FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
Thrushes & robbins												
TURDIDAE	*Cossypha*	*natalensis***	Red-capped robin chat	F	{}	#						
	Neocossyphus	*rufus*	Red-tailed ant thrush	FF		#						
	Cercotrichas	*leocophrys*	White-browed scrub robin			#		x		x		
	Cercotrichas	*quadrivigata*	Eastern-bearded scrub robin			#						
	Sheppardia	*gunningi*	East coast akalat			#						
	Pogonocichla	*stellata*	White starred forest robin		{}							
Warblers												
SYLVIIDAE	*Macrospehnus*	*kretschmeri*	Kretschmer's longbill	FF		#						
	Apalis	*melanocephala*	Black-headed apalis			#						
	Apalis	*flavida*	Yellow-breasted apalis		{}							
	Camaroptera	*brachyura*	Grey-backed camaroptera		{}	# {}	{}			x		
	Sylvietta	*sp.*	Crombec						x			
Flycatchers												
MONARCHIDAE	*Erythrocercus*	*livingstonei*	Livingstone's flycatcher	f	{}	?						
	Erythrocercus	*holochlorus*	Little yellow flycatcher			#	$					
	Trochocercus	*cyanomelas*	Crested flycatcher	FF		#						
	Terpsiphone	*viridis*	Paradise flycatcher		{}	# {}	{}	x				
Wattle-eyes												

Con't

Classification	Genus	Species	Common name	Forest depend.	KH FR	KG FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
PLATYSTEIRIDAE	*Batis*	*mixta*	Forest batis	FF	{}	?						
	Batis	*soror*	East coast batis		{}	{}	{}		x			
Helmet shrikes												
PRIONOPIDAE	*Prionops*	*scopifrons*	Chestnut-fronted helmet shrike	F		#					x	
	Prionops	*retzii*	Retz's helmet shrike		{}	{}	{}					
Bush shrikes												
MALACONOTIDAE	*Dryoscopus*	*cubla*	Black-backed puffback	F		#			x			
	Malaconotus	*quadricolor*	Four-coloured bush shrike	F		?		x		x		
	Malaconotus	*sulfureopectus*	Sulphur breasted bush shrike		{}							
	Laniarius	*ferrugineus*	Tropical boubou		{}	# {}	{}				x	
Drongos												
DICRURIDAE	*Dicrurus*	*ludwigii*	Square-tailed drongo	F	{}	# {}	{}					
			Fork-tailed drongo		{}	{}	{}	x	x		x	
Orioles												
ORIOLIDAE	*Oriolus*	*auratus*	African golden oriole			#						
	Oriolus	*larvatus*	Black-headed oriole			#		x				
			Green-headed oriole						x		x	

Con't

Classification	Genus	Species	Common name	Forest depend.	KH FR	KG FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
			European golden oriole					x				
TIMALIIDAE	*Trichastoma*	*rufipennis*	Pale-breasted Illadopsis			#						
Cuckoo-shrikes												
CAMPEPHAGIDAE	*Campephaga*	*flava*	Black cuckoo-shrike		{}	#	{}					
Starlings & oxpeckers												
STURNIDAE	*Lamprotornis*	*corruscus*	Black-bellied starling	F		#	{}	x				
Sunbirds												
NECTARINIIDAE	*Anthreptes*	*collaris*	Collared sunbird	F	{}	# {}	{}					
	Anthreptes	*neglectus*	Uluguru violet-backed sunbird	F		#						
	Nectarinia	*olivacea*	Olive sunbird	FF	{}	# {}	{}					
Weavers												
PLOCEIDAE	*Ploceus*	*bicolor*	Dark-backed weaver	F	{}	# {}	{}	x		x	x	
Waxbills												
ESTRILDIDAE	*Estrilda*	*astrild*	Common waxbill			#						
	Hypargos	*niveoguttatus*	Peter's twinspot	F		#						
	Mandingoa	*nitidula*	Green-backed twinspot	F		#						
	Pytilia	*melba*	Green-winged pytilia				{}					

Con't

Classification	Genus	Species	Common name	Forest depend.	KH FR	KG FR	NN FR	Nam VLFR	Mb VLFR	Ny VLFR	Ta VLFR	Source and year of survey
Rollers												
CORACIIDAE	*Coracias*	*caudatus*	Lilac breasted roller		{}							
	Eurystomus	*glaucurus*	Broad billed roller		{}				x		x	

* Altitudinal migrant
** Afro tropical migrant

Forest dependency taken from Burgess & Clarke, 2000
FF = Forest specialist. Species typical of forest interior, likely to disappear when forest modified to great extent.
F = Forest generalist. Species that occur in undisturbed forest but are able to exist at forest edge or in modified and fragmented forests. Still depend on forests for resources e.g. nesting sites.
f = Forest visitor. Species that sometimes exist in forests but more typical of other habitats especially moist woodlands & thickets. Their presence in forests may be indication of habitat disturbance.

Key to locations:

KH Kichi Hills FR
KG Kiwengoma FR
TO Tong'omba FR
NN Namakutwa Nyamuete FR
Nam Nambunju VLFR
Mb Mbwara VLFR
Ny Nyamwage VLFR
Ta Tawi VLFR

6.2.3 Species list – amphibians

Classification	Genus	Species	Forest depend.	KH FR	KG FR	TO FR	NN FR	Source and year of survey
ARTHROLEPTIDAE	*Arthroleptis*	*stenodactylus*	F	X	#	#	$	X = Howell et al (2000)
	Schoutedenella	*xenodactyloides*	F	X	#	#	$	# = Frontier (1990)
								$ = Frontier (1992)
BUFONIDAE	*Bufo*	*gutturalis*	f		#		$	
	Mertensophryne	*micranotis*	F	X	#	#		
	Stephopaedes	*loveridgei*	F	X	#			
HEMISIDAE	*Hemisus*	*narnoratus*			#			
	Hemisus	*marmoratus*	f		#			
HYPEROLIIDAE	*Afrixalus*	*brachycnemis*	f		#			
	Afrixalus	*Mitchelli*	F		#			
	Leptopelis	*flavomaculatus*	F		#	#	$	
	Leptopelis	*Argentus*	f		#			
	Hyperolius	*Mitchelli*	F		#			
	Hyperolius	*tuberilinguis*	f		#			
HEMISOTIDAE	*Hemisis*	*marmoratus*	f		#		$	
MICROHYLIDAE	*Breviceps*	*mossambicus*	f	X	#		$	
PIPIDAE	*Xenopus*	*Muelleri*	f		#	#		
RANIDAE	*Rana*	*angolensis*	f		#		$	
	Phrynobatrachus	*acridoides*	f		#		$	
	Phrynobatrachus	*mababiensis*	f				$	
	Phrynobatrachus	*ukinggensis*	F		#			
	Ptychadena	*anchietae*	f		#		$	
RHACOPHORIDAE	*Chiromantis*	*xerampelina*	f	X	#		$	

Forest dependency taken from Burgess & Clarke, 2000
F = not known to breed in the open, at least one record from coastal forest
f = regarded as non-forest species, known to breed in the open, may enter forest

6.2.3 Species list – reptiles

Classification	Genus	Species	KH FR	KG FR	TO FR	NN FR	Source and year of survey
GEKKONIDAE	*Lygodactylus*	*viscatus*		#	#	$	X = Howell et al (2000)
	Lygodactylus	*capensis grotei*		#			# = Frontier (1990)
	Lygodactylus	*luteopicturatus*		#			$ = Frontier (1992)
	Lygodactylus	*broadleyi* *		#			{} = Perkin (2002)
	Cnemaspis	*uzungwae*	X	#	#		
	Cnemaspis	*africana*		#			
	Cnemaspis	*sp.*		#			
	Hemidactylus	*platycephalus*		#	#	$	
	Hemidactylus	*mabouia*				$	
AGAMIDAE	*Agama*	*mossambica*		#	#	$	
CHAMAELEONIDAE	*Chamaeleo*	*dilepis*	X {}	#		$	
	Chamaeleo	*melleri*		#			
	Rhampholeon	*brevicaudatus*		#	#		
	Rhampholeon	*brachyurus*		#			
SCINCIDAE	*Mabuya*	*boulengeri*		#	#		
	Mabuya	*maculilabris*		#		$	
	Mabuya	*striata*		#			
	Melanseps	*loveridgei*		#			
	Panaspis	*wahlbergi*		#	#		
	Sepsina t.	*tetradactyla**		#			
CORDYLIDAE	*Cordylus t.*	*tropidosternum*	X	#			
GERRHOSAURIDAE	*Gerrhosaurus*	*major*	X				
Monitor lizards							
VARANIDAE	*Varanus*	*niloticus*		#			
Tripical worm lizards							
AMPHISBAENIDAE	*Loveridgea*	*ionidesi*				$	

Con't

Classification	Genus	Species	KH FR	KG FR	TO FR	NN FR	Source and year of survey
Serpentes							
TYPHLOPIDAE	*Rhinotyphlops*	*schlegelii*		#			
LEPTOTYPHLOPIDAE	*Leptotyphlops*	*scutifrons*		#			
VIPERIDAE	*Causus*	*defilippii*	X				
	Bitis	*gabonica*	X			$	
ATRACTASPIDIDAE	*Atractaspis*	*bibronii*		#		$	
	Aparallactus	*werneri* **		#			
	Atractaspis	*sp.*		#			
ELAPIDAE	*Naja*	*melanoleuca*		#			
	Naja	*mossambica*			#		
COLUBRIDAE: LAMPROPHIINAE	*Lamprophis*	*fuliginosus*		#	#		
PSAMMOPHIINAE	*Psammophis*	*phillipsii*			#		
	Psammophis	*subtaeniatus*		#	#		
NATRICINAE	*Natriciteres*	*olivacea*		#	#		
PHILPTHAMNINI	*Philothamnus*	*macrops**		#			
	Philothamnus	*hoplogaster*		#	#		
DISPHOLIDINI	*Thelotornis*	*capensis mossambicanus*		#	#	$	
BOIGINI	*Crotaphopeltis*	*hotomboeia*	X	#			
	Crotaphopeltis	*tornieri***		#			

Endemic definition from Burgess & Clarke, 2000
* coastal forest endemic
** forest endemic

6.2.4 Species list – butterflies

Classification	Genus	Species	Forest depend.	KG FR	NN FR	Source and year of survey
PAPILIONIDAE	*Papilio*	*ophidicephalus ophidicephalus*		#		# = Frontier (1990)
	Papilio	*dardanus tibullus*		#		? - Burgess & Clarke (published 2000). Data source / year unknown
	Papilio	*polistratus polistratus*		#		$ = Frontier (1992)
	Graphium	*leonidas leonidas*		#		
	Graphium	*philonoe philonoe*	Hw, F	#		
PIERIDAE	*Appias*	*Lasti*	Fm, Hw	#		
	Belenois	*Thysa*		#		
	Belenois	*Creona*		#		
	Nepheronia	*Argia*		#		
	Nepheronia	*Thalassina*		#		
	Leptosia	*Alcesta*		#		
	Eurema	*Floricola*		#		
	Mylothris	*yulei ertli*		#		
	Mylothris	*kilimensis rondonis**	F, Fm	?		
	Dixeya	*Orbone*		#		
	Colotis	*Antevippe*		#		
ACRAEIDAE	*Bematistes*	*epaea epitellus*		#		
	Acraea	*Satis*		#		
	Acraea	*quirina roas*		#		
	Acraea	*Eponina*		#		
SATYRIDAE	*Bicyclus*	*Safitza*		#		
	Bicyclus	*Campus*		#		
DANAIDAE	*Amauris*	*niavius damoclides*		#		
LYCAENIDAE	*Pentila*	*pauli nyassana*		#		
	Pentila	*r. parapetreia**	F	?		
	Pentila	*Rodgersi*		#		
	Baliochila	*Amanica*	F	?		

