Tanzania Forest Conservation Group

Shirika la Kuhifadhi Misitu ya Asili Tanzania

MJUMITA

TFCG Technical Paper 37

THE BIODIVERSITY AND FOREST CONDITION OF RUVU SOUTH FOREST RESERVE

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Dar es Salaam

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Cover photographs by Andrew Perkin. Clockwise from top left. 1. View over Ruvu South Forest Reserve. 2. Charcoal kiln in preparation in Ruvu South F.R. 3. Rondo galago. 4. Four-toed Elephant-shrew.

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Executive Summary

Ruvu South is one of the most important coastal forests in Tanzania. It is a large forest (320km^2) relative to other coastal forest fragments in Tanzania (most of which measure less than 20km^2). It lies 45km west of Dar es Salaam and is therefore under constant pressure from the illegal production of charcoal to supply the city's markets. Deforestation rates in Ruvu South Forest Reserve reached 7 % per annum between 2008 – 2010.

Ruvu South FR supports four Eastern Arc and Coastal Forest endemic vertebrates; it is contained in the Kisarawe District Coastal Forest Important Bird Area (Baker & Baker, 2002) hosting a number of rare and low-density forest bird species; and 33 plant species endemic to the Swahili Regional Centre of Endemism (IUCN, 2010).

Between 2001 - 2005 three NGOs (CARE, WCST and TFCG) implemented the Misitu Yetu Project to increase community capacity to manage Ruvu South Forest Reserve. The project supported the establishment of joint forest management including preparation of management plans, by-laws and joint management agreements that were approved by the Districts but were never signed by the Forestry and Beekeeping Division. In 2008, as part of the Mama Misitu campaign launch, the late Wangari Maathai visited Ruvu South FR as the guest of the Director of the Forestry and Beekeeping Division.

Between 2011 – 2013, as part of the Forest Justice in Tanzania project TFCG assessed the fauna and flora of targeted coastal forests and measured rates of human disturbance within these Forest Reserves. As part of this effort, five sites in Ruvu South FR were surveyed with a combination of systematic and opportunistic survey methods.

At these five sites, TFCG recorded 149 plant species in 130 genera and 50 families, with four dominant plant families, Leguminaceae (25 spp.), Rubiaceae (14 spp.), Euphorbiaceae (11 spp.) and Annonaceae (9 spp.).