Con't

Classification	Genus	Species	Forest depend.	KG FR	NN FR	Source and year of survey
	Baliochila	*latimarginata**	F	?		
	Baliochila	*Minima*		#		
	Baliochila	*stygia**	F	#		
	Teriomima	*micra**	F	#		
	Teriomima	*puella**	F	#		
	Teriomima	*subpunctata**	F	?		
	Hemiolaus	*Coeculus*		#		
	Epamera	*sp.*		#		
	Epamera	*silanus silanus**	F	?		
	Azanus	*Moriqua*		#		
HESPERIIDAE	*Tagiades*	*Flesus*		#		
	Sarangesa	*Motozi*		#		
	Gorgyra	*Subflavidus*		#		
	Andronymus	*caesar philander*		#		
	Teniorhinus	*Herilus*		#		
NYMPHALIDAE	*Euphaedra*	*orientalis**	F	#	$	
	Euphaedra	*neophron neophron*	G, F, Hw	#		
	Bebearia	*Mardania*		#		
	Bebearia	*Chriemhilda*	F		$	
	Hypolimnus	*dubius wahlbergi*		#		
	Hypolimnus	*Deceptor*	F, W	#	$	
	Hypolimnus	*usambarae**	F	#		
	Salamis	*cacta amaniensis*	F	#		
	Pseudacraea	*boisduvali trimeni*		#		
	Pseudacraea	*Lucretia*		#		
	Sallya	*boisduvali*		#		
	Sallya	*Natalensis*	Hw, F		$	
	Sallya	*Pseudotrimeni*	F	#		
	Neptis	*saclava marpessa*		#		
	Neptis	*Carcassoni*	F	#	$	
	Harma	*theobene blassi*		#		

Con't

Classification	Genus	Species	Forest depend.	KG FR	NN FR	Source and year of survey
	Cyrestis	*camillus sublineata*		#		
	Aterica	*Galenus*		#		
	Junonia	*Natalica*		#		
	Charaxes	*Macclouni*		#		
	Charaxes	*cithaeron kennethi*		#		
	Charaxes	*violetta maritime**	F	#	$	
	Charaxes	*protoclea azota*		#		
	Charaxes	*jahluisa kenyensis*		#		
	Charaxes	*etesipe tavetensis*		#		
	Charaxes	*brutus alcyone*		#		
	Charaxes	*castor flavifasciatus*		#		
	Charaxes	*zoolina zoolina*		#		
	Charaxes	*bohemani bohemani*		#		
	Charaxes	*varanes vologeses*		#		
	Charaxes	*Candiope*		#		
	Charaxes	*phthodoris nesaea**	F		$	
	Euxanthe	*Wakefieldi*	F	#		
	Euxanthe	*tiberius tiberius**	F	#		
	Acraea	*epaea epitellus*	F	?		
	Acraea	*satis Ward*	F	?		
	Bebearia	*orientis orientis*	Fm, G	?	$	

Forest dependant definition from Burgess & Clarke, 2000

Habitats

F Forest
Fm Forest margins
Hw Dense woodland (closed canopy)
W Woodland
G Gardens and farmland

6.3 Discussion

For those FRs where faunal data do exist the survey effort differs between reserves thus species richness can not be compared between reserves.

Mammals: A total of 73 species from 25 families have been recorded in the eight FRs, summarised by FR in Table 7. Forest dependence definitions are taken from Burgess and Clarke, 2000. Conservation Status is taken from IUCN 2006 Red List of Threatened Species, EN = endangered, VU = vulnerable.

Table 7 No. of species of mammal per Forest Reserve

Forest Reserve	No. of species	No. of families	Forest dependency	Conservation status (EN or VU)
Kichi Hills FR	33	16	FF x 2 F x 11 f x 5	VU x 3
Kiwengoma FR	44	21	FF x 3 F x 18 f x 10	VU x 4
Tong'omba FR	25	19	FF x 6 FF? x 1 F x 11 f x 4	EN x 1 VU x 3
Namakutwa Nyamuete FR	36	17	FF x 4 F x 16 f x 6	VU x 2
Nambunju VLFR	6	3	F x 1 f x 2	Non
Mbwara VLFR	4	3	F x 2 f x 1	VU x 1
Nyamwage VLFR	6	5	F x 3	VU x 1
Tawi VLFR	1	1	f x 1	Non

FF = Forest specialist (FF? species characteristics unknown)
F = Found in forest & other habitats
f = normally regarded as non-forest sp. (as assessed by NDB from Wilson & Reeder, 1993)

Birds: A total of 93 species from 36 families have been recorded in the seven of the eight FRs, no data are available for Tong'omba FR. Data are summarised by FR in Table 8. Forest dependence definitions are taken from Burgess and Clarke, 2000. Non of the species recorded to date are classified as Endangered or Vulnerable on the IUCN 2006 Red List of Threatened Species.

Table 8 No. of species of bird per Forest Reserve

Forest Reserve	No. of species	No. of families	Forest dependency
Kichi Hills FR	41	26	FF x 4 F x 12 f x 1
Kiwengoma FR	80	33	FF x 12 F x 25 f x 1
Namakutwa Nyamuete FR	27	21	FF x 2 F x 9
Nambunju VLFR	11	10	F x 3
Mbwara VLFR	18	16	FF x 1 F x 6
Nyamwage VLFR	10	10	FF x 1 F x 3
Tawi VLFR	12	11	FF x 1 F x 3

FF = Forest specialist. Species typical of forest interior, likely to disappear when forest modified to great extent.
F = Forest generalist. Species that occur in undisturbed forest but are able to exist at forest edge or in modified and fragmented forests. Still depend on forests for resources e.g.nesting sites.
f = Forest visitor. Species that sometimes exist in forests but more typical of other habitats esppecially moist woodlands & thickets. Their presence in forests may be indication of habitat disturbance.

Amphibians: Data on amphibians exists for four of the eight FRs under investigation. A total of 22 species from nine families have been recorded in four FRs; Kichi Hills FR, Kiwengoma FR, Tong'omba FR and Namakutwa Nyamuete FR. Summarised in Table 9. Forest dependence definitions and endemism are taken from Burgess and Clarke, 2000.

Table 9 Number of species of amphibians by Forest Reserve

Forest Reserve	No. of species	No. of families	Forest dependency
Kichi Hills	6	4	F = 4 f = 2
Kiwengoma	21	9	F = 8 f = 12
Tong'omba	5	4	F = 4 f = 1
Namakutwa Nyamuete	11	7	F = 3 f = 8

F = not known to breed in the open, at least one record from a coastal forest
f = regarded as non-forest species, known to breed in open, may enter forest

Reptiles: Data on reptiles exists for four of the eight FRs under investigation.

A total of 42 species from 19 families have been recorded in four FRs; Kichi Hills FR, Kiwengoma FR, Tong'omba FR and Namakutwa Nyamuete FR. Summarised in Table 10.

Table 10 Number of species of reptiles by Forest Reserve

Forest Reserve	No. of species	No. of families	Endemism
Kichi Hills	7	6	Non
Kiwengoma	35	16	Including three coastal forest endemics and two forest endemics
Tong'omba	14	10	Non
Namakutwa Nyamuete	10	8	Non

Butterflies: Frontier in 1990 and 1992 collected butterfly specimens from Kiwengoma FR and Namakutwa Nyamuete FR, with little collection being conducted in the latter. The Frontier report, Waters & Burgess, 1994, highlight the fact that the resultant species list does not account for all species present in the FR.

Table 11 Number of species of butterfly by Forest Reserve

Forest Reserve	No. of species	No. of families	Habitat
Kiwengoma	76	8	F = 20
Namakutwa Nyamuete	8	1	F = 5

F = Forest habitat

6.4 Kichi Hills trap site locations and summary of survey method

Table 12 contains trap site locations within Kichi Hills established in February 2000 by Howell *et al,* 2000. The survey ran from 26 February – 3 March 2000. Trapping methods included a bucket pitfall line (11 buckets each 5m apart buried up to rim height and a plastic drift fence bisecting each bucket); snap traps (number used not stated); live or 'Sherman' traps (number used not stated) and casual observations including tracks and signs. Bats, birds and butterflies were not surveyed.

Table 12 GPS coordinates (Howell *et al,* 2000)

BPFL* number	Habitat	South	East
BPFL 1	Disturbed, regenerating forest in valley near base camp at Kungurwe village	08° 18' 03"	38° 39' 06.1"
BPFL 2	200 m east of BPFL 1 in regenerating thicket, abandoned shamba. Closed thicket with tangles and climbers.	GPS unable to take reading	
BPFL 3	Secondary forest regeneration from old settlements south of Kungurwe village. Closed canopy and open or clear understory with very little leaf litter and undergrowth.	08° 16' 43.2"	38° 39' 10.2"
BPFL 4	As fro BPFL 3	08° 16' 38.5"	38° 38' 38.4"
BPFL 5	Highest point in Kichi Hills app. 300 m a.s.l. (also known as Mking Hill or Chumanii land mark); closed forest with only a few large trees; area highly disturbed by elephants in the wet season; undergrowth herbaceous.	08° 12' 46.2"	38° 38' 38.4"
BPFL 6	As for BPFL 5	08° 12' 47.3"	38° 38' 38.5"

* Bucket pitfall line.

7.0 Disturbance Transects

7.1 Introduction

Trevor Jones conducted the training sessions on how to conduct disturbance transects. He also collected casual observation data on fauna whilst in the VLFRs.

An initial briefing meeting was held in Mbwara village for representative of Nambunju, Mbwara, Nyamwage and Tawi village councils and VNRCs. At this meeting participants received an introduction as to why they should monitor changes within their VLFRs and an outline of how disturbance transects are conducted. Participants of this meeting are attached as Appendix 4.

7.2 Method

Adapted from: Doggart, N. (Ed), 2006.

Levels of disturbance are measured along transects distributed through the forest based on a stratified sampling strategy. The levels of pole cutting, timber extraction, trapping, encroachment and other human disturbances are assessed. For the purposes of this survey, poles are defined as all trees with straight stems at least 2 m in length and with a circumference at breast height (cbh) of 15.7 – 47 cm. Timber trees are defined as all trees with straight stems at least 3 m in length and exceeding 47 cm cbh.

The level of disturbance is assessed in terms of the number of incidences of pole cutting, timber cutting, traps and other disturbances in a 10 m strip (5 m either side of the transect line) along a 1 km transect. The disturbance transect is sub-divided into 50 m sections and data is recorded separately for each section.

The longitude, latitude and altitude of the start and end points of each disturbance transect are carefully measured using a GPS and recorded.

The team also record other disturbance events observed during the survey including descriptions of the kind of activity and the location of the 'event'. This provides a more comprehensive overview of disturbance occurring within the forest.

Having located the start point of the transect using the GPS, the correct bearing is followed for 1 km using a compass. The bearing may be East, West, North or South. The team use a 50 m rope to measure out 50 m sections along the 1 km transect. Records are taken separately for each 50 m section.

All disturbances and all live or naturally dead poles and trees within 5 m either side of the transect line are recorded. Where there is uncertainty regarding the circumference of a tree or pole, rope of known length is used to determine the circumference. Data are recorded in note books and transcribed onto data sheets at the end of the day's fieldwork. In case of rain, it is preferable to use a pencil for recording the data.

Fallen tree trunks or branches are not counted, only stumps. This reduces possible duplicate counts by ensuring that the trunk and branches are not counted as separate 'events'. Trees killed by fire should be recorded under the '*dead tree'* (*miti iliyokufa*) column, and a note made that they were killed by fire.

Records of other human disturbance seen along each 50 m section of the transect are made including the number of traps, pitsaws, cultivated areas or burnt areas. For each of these disturbance types notes are made on the nature of the disturbance. For example this might include information on the kind of trap; the type of crop being cultivated; the area being cultivated or the extent of a burnt area.

7.2.1 Equipment

Below is a list of required equipment. The items shown in bold have already been supplied to Nambunju, Mbwara, Nyamwage and Tawi VNRC's. With the exception of notebooks and pencils which are in the property of each member of the VNRC, equipment is retained by each Village Secretary.

50m rope
Spare rope for measuring 5m, circumferences of poles and timbers
Tape measure
Notebooks and pencils
Datasheets (Appendix 7)
Compass
Garmin Etrex GPS unit
Batteries for GPS unit
List of coordinates of all transects
Summary of transect methodology for reference

During the debriefing meeting held on 29th November it was explained that each VNRC would be responsible for the replacement of equipment as it becomes worn (e.g. GPS batteries, stationery and rope). These are low cost items that the VNRC should be able to budget for thus ensuing that the monitoring can be sustained. At the debriefing meeting there was a request for tents to facilitate travelling to parts of their forests that are considered to far to visit, conduct a transect and return in the same day. A list of participants that attended the debriefing meeting can be found in Appendix 6.

7.3 Results

A total of 45 villagers were trained to conduct disturbance transects in addition to two Rufiji District Forest Officers and one Kilwa District Forest Officer. Full lists of persons attending each training session can be found in Appendix 5.

Village	No. of villagers trained
Nambunju	11
Mbwara	10
Nyamwage	13
Tawi	11

Each day one trainee was selected from the team of trainees to assist with the training being held in other villages on subsequent days, theses persons are;
Kundemba, Nambunju
Ali Kyuta, Mbwara
Salum Ally Makogojo, Nyamwage
Habibu S. Mniwa, Tawi

One transect has been set up in each of Mbwara, Nyamwage and Tawi VLFRs and two have been set up in Nambunju VLFR. Participants recorded data along these transects as a training exercise and completed the data sheet. The understanding of the methodology was good and data recorded clearly.

Examples of completed datasheets for each of the four VLFR are shown below. The transect data collected during this consultancy should be viewed as data collected whilst people were being trained rather than as a baseline for the monitoring programme of the LCF project.

FOMU YA UHARIBIFU KATIKA TRANSECT

JINA LA MSITU.....Nambunju..... TAREHE....25.11.06.....
TRANSECT NAMBA.....1..... WASHIRIKI.....Freya St John.....
MWANZO (LAT/LONG)...37L 0494720 / 9085902.....
MWISHO (LAT/LONG).....37L 0493704 / 9085814.....
DIRA...Magharibi (270^{o})..... MUDA WA KUANZA.....04:00..... MUDA WA KUMALIZA....06:40.....

SEHEMU (m)	NGUZO HAI	NGUZO ILIYOKUFA	NGUZO ZILIZOKATWA		MITI HAI	MITI ILIYOKUFA	MITI ILIYOKATWA		Aina ya uharibifu / Mengineyo
			ZAMANI	KARIBUNI			ZAMANI	KARIBUNI	
0-50	25	1	1	0	18	0	0	0	Mt: Moto ya 2006, kwenye transect
50-100	24	0	0	0	5	3	0	0	nzima, kutoka 0-1000m
100-150	14	1	0	0	6	1	0	0	
150-200	16	0	0	0	14	0	0	0	
200-250	17	0	0	0	4	0	3	0	
250-300	17	2	0	0	5	0	0	0	
300-350	32	0	0	0	7	0	1	0	
350-400	29	0	0	0	8	0	0	0	
400-450	17	1	1	0	6	0	0	0	
450-500	16	1	0	0	7	0	2	0	
500-550	25	0	0	0	10	0	0	0	
550-600	18	2	2	0	3	0	0	0	
600-650	34	0	0	0	8	0	0	0	
650-700	22	0	0	0	3	0	0	0	Mitego ya nyati/tembo; urefu 300m;
700-750	27	3	0	0	6	1	0	0	Wire tano
750-800	15	1	0	0	7	1	1	0	
800-850	11	0	0	0	7	2	0	0	
850-900	17	0	0	0	5	1	1	0	
900-950	14	2	0	0	10	1	0	0	
950-1000	24	0	0	0	7	0	1	0	
JUMLA	**414**	**14**	**4**	**0**	**146**	**10**	**9**	**0**	

Aina ya uharibifu
Mb=Upasuaji wa mbao Mt=Moto K=Kilimo Mkz=Makazi Kb=Kambi Md=Uchimbaji madini N=Njia
Mk=Uchomaji mkaa Mg=Mitego Mw=Mizoga ya wanyama Bu=Milio ya bunduki M=Mengine
Mfano wa mengineyo: maelezo ya kina ya aina ya uharibifu, mfano ukubwa wa eneo la moto, mitego mingapi, n.k
Wawindaji. Wanyama. Alama za wanyama.

FOMU YA UHARIBIFU KATIKA TRANSECT

JINA LA MSITU.....Nambunju..... TAREHE....25.11.06.....
TRANSECT NAMBA.....2..... WASHIRIKI.....Freya St John, Francis Kiondo.....
MWANZO (LAT/LONG)...37L 0493754 / 9085314.....
MWISHO (LAT/LONG).....37L 0494792 / 9085334.....
DIRA...Mashiriki (90^{o})..... MUDA WA KUANZA.....07:20..... MUDA WA KUMALIZA....09:00.....

SEHEMU (m)	NGUZO HAI	NGUZO ILIYOKUFA	NGUZO ZILIZOKATWA		MITI HAI	MITI ILIYOKUFA	MITI ILIYOKATWA		Aina ya uharibifu / Mengineyo
			ZAMANI	KARIBUNI			ZAMANI	KARIBUNI	
0-50	29	1	0	0	8	2	1	0	Mt: Moto ya 2006, kwenye transect
50-100	6	0	0	0	7	0	0	0	nzima, kutoka 0-1000m
100-150	21	1	0	0	6	0	0	0	N
150-200	26	1	0	0	7	0	1	0	
200-250	44	4	0	0	8	1	0	0	
250-300	23	1	0	0	16	0	0	0	
300-350	19	1	0	0	10	0	0	0	
350-400	7	0	0	0	8	1	0	0	Alama za wanyama
400-450	9	0	0	0	8	1	0	0	
450-500	10	0	0	0	10	1	1	0	
500-550	14	0	0	0	15	1	0	0	
550-600	10	0	0	0	3	0	0	0	
600-650	8	0	0	0	5	0	0	0	
650-700	9	11	2	0	8	4	1	0	
700-750	25	0	0	0	10	11	1	0	
750-800	11	0	0	0	4	0	0	0	
800-850	14	0	0	0	6	0	0	0	
850-900	11	0	0	0	7	0	0	0	
900-950	17	1	0	0	10	1	0	0	
950-1000	19	0	0	0	4	1	0	0	
JUMLA	**332**	**21**	**2**	**0**	**160**	**24**	**5**	**0**	

Aina ya uharibifu
Mb=Upasuaji wa mbao Mt=Moto K=Kilimo Mkz=Makazi Kb=Kambi Md=Uchimbaji madini N=Njia
Mk=Uchomaji mkaa Mg=Mitego Mw=Mizoga ya wanyama Bu=Milio ya bunduki M=Mengine

Mfano wa mengineyo: maelezo ya kina ya aina ya uharibifu, mfano ukubwa wa eneo la moto, mitego mingapi, n.k

WWF-TPO Matumbi Hills

FOMU YA UHARIBIFU KATIKA TRANSECT

JINA LA MSITU.....Mbwara..... TAREHE....26.11.06.....
TRANSECT NAMBA.....1..... WASHIRIKI.....Freya St John, Francis Kiondo.....
MWANZO (LAT/LONG)...37L 0501780 / 9093598.....
MWISHO (LAT/LONG).....37L 0500769 / 9093662.....
DIRA...Magharibi (270^{o})..... MUDA WA KUANZA.....04:00..... MUDA WA KUMALIZA....06:05.....