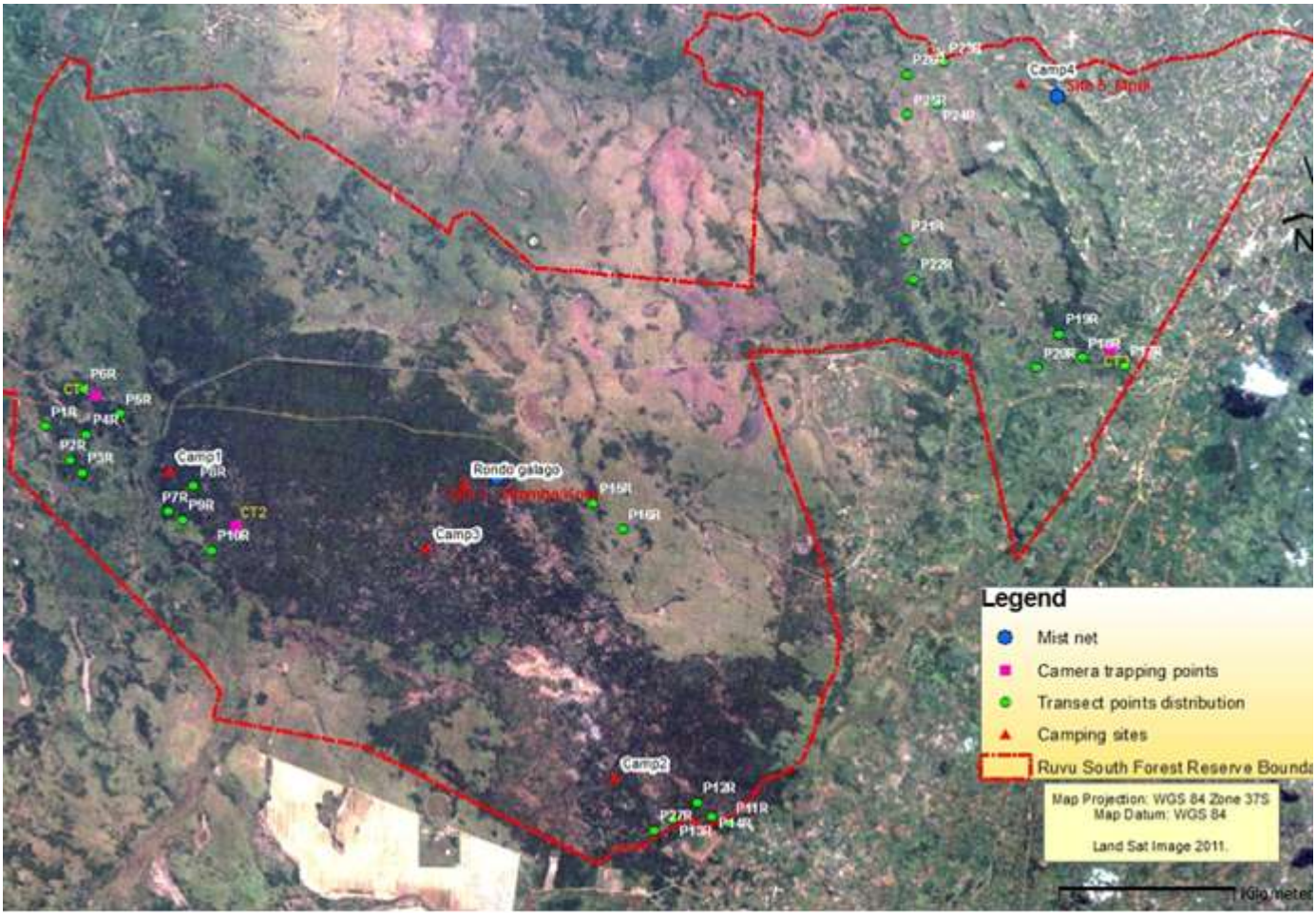
In total, 21 mammal species were recorded. Three camera traps (CTs) stationed in Ruvu South FR for 30+ days captured seven mammal species from five families including two species of elephant shrew, Blotched genet, African civet, Suni, Bushy-tailed mongoose and Giant pouched rat. The CTs also captured a monitor lizard and two birds, a dove and a francolin. The highest camera trapping rate was of Four-toed elephant-shrews (274 of the 327 images, or 84%). Giant pouched rats (18 images), Suni (13 images) and Rufous and black elephant-shrews (12 images) were the three most commonly photographed mammals after four-toed elephant shrews. On mammal transects, sightings, sounds and/or signs of Sykes monkeys, yellow baboons, red duiker, bushbuck, warthog, suni and elephant shrew were recorded; in addition, opportunistic records of buffalo, aardvark, hyena, bushpig, hare and hyrax signs were made along disturbance transects. During nocturnal surveys, the Tanzanian Coastal forest endemic and Critically Endangered Rondo galago was observed (at Mtamba / Chakenge), and the Zanzibar galago was also detected.

In 99 hours of opportunistic bird surveys, 39 families, 67 genera and 88 species were recorded including two red-listed species, the bateleur (NT) and East Coast akalat (NT).

A total of 5521 disturbance events were recorded along the 13 transects at five sites with an overall disturbance rate of 425 events per hectare. Across the five sites, Mtamba/Kola (good forest) was most disturbed overall with 1427 disturbance events or 26% of the total (764 poles, 495 timber and 168 other disturbances) and a disturbance rate of 476 events/ha. Charcoal kilns were the most frequent disturbance type throughout the forest reserve.

Forest loss is occurring at a rapid rate, and a coordinated effort is needed to halt further destruction in Ruvu South FR and concomitant loss of fauna and flora of global conservation importance.

Figure 1. Google Earth image of Ruvu South Forest Reserve in 2011.



Small-eared galago, *Otolemur garnettii*

White-crested Helmet-shrike *Prionops plumatus*

Puff adder, *Bitis arietans*

Red-bellied coast squirrel, *Paraxerus palliatus*

Coastal forest in Ruvu South FR

Moses Mwangoka, botanist on the TFCG survey

Charcoal from Coastal Forest in Ruvu South

Charcoal preparation in Ruvu South

Figure 2. Survey photographs from Ruvu South Forest Reserve by Andrew Perkin.

Tanzania Forest Conservation Group

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

TFCG supports field-based projects promoting participatory forest management, environmental education, community development, advocacy and research in the Eastern Arc Mountain and East African Coastal Forests. To find out more about TFCG please visit our website http://www.tfcg.org.