SEHEMU (m)	NGUZO HAI	NGUZO ILIYOKUFA	NGUZO ZILIZOKATWA		MITI HAI	MITI ILIYOKUFA	MITI ILIYOKATWA		Aina ya uharibifu / Mengineyo
			ZAMANI	KARIBUNI			ZAMANI	KARIBUNI	
0-50	8	2	3	0	8	0	0	0	
50-100	8	0	0	0	4	0	1	0	Mt
100-150	4	2	0	0	8	0	1	0	
150-200	11	1	0	0	4	5	0	0	Mt
200-250	8	2	0	0	11	1	0	0	
250-300	29	1	0	0	9	2	0	0	N
300-350	12	0	3	0	9	0	1	0	
350-400	13	1	0	0	12	1	0	0	
400-450	18	2	1	0	11	1	0	0	
450-500	10	0	1	0	8	1	1	0	Kb
500-550	25	1	0	0	8	1	2	0	
550-600	14	2	0	0	6	0	0	0	
600-650	15	1	1	0	8	1	0	0	
650-700	5	1	1	0	4	2	0	0	
700-750	26	5	0	0	20	3	0	0	
750-800	26	3	0	0	3	1	2	0	
800-850	55	4	0	0	21	0	0	0	
850-900	50	3	0	0	6	1	0	0	
900-950	69	8	0	0	9	2	0	0	
950-1000	53	11	0	0	7	1	0	0	Mavi ya tembo (zamani)
JUMLA	**459**	**50**	**10**	**0**	**176**	**24**	**8**	**0**	

Aina ya uharibifu
Mb=Upasuaji wa mbao Mt=Moto K=Kilimo Mkz=Makazi Kb=Kambi Md=Uchimbaji madini N=Njia
Mk=Uchomaji mkaa Mg=Mitego Mw=Mizoga ya wanyama Bu=Milio ya bunduki M=Mengine

Mfano wa mengineyo: maelezo ya kina ya aina ya uharibifu, mfano ukubwa wa eneo la moto, mitego mingapi, n.k

FOMU YA UHARIBIFU KATIKA TRANSECT

JINA LA MSITU.....Nyamwage..... TAREHE.....27.11.06.....
TRANSECT NAMBA.....1..... WASHIRIKI.....Bakari Matimbwa na Bakari Linjunde.....
MWANZO (LAT/LONG)....37L 0502856 / 9096190.....
MWISHO (LAT/LONG).....37L 0502947 / 9097116.....
DIRA....Kaskazini..... MUDA WA KUANZA.....04:00..... MUDA WA KUMALIZA.....06:00.....

SEHEMU (m)	NGUZO HAI	NGUZO ILIYOKUFA	NGUZO ZILIZOKATWA		MITI HAI	MITI ILIYOKUFA	MITI ILIYOKATWA		Aina ya uharibifu / Mengineyo
			ZAMANI	KARIBUNI			ZAMANI	KARIBUNI	
0-50	12	0	0	0	7	1	2	0	Uchomaji wa moto
50-100	21	3	0	0	10	1	0	0	Barbara ya magogo
100-150	5	0	1	0	5	0	0	0	
150-200	8	1	0	0	0	0	0	0	
200-250	15	3	0	0	6	0	3	0	
250-300	19	0	0	0	8	0	1	0	
300-350	26	3	0	0	7	0	0	0	
350-400	32	2	1	0	8	2	2	0	
400-450	25	0	0	1	13	0	0	0	
450-500	18	0	3	0	7	0	0	0	
500-550	20	0	0	0	8	0	0	0	
550-600	19	0	0	0	9	0	0	0	
600-650	33	0	1	0	13	0	0	0	
650-700	22	0	0	0	7	0	0	00	
700-750	15	0	0	2	8	3	0	0	
750-800	12	0	0	0	5	0	0	0	Njia ya tembo
800-850	22	0	0	0	8	0	0	0	Njia ya tembo
850-900	14	0	0	0	4	2	1	0	
900-950	20	0	0	00	3	1	0	00	
950-1000	27	0	0	0	18	0	0	0	
JUMLA	**391**	**15**	**6**	**3**	**154**	**10**	**9**	**0**	

Aina ya uharibifu
Mb=Upasuaji wa mbao Mt=Moto K=Kilimo Mkz=Makazi Kb=Kambi Md=Uchimbaji madini N=Njia
Mk=Uchomaji mkaa Mg=Mitego Mw=Mizoga ya wanyama Bu=Milio ya bunduki M=Mengine
Mfano wa mengineyo: maelezo ya kina ya aina ya uharibifu, mfano ukubwa wa eneo la moto, mitego mingapi, n.k
Wawindaji. Wanyama. Alama za wanyama.

FOMU YA UHARIBIFU KATIKA TRANSECT

JINA LA MSITU.....Tawi..... TAREHE....28.11.06.....
TRANSECT NAMBA.....1..... WASHIRIKI.....Ally M. Mamhriglaza, Mohd Kundemba.....
MWANZO (LAT/LONG)...37L 0485350 / 9086168.....
MWISHO (LAT/LONG).....37L 0486283 / 9086136.....
DIRA...Mashariki (90^{o})..... MUDA WA KUANZA.....05:30..... MUDA WA KUMALIZA....07:40.....

SEHEMU (m)	**NGUZO HAI**	**NGUZO ILIYOKUFA**	**NGUZO ZILIZOKATWA**		**MITI HAI**	**MITI ILIYOKUFA**	**MITI ILIYOKATWA**		**Aina ya uharibifu / Mengineyo**
			ZAMANI	**KARIBUNI**			**ZAMANI**	**KARIBUNI**	
0-50	16	0	0	0	7	1	0	0	Mt
50-100	15	1	0	0	5	0	0	0	Mt
100-150	15	0	0	0	12	1	0	0	Mt
150-200	16	1	0	0	9	0	0	0	
200-250	24	1	0	1	4	0	0	0	
250-300	16	2	0	0	6	1	0	0	
300-350	11	0	0	0	2	1	0	0	
350-400	23	0	0	0	9	0	0	0	
400-450	34	0	0	0	0	0	1	0	Gogo
450-500	17	0	0	0	0	0	0	0	
500-550	22	0	0	0	3	0	0	0	
550-600	39	0	0	0	0	0	0	0	Msitu
600-650	48	0	0	0	0	0	0	0	
650-700	41	0	0	0	0	0	0	0	
700-750	43	0	0	0	0	0	0	0	
750-800	56	0	0	0	0	0	0	0	
800-850	39	0	0	0	0	0	0	0	
850-900	36	0	0	0	9	0	0	0	
900-950	67	0	0	0	10	0	0	0	
950-1000	58	0	0	0	11	0	0	0	
JUMLA	**540**	**5**	**0**	**1**	**84**	**4**	**1**	**0**	

Aina ya uharibifu
Mb=Upasuaji wa mbao Mt=Moto K=Kilimo Mkz=Makazi Kb=Kambi Md=Uchimbaji madini N=Njia
Mk=Uchomaji mkaa Mg=Mitego Mw=Mizoga ya wanyama Bu=Milio ya bunduki M=Mengine

Mfano wa mengineyo: maelezo ya kina ya aina ya uharibifu, mfano ukubwa wa eneo la moto, mitego mingapi, n.k
Wawindaji. Wanyama. Alama za wanyama.

7.4 Discussion

7.4.1 Summary of training transect data

Table 13 Training transect data summary

	Number of trees per transect				Number of poles / saplings per transect			
Transect	**Live**	**Nat. Dead**	**Old Cut**	**New Cut**	**Live**	**Nat. Dead**	**Old Cut**	**New Cut**
Nambunju T1	146	10	9	0	414	14	4	0
Nambunju T2	160	24	5	0	332	21	2	0
Mbwara T1	176	24	8	0	459	50	10	0
Nyamwage T1	154	10	9	0	391	15	6	3
Tawi T1	84	4	1	0	540	5	0	1

A total of 354 trees and 787 poles were counted on the two transects completed in Nambunju VLFR covering a distance of 2000 m, out of these 86.4% of the trees and 94.7 % of the poles were live.

A total of 208 trees and 519 poles were counted on the transect completed in Mbwara VLFR covering a distance of 1000 m, out of these 84.6 % of the trees and 88.4 % of the poles were live.

A total of 173 trees and 415 poles were counted on the transect completed in Nyamwage VLFR covering a distance of 1000 m, out of these 89.0 % of the trees and 94.2 % of the poles were live.

A total of 89 trees and 546 poles were counted on the transect completed in Tawi VLFR covering a distance of 1000 m, out of these 94.4 % of the trees and 98.9 % of the poles were live.

Old pit saw sites were found in both Nyamwage VLFR and Mbwara VLFR.

Figure 2 Mbwara pitsaw site

Figure 1 Nyamwage pitsaw site

7.4.2 Evaluation of transect data

Every three months, following the commencement of the monitoring programme, the WWF project executant / local FBD officers will meet with representatives of each village to assess progress of the WWF-facilitated conservation programme for each Village Forest Reserve. At these meetings some simple assessment of the transect data to observe trends in the different categories of disturbance along each transect should be undertaken, and the village representatives trained to interpret their data.

The results of each transect will be compared with the results from the same transect three months later, six months later, and so on ad infinitum. In terms of quantitative analysis, the key indicators for comparison between months are ratios of disturbance, e.g. the ratio of live to freshly cut trees, along each transect. The most important ratios for detecting changes in levels of disturbance are calculated as follows:

1. Ratio of freshly cut poles to live poles = $\frac{\text{freshly cut poles}}{\text{live poles}}$

2. Ratio freshly cut timbers to live timbers = $\frac{\text{freshly cut timbers}}{\text{live timbers}}$

Thus for example, if ratio 1 on Transect 3 in Tawi VFR changes over three months from 0.05 to 0.3 (a 6-times increase), we would expect to find that there has been a significant increase in the cutting of poles in that area.

Other more simple comparisons can be made between the number of snares detected, amount of animal signs observed, etc along each transect – and in the forest as a whole (by pooling data from all the transects in the forest).

This training in evaluation of data should continue every three months, until the village representatives are able to carry it out on a regular basis independently.

The direct relevance of these transect results to decision-making at the village government level on measures to protect different areas of the forest should be stressed at all times.

7.4.3 Suggested timetable

Following discussions with the WWF TPO project executant the following programme of disturbance transects for the four VLFR was agreed upon and presented to representatives of the villages at the 29th November 2006 meeting in Nambunju. As noted in the next two sections of this report, the METT and TRA together with the disturbance transects form the monitoring plan for the LCF project, with the TRA process drawing directly on information gained from the disturbance transects, the three activities need timetabling to run smoothly together.

Table 14 Monthly Monitoring Plan. Transects, METT and TRA timetable

	Nyamwage, Nambunju, Tawi VLFRs	Mbwara*	METT	TRA
Month 1	Transects 1 – 4	Transects 1 – 4	Complete form	Complete 1st half of form at start of quarter
Month 2	Transects 5 – 8	Transects 5 – 6		
Month 3	Transects 9 – 12	Transects 7 – 8		Complete 2nd half of form at end of quarter
Month 4	Transects 1 – 4	Transects 1 – 4	Complete form	Complete 1st half of form at start of quarter
Month 5	Transects 5 – 8	Transects 5 – 6		
Month 6	Transects 9 – 12	Transects 7 – 8		Complete 2nd half of form at end of quarter
Month 7	Transects 1 – 4	Transects 1 – 4	Complete form	Complete 1st half of form at start of quarter
Etc ….	Etc ….	Etc ….	Etc ….	Etc …

* Due to the small size of Mbwara VLFR (600 ha) only eight transects are required.

7.4.4 Transect GPS reference points

- All transects should be 1 km long.
- Transects are paired (parallel to each other, 300m apart, in opposite directions) to facilitate completion of two transects per day.
- For Nyamwage, Nambunju and Tawi VLFRs, each forest was divided into three sections of approximately equal area, and two pairs of transects placed randomly in each section.
- For Mbwara VLFR (which is much smaller), the forest was divided in half, and two pairs of transects placed randomly in each area.
- Only the start-points are given, because since there will be some deviation from the exact bearing on each occasion over the course of each occasion, the exact end point will vary slightly each time. This should not significantly devalue the results or negate comparisons between months.
- The end points of each transect should be recorded in the GPS unit and entered onto the datasheet.

All coordinates are in the UTM Arc 1960 geographic system – it is important that each GPS is set to this system.

Transects have been marked directly onto one copy of the appropriate JB map for each of the following FRs; Mbwara VLFR, Nambunju VLFR, Tawi VLFR, Kiwengoma FR, Tong'omba FR and Namakutwa Nyamuete. Maps for Nambunju and Kichi Hills were not available from the mapping division. These marked maps are delivered to WWF TPO together with this report so that they may be taken to the field.

Table 15 GPS coordinates for transects

Forest	Transect Number	Bearing	Easting	Northing
Mbwara VLFR	1	West	501780	9093598
	2	East	500448	9093798
	3	West	501209	9094091
	4	East	500209	9094391
	5	North	498750	9091156
	6	South	498450	9092156
	7	North	498473	9090642
	8	South	498173	9091642
Nambunju VLFR	1	West	494720	9085902
	2	East	493754	9085314
	3	West	494550	9084010
	4	East	493550	9083710
	5	West	492957	9085590
	6	East	491957	9085290
	7	West	492810	9082961
	8	East	491810	9083661
	9	West	491261	9085440
	10	East	490261	9085140
	11	West	490532	9083859
	12	East	489532	9083559
Tawi VLFR	1	East	485350	9086168
	2	West	486350	9085868
	3	East	485753	9085439
	4	West	486753	9085139
	5	East	486210	9083612
	6	West	487210	9083312
	7	East	487051	9083051
	8	West	488051	9082751
	9	East	487380	9088001
	10	West	488380	9087701
	11	East	487684	9089221
	12	West	488684	9088921
Kiwengoma FR	1	East	489406	9081582
	2	West	490406	9080582
	3	East	489812	9080491
	4	West	490812	9079491
	5	East	492387	9078792
	6	West	493387	9077792
	7	East	491923	9078005
	8	West	492923	9077005
	9	East	489631	9076922
	10	West	490631	9075922

	11	East	490905	9076111
	12	West	491905	9075111
Tong'omba	1	East	497250	9066353
	2	West	498250	9065353
	3	East	499734	9067543
	4	West	500734	9066543
	5	East	498822	9069001
	6	West	499822	9068001
	7	East	500299	9069412
	8	West	501299	9068412
	9	East	500098	9071743
	10	West	501098	9070743
	11	East	500916	9071115
	12	West	501916	9070115
Namakutwa Nyamuete FR	1	East	503618	9088752
	2	West	504618	9087752
	3	East	502001	9088622
	4	West	503001	9087622
	5	East	503958	9086391
	6	West	504958	9085391
	7	East	500374	9086252
	8	West	501374	9085252
	9	East	502812	9083211
	10	West	503812	9082211
	11	East	500653	9082433
	12	West	501653	9081433

7.4.5 Training on hand-held GPS unit

Two people from each village (the 'trainer' – see named above – plus one other) should be trained in use of the village's Garmin Etrex GPS unit. (This was not carried out during the timeframe of this consultancy because it was not determined which type of GPS unit each village would be using). Prior to delivery of a GPS unit to each village, the waypoints for each transect starting point should be entered manually into the GPS unit and given appropriate codes.

Training on how to use the GPS unit must include; turning the unit on and off (and the need to conserve batteries when it is not in use); navigating through screens and menus; obtaining satellite reception; finding required waypoint; using GO TO function to locate start of transect.

8.0 Threat Reduction Assessment

8.1 Introduction

The Threat Reduction Assessment (TRA) monitoring protocol does not take the traditional approach of monitoring biological indicators as a measure of success of a conservation project. Instead it monitors the impacts a project makes on reducing threats on a project site it is thus an indirect measurement of conservation success. If threats to the biodiversity of a project site are identified a project can assess its progress by monitoring the degree to which the threats are reduced (Margoluis & Salafsky).

Calculating the Threat Reduction Index of a project site is the result of identifying threats, ranking them according to specific criteria, and assessing progress in reducing each of them. The Threat Reduction Index is a single figure result in no need of complicated interpretation as such managers can easily see the degree to which threats to biodiversity of a project site have been reduced.

The TRA makes three key assumptions

1) **All destruction of biodiversity is human-induced.** Losses of species or habitats due to natural processes such are not considered threats to biodiversity. However human-caused increases in the magnitude or frequency of natural catastrophic events can be considered as threats.

2) **All threats to biodiversity at a given site can be identified.** At any given point in time, a project can determine all the direct threats to biodiversity that exist at the project site. A project can separate the effects of different threats and rank them in terms of the area they affect, the severity to which the threat affects the habitat, and the urgency of the threat.

3) **Changes in all threats can be measured or estimated.** A project can systematically, either quantitatively or qualitatively, assess the degree of reduction of all threats at any given time.

8.2 Methods

Margoluis and Salafsky of the Biodiversity Support Program developed the TRA methodology in response to the need for a way of measuring project impacts that were 1) cost-effective 2) based on data collected using simple techniques 3) is directly related to project interventions and 4) is readily interpreted by project staff. Unlike biological indicator monitoring, the TRA methodology can measure project impact over short periods of time this is desirable as many projects are run in a three – five year timeframe.

Practical training on the completion of TRA was given to Isaac Mallugu, WWF TPO, Paulo Fute, FO, Rufiji District, Francise Kiondo, FO, Rufiji Distict and Richard Elibariki, FO, Kilwa District over a period of two days. The TRA Worksheet was slightly adapted for use by the LCF project to ensure that full information regarding % threat reduction is captured. The TRA form is attached as Appendix 1.

Trainees were also provided with brief summary document outlining how to complete the TRA Worksheet Appendix 2.

8.3 Results

Four persons are now trained to complete the TRA process.

It was agreed unanimously that when completing TRA for VLFR the team must include village representatives as villages through their VNRC's and village meeting records hold important information that should be fed into the process.

It was agreed that when completing TRA for LA FRs a District Forest Officer familiar with the FR must be part of the team.

9.0 Management Effectiveness Tracking Tool

9.1 Introduction

The Management Effectiveness Tracking Tool (METT) was developed by WWF and the World Bank it entails completing a simple form that uses a scoring system to assess how well an area is managed. The METT form covers ISSUES ranging from Legal Status; protected area boundary demarcation; Staff numbers and Budgets. For each ISSUE there is a choice of CRITERIA. The task of the personnel completing the METT is to decide amongst them which CRITERIA best fits the protected area being assessed by circling the corresponding SCORE. The METT includes 30 ISSUES, once a suitable CRITERIA SCORE has been selected for each ISSUE the SCORE simply has to be summed, divided by 96 (the maximum score possible) and multiplied by 100 to convert the resulting score into a percentage.

9.2 Methods

Practical training on the completion of METT forms was given to Isaac Mallugu, WWF TPO, Paulo Fute, FO, Rufiji District, Francise Kiondo, FO, Rufiji Distict and Richard Elibariki, FO, Kilwa District over a period of two days. A blank METT form, inclusive of instructions for completion can be found in Appendix 3.

9.3 Results

Four persons are now trained to complete the METT forms.

It was agreed that the team completing the METT form should consist of a District Forest Officer familiar with the FR in question and a WWF TPO staff member.

10.0 Conclusion

Forest Officers of both Kilwa and Rufiji Districts and Isaac Mallugu of WWF TPO have been fully trained to conduct METT, TRA and disturbance transects. Villagers from Tawi, Mbwara, Nambunju and Nyamwage have been trained to conduct disturbance transects each being trained in their own VLFR. This training forms a good base from which the monitoring programme can begin.

10.1 Recommendations

- METT, TRA and disturbance transects together can form a monitoring programme for the LCF project. It was jointly decided that a three monthly assessment cycle be initiated. At the start of each cycle a METT form and the first half of the TRA form should be completed and the programme of disturbance transects started (12 transects per VLFR with villagers completing four transects per month).
- To truly understand the faunal and flora values of the FRs within the LCF project systematic biodiversity surveys should be conducted in both the wet and dry season. Data that do exist are dated with the Frontier Tanzania data having been collected between 14 – 16 years ago. The IUCN survey was also short in duration thus the area covered was small and did not account for seasonal variability. None of the four VLFRs listed in this consultancy have been assessed at any time with regards to their biodiversity status. Conducting such surveys however is costly and other project activities may be of higher priority.
- The development of Village Environment Management Plans for villages that the LCF project is working with would be of benefit to the communities, and indeed the districts. When communities take responsibility for the management of their natural resources revenue collection is seen to increase as leakages are reduced. An agreeable cost / benefit agreement between the district and a village can also decrease the demands of the village on the district as the village has its own resources to make provisions for health / education and patrolling for example.
- The project must decide whom – villagers of District staff – will be responsible for conducting disturbance transects in LA FRs. Once a decision has been reached the relevant people require training on how to conduct disturbance transects.
- This consultancy was a training exercise. The Project Executant together with District Forest Officers must now ensure that the monitoring programme is implemented.
- A field manual / handbook for conducting TRA and disturbance transects should be prepared in Kiswahili for use by field staff from the Government, NGOs, private sector and Village Natural Resource Committee members.
- It may be advantageous to translate the METT form into Kiswahili to ensure that it is well understood, however, the English is very particular and translation may alter the questions to the point of them losing their exact meaning.

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Appendix 1: TRA WORKSHEET

TRA WORKSHEET SIDE A

SITE NAME:		
SITE DESCRIPTION:		
ASSESSMENT PERIOD:	TO:	COMPLETED ON:
COMPLETED BY:		

	THREATS	CRITERIA RANKINGS			TOTAL RANKING	% THREAT REDUCED	RAW SCORE
		Size of area affected	Severity of destruction to habitat	Urgency of threat			
A							
B							
C							
D							
E							
F							
G							
	TOTAL						

TRA INDEX FORMULA	**TOTAL RAW SCORE**		**TOTAL RANKING**		**CONVERT TO PERCENTAGE**				**TRA INDEX**
TRA INDEX CALCULATION		÷		=		**X**	**100**	**=**	

SITE MAP

TRA WORKSHEET SIDE B

EXPLANIATION OF THREATS	
A	THREAT:
	100 % REDUCTION =
B	THREAT:
	100 % REDUCTION =
C	THREAT:
	100 % REDUCTION =
D	THREAT:
	100 % REDUCTION =
E	THREAT:
	100 % REDUCTION =
F	THREAT:
	100 % REDUCTION =
G	THREAT:
	100 % REDUCTION =

TRA WORKSHEET SIDE C

COMMENTS ON % THREAT REDUCTED SCORE: ***Give numeric details where possible e.g. only 5 forest fires during assessment period. Or no animal traps found.***	
A	THREAT:
	COMMENTS ON % THREAT REDUCED SCORE
B	THREAT:
	COMMENTS ON % THREAT REDUCED SCORE
C	THREAT:
	COMMENTS ON % THREAT REDUCED SCORE
D	THREAT:
	COMMENTS ON % THREAT REDUCED SCORE
E	THREAT:
	COMMENTS ON % THREAT REDUCED SCORE
F	THREAT:
	COMMENTS ON % THREAT REDUCED SCORE
G	THREAT:
	COMMENTS ON % THREAT REDUCED SCORE

Appendix 2 Instruction for completion of TRA Worksheet

Instructions for completion of the TRA Worksheet

Full instructions for conducting a TRA are given in the document 'A Guide to Threat Reduction Assessment', Richard Margoluis and Nick Salafsky, Biodiversity Support Program. The following is a locally relevant example designed as a training supplement for WWF TPO Lowland Coastal Forest project staff and District Officer personnel.

Ground work feeding into the TRA. The project team needs to decide what data it is feasible to collect to feed into the TRA process. Forest condition assessment using disturbance transects is one suitable methodology that training will be provided in, this method will be taught to Village Environment Committee Members in addition to WWF and Forest Officers.

STEP 1: DEFINING THE PROJECT
Complete the following sections in side A of the Worksheet; **SITE NAME, SITE DESCRIPTION, ASSESSMENT PERIOD, COMPLETED ON, COMPLETED BY** and **SITE MAP.** (See example sections below).

SITE NAME: ***e.g. Uluguru North Forest Reserve***		
SITE DESCRIPTION: ***e.g. Central Government Forest Reserve managed by FBD***		
ASSESSMENT PERIOD: ***Jan 2006***	TO: ***June 2006***	COMPLETED ON: ***01 July 2006***
COMPLETED BY: ***name / job title / organisation of each person involved in the TRA***		

	THREATS	CRITERIA RANKINGS			TOTAL RANKING	% THREAT REDUCED	RAW SCORE
		Size of area affected	Severity of destruction to habitat	Urgency of threat			
A							
B							
C							
D							
E							
F							
G							
	TOTAL						

Site map: *draw a sketch of the areas for which you are conducting the TRA. Show any roads, settlements, paths close to the forest reserve or any features likely to impact on the state of the reserve.*

STEP 2: LIST ALL DIRECT THREATS

- A *direct threat* is a threat that immediately affects the biodiversity of the site e.g. hunting.
- An *indirect threat* is the need for people to hunt for meat as they can not afford to buy it e.g. *hunting (subsistence);* or
- People hunting to supply the market *hunting (commercial).*
- Only direct threats should be listed. However, state the threat clearly as in the examples given this is important as project interventions on the ground may stop subsistence hunting by implementing an effective local education and awareness raising campaign however, the project may fail to stop commercial hunting as it did not eliminate the commercial demand for bush meat at markets further away from the project site (See example below).

	THREATS	CRITERIA RANKINGS			TOTAL RANKING	% THREAT REDUCED	RAW SCORE
		Size of area affected	Severity of destruction to habitat	Urgency of threat			
A	***e.g. Pole cutting (subsistence)***						
B	***e.g. Timber cutting (commercial)***						
C	***e.g. Fire (clearing for agriculture)***						
D	***e.g. Hunting (subsistence)***						
E							
F							
G							
	TOTAL						

STEP 3: EXPLAINATION OF THREAT AND DEFINING 100% REDUCTION

For each of the **THREATS** listed write a precise definition of each. Also define what **100% REDUCTION** of this threat means.

EXPLANIATION OF THREATS	
A	THREAT: ***e.g. Pole cutting (subsistence) local residents cut poles within the Forest Reserve for use in use in the construction of their houses.***
	100 % REDUCTION = ***e.g. No pole cutting occurs within the Forest Reserve.***

STEP 4: RANK EACH THREAT; SIZE OF AREA AFFECTED[1] (side A)

NOTE: When you are conducting rankings for your site, avoid ranking threats equally. The TRA procedure works best when you rank threats each with a distinct whole number.

Which of the **THREATS** listed will affect the **biggest area** of the Reserve? In the example above four threats have been listed thus the threats will be ranked from #1 (lowest **SIZE OF AREA AFFECTED**) to #4 (highest **SIZE OF AREA AFFECTED**) see example in table below;

Threats		Size of area affected	Severity of destruction to habitat	Urgency of threat	Total ranking	% Threat Reduction	Raw Score
A	***Pole cutting (subsistence)***	***2***	***1***	***1***	*4*	***75***	***3***
B	***Timber cutting (commercial)***	***1***	***2***	***2***	*5*	***20***	***1***
C	***Fire (clearing for agriculture)***	***4***	***4***	***4***	*12*	***50***	***6***
D	***Hunting (subsistence)***	***3***	***3***	***3***	*9*	***100***	***9***
E							
F							
G							
	TOTAL	***10***	***10***	***10***	*30*		***19***

TRA INDEX FORMULA	**TOTAL RAW SCORE**		**TOTAL RANKING**		**CONVERT TO PERCENTAGE**				**TRA INDEX**
TRA INDEX CALCULATION	***19***	÷	***30***	=	**0.63**	**X**	**100**	**=**	***63 %***

If six threats are identified the ranking would go from 1 – 6, and so on, depending upon the number of threats identified.

STEP 5: RANK EACH THREAT FOR SEVERITY OF DESTRUCTION[2]
As in step four, each threat will be ranked from 1 (lowest **SEVERITY OF DESTRUCTION**) to 4 (highest **SEVERITY OF DESTRUCTION**). When ranking **SEVERITY OF DESTRUCTION**; within the overall area, will the threat completely destroy the habitat(s) (high **SEVERITY OF DESTRUCTION**) or will it cause only minor changes (low **SEVERITY OF DESTRUCTION**)? (See example above).

STEP 6: RANK EACH THREAT FOR URGENCY
As in steps 4 and 5 each threat will be ranked from 1 (lowest **URGENCY**) to 4 (highest **URGENCY**). **URGENCY** is the immediacy of the threat; is the threat occurring now or will it occur after many years (see example above)

[1] Size of Area Affected is referred to simply as 'AREA' in the original TRA Guide.
[2] Severity of Destruction is referred to as 'INTENSITY' in the original TRA Guide

STEP 7: ADD UP THE RANKING SCORES
Add the ranking scores across the columns (**SIZE OF AREA AFFECTED** + **SEVERITY OF DESTRUCTION TO HABITAT + URGENCY OF THREAT**) and write the answers for each threat in the **TOTAL RANKING** column. Next add up the totals in the **TOTAL RANKING** column and write the answer in the Total row at the bottom of the table. At this stage double check all calculations, the **sum** of the three ranking columns should be equal to the **TOTAL RANKING** sum (see example table).

STEP 8: DETERMINE % THREAT REDUCTION
At the end of the assessment period determine the **% THREAT REDUCTION**, chose an accurate yet cost effective and feasible way of assessing the **% THREAT REDUCTION**. Field visits are encouraged to increase the accuracy of the **% THREAT REDUCTION**.

A quantitative approach can be used where disturbance transects can be conducted to assess the increase or decrease in pole and timber cutting – this is a sound method particularly if baseline data are available. Occurrence of fires and hunting can also be quantified whilst conducting disturbance transects thus making this a cost effective and efficient method of collecting multiple data regarding threats.

A qualitative approach could also be taken by interviewing residents and estimating forest condition from their statements. The quantitative approach should be used wherever possible.

Refer back to what **% THREAT REDUCTION** means for each threat (as recorded in **Step 3**). With this in mind decide for each threat the **% THREAT REDUCTION**. If the threat has be eradicated the score will be 100% (see example table).

For each **% THREAT REDUCTION** write on page C of the Worksheet evidence to support the value given.

STEP 9: CALCULATE RAW SCORE
The next step is to calculate the **RAW SCORE** for each threat. To do this, multiply the **TOTAL RANKING** for each threat by the decimal form of the **% THREAT REDUCED** (to convert **% THREAT REDUCED** to decimal form divide by 100). Write the **RAW SCORE** for each threat in the appropriate **RAW SCORE** box. When all **RAW SCORES** have been calculated add up all the **RAW SCORES** and write the answer in the **TOTAL** box of the **RAW SCORE** column (see example table)

STEP 10:
You can now calculate the final **TRA INDEX.** To do this, divide the **TOTAL RAW SCORE** (from **Step 9**) by the **TOTAL RANKING** (from **Step 7**). Follow the arrows in the worksheet to transfer the **TOTAL RANKING** and **TOTAL RAW SCORE** into the indicated spaces in the area for calculating the formula. Then complete the calculations and write in the **TRA INDEX** (see example table).

The resulting TRA INDEX for the example given is 63%. This means that in this example the collective threats were reduced by 63% during the assessment period.

Appendix 3 Management Effectiveness Tracking Tool

NAME OF FOREST RESERVE TO BE ASSESSED: ……

DATE OF COMPLETION: ……..

COMPLETED BY

Name	Job Title	Organisation

COMPLETION INSTRUCTIONS:

1. Complete one form per Forest Reserve.
2. Complete **NAME OF FOREST RESERVE TO BE ASSESSED, DATE OF COMPLETION, COMPLETED BY** sections above.
3. The METT Form comprises 30 **ISSUES** e.g. 1) Legal Status 2) Protected Area Regulations. For each **ISSUE** there are a number of **CRITERIA** each **CRITERIA** has a corresponding **SCORE**.
4. Read each **ISSUE** in turn and choose which **CRITERIA** best describes the Forest Reserve that is being assessed by circling the corresponding **SCORE**.
5. **TOTAL SCORE:** Add up all scores circled then divide by 96 (maximum score possible), multiply this value by 100 to get a **PERCENTAGE (%) SCORE**.

e.g.

Issue	Criteria	Score	Comments	Next Steps
12. Staff Numbers Are there enough people employed to mange the protected area	There are no staff	0		
	Staff numbers are inadequate for management activities	1		
	Staff numbers are below optimum level for management activities	(2)		
	Staff numbers are adequate for the management needs of the site	3		

MANAGEMENT EFFECTIVENESS TRACK TOOL

Issue	Criteria	Score	Comments	Next steps
1. Legal status Does the protected area have legal status?	The protected area is not gazetted	0		
	The government has agreed that the protected area should be gazetted but the process has not yet begun	1		
	The protected area is in the process of being gazetted but the process is still incomplete	2		
	The protected area has been legally gazetted (or in the case of private reserves is owned by a trust or similar)	3		
2. Protected area regulations Are inappropriate land uses and activities (e.g. poaching) controlled?	There are no mechanisms for controlling inappropriate land use and activities in the protected area	0		
	Mechanisms for controlling inappropriate land use and activities in the protected area exist but there are major problems in implementing them effectively	1		
	Mechanisms for controlling inappropriate land use and activities in the protected area exist but there are some problems in effectively implementing them	2		
	Mechanisms for controlling inappropriate land use and activities in the protected area exist and are being effectively implemented	3		
3. Law enforcement Can staff enforce protected area rules well enough?	The staff have no effective capacity/resources to enforce protected area legislation and regulations	0		
	There are major deficiencies in staff capacity/resources to enforce protected area legislation and regulations (e.g. lack of skills, no patrol budget)	1		
	The staff have acceptable capacity/resources to enforce protected area legislation and regulations but some deficiencies remain	2		
	The staff have excellent capacity/resources to enforce protected area legislation and regulations	3		

Issue	Criteria	Score	Comments	Next steps
4. Protected area objectives Have objectives been agreed?	No firm objectives have been agreed for the protected area	0		
	The protected area has agreed objectives, but is not managed according to these objectives	1		
	The protected area has agreed objectives, but these are only partially implemented	2		
	The protected area has agreed objectives and is managed to meet these objectives	3		
5. Protected area design Does the protected area need enlarging, corridors etc to meet its objectives?	Inadequacies in design mean achieving the protected areas major management objectives of the protected area is impossible	0		
	Inadequacies in design mean that achievement of major objectives are constrained to some extent	1		
	Design is not significantly constraining achievement of major objectives, but could be improved	2		
	Reserve design features are particularly aiding achievement of major objectives of the protected area	3		
6. Protected area boundary demarcation Is the boundary known and demarcated?	The boundary of the protected area is not known by the management authority or local residents/neighbouring land users	0		
	The boundary of the protected area is known by the management authority but is not known by local residents/neighbouring land users	1		
	The boundary of the protected area is known by both the management authority and local residents but is not appropriately demarcated	2		
	The boundary of the protected area is known by the management authority and local residents and is appropriately demarcated	3		

Issue	Criteria	Score	Comments	Next steps
7. Management plan Is there a management plan and is it being implemented?	There is no management plan for the protected area	0		
	A management plan is being prepared or has been prepared but is not being implemented	1		
	An approved management plan exists but it is only being partially implemented because of funding constraints or other problems	2		
	An approved management plan exists and is being implemented	3		
Additional points	The planning process allows adequate opportunity for key stakeholders to influence the management plan	+1		
	There is an established schedule and process for periodic review and updating of the management plan	+1		
	The results of monitoring, research and evaluation are routinely incorporated into planning	+1		
8. Regular work plan Is there an annual work plan?	No regular work plan exists	0		
	A regular work plan exists but activities are not monitored against the plan's targets	1		
	A regular work plan exists and actions are monitored against the plan's targets, but many activities are not completed	2		
	A regular work plan exists, actions are monitored against the plan's targets and most or all prescribed activities are completed	3		

Issue	Criteria	Score	Comments	Next steps
9. Resource inventory Do you have enough information to manage the area?	There is little or no information available on the critical habitats, species and cultural values of the protected area	0		
	Information on the critical habitats, species and cultural values of the protected area is not sufficient to support planning and decision making	1		
	Information on the critical habitats, species and cultural values of the protected area is sufficient for key areas of planning/decision making but the necessary survey work is not being maintained	2		
	Information concerning on the critical habitats, species and cultural values of the protected area is sufficient to support planning and decision making and is being maintained	3		
10. Research Is there a programme of management-orientated survey and research work?	There is no survey or research work taking place in the protected area	0		
	There is some *ad hoc* survey and research work	1		
	There is considerable survey and research work but it is not directed towards the needs of protected area management	2		
	There is a comprehensive, integrated programme of survey and research work, which is relevant to management needs	3		

Issue	Criteria	Score	Comments	Next steps
11. Resource management Is the protected area adequately managed (e.g. for fire, invasive species, poaching)?	Requirements for active management of critical ecosystems, species and cultural values have not been assessed	0		
	Requirements for active management of critical ecosystems, species and cultural values are known but are not being addressed	1		
	Requirements for active management of critical ecosystems, species and cultural values are only being partially addressed	2		
	Requirements for active management of critical ecosystems, species and cultural values are being substantially or fully addressed	3		
12. Staff numbers Are there enough people employed to manage the protected area?	There are no staff	0		
	Staff numbers are inadequate for critical management activities	1		
	Staff numbers are below optimum level for critical management activities	2		
	Staff numbers are adequate for the management needs of the site	3		
13. Personnel management Are the staff managed well enough?	Problems with personnel management constrain the achievement of major management objectives	0		
	Problems with personnel management partially constrain the achievement of major management objectives	1		
	Personnel management is adequate to the achievement of major management objectives but could be improved	2		
	Personnel management is excellent and aids the achievement major management objectives	3		

Issue	Criteria	Score	Comments	Next steps
14. Staff training Is there enough training for staff?	Staff are untrained	0		
	Staff training and skills are low relative to the needs of the protected area	1		
	Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management	2		
	Staff training and skills are in tune with the management needs of the protected area, and with anticipated future needs	3		
15. Current budget Is the current budget sufficient?	There is no budget for the protected area	0		
	The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage	1		
	The available budget is acceptable, but could be further improved to fully achieve effective management	2		
	The available budget is sufficient and meets the full management needs of the protected area	3		
16. Security of budget Is the budget secure?	There is no secure budget for the protected area and management is wholly reliant on outside or year by year funding	0		
	There is very little secure budget and the protected area could not function adequately without outside funding	1		
	There is a reasonably secure core budget for the protected area but many innovations and initiatives are reliant on outside funding	2		
	There is a secure budget for the protected area and its management needs on a multi-year cycle	3		

Issue	Criteria	Score	Comments	Next steps
17. Management of budget Is the budget managed to meet critical management needs?	Budget management is poor and significantly undermines effectiveness	0		
	Budget management is poor and constrains effectiveness	1		
	Budget management is adequate but could be improved	2		
	Budget management is excellent and aids effectiveness	3		
18. Equipment Is equipment adequately maintained?	There is little or no equipment and facilities	0		
	There is some equipment and facilities but these are wholly inadequate	1		
	There is equipment and facilities, but still some major gaps that constrain management	2		
	There is adequate equipment and facilities	3		
19. Maintenance of equipment Is equipment adequately maintained?	There is little or no maintenance of equipment and facilities	0		
	There is some *ad hoc* maintenance of equipment and facilities	1		
	There is maintenance of equipment and facilities, but there are some important gaps in maintenance	2		
	Equipment and facilities are well maintained	3		

Issue	Criteria	Score	Comments	Next steps
20. Education and awareness programme Is there a planned education programme?	There is no education and awareness programme	0		
	There is a limited and *ad hoc* education and awareness programme, but no overall planning for this	1		
	There is a planned education and awareness programme but there are still serious gaps	2		
	There is a planned and effective education and awareness programme fully linked to the objectives and needs of the protected area	3		
21. State and commercial neighbours Is there co-operation with adjacent land users?	There is no contact between managers and neighbouring official or corporate land users	0		
	There is limited contact between managers and neighbouring official or corporate land users	1		
	There is regular contact between managers and neighbouring official or corporate land users, but only limited co-operation	2		
	There is regular contact between managers and neighbouring official or corporate land users, and substantial co-operation on management	3		
22. Indigenous people Do indigenous and traditional peoples resident or regularly using the PA have input to management decisions?	Indigenous and traditional peoples have no input into decisions relating to the management of the protected area	0		
	Indigenous and traditional peoples have some input into discussions relating to management but no direct involvement in the resulting decisions	1		
	Indigenous and traditional peoples directly contribute to some decisions relating to management	2		
	Indigenous and traditional peoples directly participate in making decisions relating to management	3		

Issue	Criteria	Score	Comments	Next steps
23. Local communities Do local communities resident or near the protected area have input to management decisions?	Local communities have no input into decisions relating to the management of the protected area	0		
	Local communities have some input into discussions relating to management but no direct involvement in the resulting decisions	1		
	Local communities directly contribute to some decisions relating to management	2		
	Local communities directly participate in making decisions relating to management	3		
Additional points	There is open communication and trust between local stakeholders and protected area managers	+1		
	Programmes to enhance local community welfare, while conserving protected area resources, are being implemented	+1		
24. Visitor facilities Are visitor facilities (for tourists, pilgrims etc) good enough?	There are no visitor facilities and services	0		
	Visitor facilities and services are inappropriate for current levels of visitation or are under construction	1		
	Visitor facilities and services are adequate for current levels of visitation but could be improved	2		
	Visitor facilities and services are excellent for current levels of visitation	3		

Issue	Criteria	Score	Comments	Next steps
25. Commercial tourism Do commercial tour operators contribute to protected area management?	There is little or no contact between managers and tourism operators using the protected area	0		
	There is contact between managers and tourism operators but this is largely confined to administrative or regulatory matters	1		
	There is limited co-operation between managers and tourism operators to enhance visitor experiences and maintain protected area values	2		
	There is excellent co-operation between managers and tourism operators to enhance visitor experiences, protect values and resolve conflicts	3		
26. Fees If fees (tourism, fines) are applied, do they help protected area management?	Although fees are theoretically applied, they are not collected	0		
	The fee is collected, but it goes straight to central government and is not returned to the protected area or its environs	1		
	The fee is collected, but is disbursed to the local authority rather than the protected area	2		
	There is a fee for visiting the protected area that helps to support this and/or other protected areas	3		

Issue	Criteria	Score	Comments	Next steps
27. Condition assessment Is the protected area being managed consistent to its objectives?	Important biodiversity, ecological and cultural values are being severely degraded	0		
	Some biodiversity, ecological and cultural values are being severely degraded	1		
	Some biodiversity, ecological and cultural values are being partially degraded but the most important values have not been significantly impacted	2		
	Biodiversity, ecological and cultural values are predominantly intact	3		
Additional points	There are active programmes for restoration of degraded areas within the protected area and/or the protected area buffer zone	+1		
28. Access assessment Are the available management mechanisms working to control access or use?	Protection systems (patrols, permits etc) are ineffective in controlling access or use of the reserve in accordance with designated objectives	0		
	Protection systems are only partially effective in controlling access or use of the reserve in accordance with designated objectives	1		
	Protection systems are moderately effective in controlling access or use of the reserve in accordance with designated objectives	2		
	Protection systems are largely or wholly effective in controlling access or use of the reserve in accordance with designated objectives	3		

Issue	Criteria	Score	Comments	Next steps
29. Economic benefit assessment Is the protected area providing economic benefits to local communities?	The existence of the protected area has reduced the options for economic development of the local communities	0		
	The existence of the protected area has neither damaged nor benefited the local economy	1		
	There is some flow of economic benefits to local communities from the existence of the protected area but this is of minor significance to the regional economy	2		
	There is a significant or major flow of economic benefits to local communities from activities in and around the protected area (e.g. employment of locals, locally operated commercial tours etc)	3		
30. Monitoring and evaluation	There is no monitoring and evaluation in the protected area	0		
	There is some *ad hoc* monitoring and evaluation, but no overall strategy and/or no regular collection of results	1		
	There is an agreed and implemented monitoring and evaluation system but results are not systematically used for management	2		
	A good monitoring and evaluation system exists, is well implemented and used in adaptive management	3		
	TOTAL SCORE *(Add up all scores circled = TOTAL SCORE then divide by 96 (maximum score possible). Multiply this value by 100 to get a percentage (%) score.*			**% score**

Appendix 4 Transect training – briefing meeting list of participants

	Name	Village	Designation
1	Salehe Nyangalio	Mbwara	Village Chairman
2	Bakari Matimbwa	Nyamwage	Village Executive Officer
3	Charles Mbonde	Nambunju	Village Chairman
4	Kiteko Mikui	Mbwara	Village Executive Officer
5	Maliki Ngwikwi	Nambunju	Village Executive Officer
6	Mohamedi Mketto	Tawi	Village Executive Officer
7	Mohamed Kundemba	Mbwara	-
8	Saidi Mikoi	Mjumbe	-
9	Ally M.	Nambunju	Katibu
10	Ibarhim Mwekela	Tawi	Village Chairman
11	Omari Mbonde	Nambunju	Member
12	Hawa Mbumbuke	Nambunju	Member
13	Saidi Saidi	Nambunju	Member
14	Fatuma Mpendu	Nyamwage	-
15	Aziz Kipanga	Nyamwage	Member
16	Bakari Linjunde	Nyamwage	Village Natural Resource Committee
17	Hadija Mbonde	Nyamwage	Member
18	Ibrahim Mailo	Tawi	Katibu
19	Habibu Mniwa	Tawi	Member
20	Alima Njola	Tawi	Member
21	Tatu Mikoi	Mbwara	Member
22	Ally Nakatona	Mbwara	Member
23	Abdallah Nguyu	Mbwara	Member
24	Taifa N-iangalio	Nambunju	Village Chairman
25	Joyce Luvanda	Mbwara	Member
26	Mwajabu Kinguane	Mbwara	-

Appendix 5 Transect training – field training attendance list, by village

Nambunju VLFR Disturbance Transect Training Attendance List

No	Name	Comment
	Trevor Jones	Trainer: Consultant to WWF TPO
1	Hamida M Mwiru	
2	Hawa A Mbumbuko	
3	Mmiajuma K Mbonde	
4	Taifa Omari Nyangalio	
5	Maliki A Ngwikwi	
6	Sudi Hamadi	
7	Omari A Mbonde	
8	Hamisi Mwaya	
9	Ali Muhidine Manbingwaya	
10	Saidi Vibumu	
11	Maulid Abdul Mbonde	
	Sufiani Abdallah	Game Scout
	Francise Kiondo	FBD
	Paulo Fute	FBD
	Richard Elibariki	FBD
	Freya St John	Consultant to WWF TPO

Mbwara VLFR Disturbance Transect Training Attendance List

No.	Name	Comment
	Trevor Jones	Trainer: Consultant to WWF TPO
1	Saidi M Kipengele	
2	Salumu Mbwana	
3	Zainabu Mbonde	
4	Mohamedi Kundemba	
5	Ali Nakatona	
6	Tatu Mikui	
7	Joyce Luvunda	
8	Mohamedi Mahangwe	
9	Abdala Nguyu	
10	Musa Nyangalio	
	Sufiani Abdallah Matimbwa	Game Scout
	Francise Kiondo	FBD
	Paulo Fute	FBD
	Freya St John	Consultant to WWF TPO

Nyamwage VLFR Disturbance Transect Training Attendance List

No.	Name	Comment
	Trevor Jones	Trainer: Consultant to WWF TPO
1	Bakari Sufiani Matimbwa	
2	Salum Ally Makogoto	
3	Abdalah Mohamedi Maunde	
4	Pili Kasimu Mdili	
5	Mohamedi Omari Nbundumwene	
6	Mariamu Maji Yanazi	
7	Saidi Mohamedi Mikui	

8	Aziza Hasani Kipanga	
9	Tatu Amiri Mkumbugo	
10	Hadija Habibu Mbonde	
11	Bakari Saidi Linjunde	
12	Amu Jabiri Kindaukile	
13	Fatuma Salum Mpendu	
	Sufiani Abdallah Matimbwa	Game Scout
	Paulo Fute	FBD (present at start of transect)
	Isaac Mallugu	WWF TPO (present at start of transect)

Tawi VLFR Disturbance Transect Training Attendance List

No	**Name**	**Comment**
	Trevor Jones	Trainer: Consultant to WWF TPO
1	Ibrahimu A. Mwekela	
2	Mohamedi M. Mketto	
3	Sinakaka N. Mchuchuli	
4	Abdallah O. Tindwa	
5	Halima O. Njora	
6	Ibrahimu K. Mahiro	
7	Habibu S. Mniwa	
8	Salum S. Mhina	
9	Kaimu S. Muhele	
10	Bakari O. Mahiro	
11	Juma O. Matimbwa	
	Sufiani Abdallah Matimbwa	Game Scout

Appendix 6 Transect training – debriefing meeting attendance list

	Name	**Village**
1	Khamis Dili	Nambunju
2	Ibrahim Kadimu	Tawi
3	Halima Omari	Nyamwage
4	Jinakaga Mchuchuli	Tawi
5	Salum M.	Tawi
6	Tatu Amili	Nyamwage
7	Pili Mpili	Nyamwage
8	Bakari Muba	Nambunju
9	Maltamu A.	Nyamwage
10	Bakari Winjunde	-
11	Habibu Saidi	Tawi
12	Mohamedi K.	-
13	Zgituni Mbonde	-
14	Mwanatuma Mbonde	-
15	Tatu Mikoli	-
16	Ali Kilindo	-
17	Ali Kyuta	-
18	Mohamed K.	-
19	Salum Malongoto	-

Appendix 7 Disturbance transect datasheet – Kiswahili

FOMU YA UHARIBIFU KATIKA TRANSECT

JINA LA MSITU..... TAREHE.....
TRANSECT NAMBA..... WASHIRIKI.....
MWANZO (LAT/LONG).....
MWISHO (LAT/LONG).....
DIRA..... MUDA WA KUANZA..... MUDA WA KUMALIZA.....

SEHEMU (m)	NGUZO HAI	NGUZO ILIYOKUFA	NGUZO ZILIZOKATWA		MITI HAI	MITI ILIYOKUFA	MITI ILIYOKATWA		Aina ya uharibifu / Mengineyo
			ZAMANI	KARIBUNI			ZAMANI	KARIBUNI	
0-50									
50-100									
100-150									
150-200									
200-250									
250-300									
300-350									
350-400									
400-450									
450-500									
500-550									
550-600									
600-650									
650-700									
700-750									
750-800									
800-850									
850-900									
900-950									
950-1000									
JUMLA									

Aina ya uharibifu
Mb=Upasuaji wa mbao Mt=Moto K=Kilimo Mkz=Makazi Kb=Kambi Md=Uchimbaji madini N=Njia
Mk=Uchomaji mkaa Mg=Mitego Mw=Mizoga ya wanyama Bu=Milio ya bunduki M=Mengine

Mfano wa mengineyo: maelezo ya kina ya aina ya uharibifu, mfano ukubwa wa eneo la moto, mitego mingapi, n.k
Wawindaji. Wanyama. Alama za wanyama.

Appendix 8 Disturbance transect datasheet – English

DISTURBANCE TRANSECT DATA SHEET

FOREST RESERVE..... DATE.....
TRANSECT NO..... RECORDERS.....
START POINT (LAT/LONG).....
END POINT (LAT/LONG).....
COMPASS BEARING..... START TIME..... END TIME.....

SECTION (m)	LIVE POLES	NAT. DEAD POLES	CUT POLES		LIVE TIMBERS	NAT. DEAD TIMBERS	CUT TIMBERS		Disturbance category / Notes
			OLD	FRESH			OLD	FRESH	
0-50									
50-100									
100-150									
150-200									
200-250									
250-300									
300-350									
350-400									
400-450									
450-500									
500-550									
550-600									
600-650									
650-700									
700-750									
750-800									
800-850									
850-900									
900-950									
950-1000									
TOTAL									

Disturbance categories
P=Pitsawing F=Fire damage C=Cultivation S=Settlement K=Camp (site) M=Mining (site) R=Path W=Timber, Planks, Poles
B=Charcoal Burning T=Traps, Pitfalls, etc A=Animal Remains G=Gunfire O=Other

Examples of notes: Details on disturbance categories, e.g. area burnt, how many traps, etc
Humans encountered. Live animals encountered. Animal signs.