Forest Justice in Tanzania

Forest Justice in Tanzania (FJT) was a three year project (2011-2013) that aims to promote improved governance and increased accountability in Tanzania's forest sector. The initiative was a partnership between the Community Forest Conservation Network of Tanzania, known as MJUMITA and the Tanzania Forest Conservation Group (TFCG). The project operated through four inter-related strategies: 1) monitoring forest governance and forest condition; 2) promoting enforcement; 3) conducting research, analysis and communication; and 4) setting standards. The project is financed by DfID through the Accountability in Tanzania programme (AcT). For more information about the project, please visit http://www.tfcg.org/publications.html.

Abbreviations and Acronyms

AcT	Accountability in Tanzania programme
a.s.l.	above sea level
dbh	diameter at breast height
DSM	Dar es Salaam
FBD	Forestry and Beekeeping Division
FJT	Forest Justice in Tanzania
FR	Forest Reserve
GR	Game Reserve
IUCN	International Union for the Conservation of Nature
JFM	Joint Forest Management
MOBOT	Missouri Botanical Garden
MJUMITA	Mtandao wa Jamii wa Usimamizi wa Misitu, Tanzania (Community Forestry Network or Tz)
TFCG	Tanzania Forest Conservation Group
WCST	Wildlife Conservation Society of Tanzania

Acknowledgements

Funding

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Permission

This survey was conducted with permission from the Tanzania Forest Sector (TFS) of the Ministry of Natural Resource and Tourism, the Tanzania Wildlife Research Institute (TAWIRI), and the Tanzania Commission of Science and Technology (COSTECH).

Survey Team

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Forest change analysis:	Theron Morgan-Brown

Additionally we are extremely grateful to the people of Kibaha district specifically the communities around Ruvu South Forest Reserve for their extraordinary co-operation in carrying out this research. In particular, we thank the Ruvu South Forest Manager, Mr. Moses Mashala.

Report writing

This report has been written by Justine Gwegime, Nike Doggart, Moses Mwangoka, Elia Mulungu, Mokolo Kitenana, and Reuben Mwakisoma.

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The overall report editing was carried out by Katarzyna Nowak and Nike Doggart.

Maps

We are grateful to Sylvia Monica Kalemera and Katarzyna Nowak for the production of the maps included in this report; and to Theron Morgan-Brown for the forest change analysis.

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1) Introduction

1.1 Background to the surveys

As part of the Forest Justice in Tanzania project, the Tanzania Forest Conservation Group (TFCG) has been carrying out biodiversity and forest condition surveys in selected forests in the Eastern Arc Mountains and Coastal Forests. The aim of the surveys is to document the biodiversity values and the levels of resource use and disturbance of these target forests.

The overall objective of the survey in Ruvu South Forest Reserve was to provide an up-to-date assessment of the biodiversity value and condition of this forest. Specific objectives were: i.To assess the status of primates, forest antelopes, and birds in Ruvu South Forest Reserve and the extent of endemism still supported by this forest and ii. To evaluate the current extent of forest disturbance and make site-level recommendations for improving protection and management.

1.2 Report structure

This report has 7 sections. The report begins with an executive summary followed by an introduction which includes a description of Ruvu South Forest Reserve, its biodiversity value and current threats. This section also includes a brief review of previous surveys and conservation efforts conducted in this forest. Scientific names of animal 7species are given, along with their IUCN Red List category of threat, if the species has been evaluated for the Red List (IUCN, 2012). These categories are abbreviated as follows: LC for Least Concern, DD for Data Deficient, NT for Near Threatened, VU for Vulnerable, EN for Endangered and CR for Critically Endangered (*ibid*.).

Section 2 provides a description of the forest reserve, including its location and management. Section 3 describes the survey sites at which the mammal, avian and disturbance surveys were carried out. Section 4 the camera trap and mammal transect results, Section 5 the birds, and section 6 forest disturbance, with each of these sections containing background information, objectives, methods, results and a discussion. In Section 7, a summary of conclusions and recommendations is given. Section 8 contains a bibliography of references cited within the text, and lastly, the Appendices provide tables of raw data collected during the forest disturbance surveys. Results of the botanical surveys will be published in a separate report.

1.4 Overview of Ruvu South Forest Reserve

Ruvu South is regarded as one of the most important coastal forests in Tanzania. The reserve is a 32,000ha mosaic of forest, woodland, thicket, swamp and grassland. Although close to both Pugu (2,180ha) and Kazimzumbwi (4,887ha) Forest Reserves, the forest composition of Ruvu South differs given historic selective logging within each of these reserves combined with unique soil and groundwater conditions (Birdlife, 2012). Ruvu forest spans Kibaha and Kisarawe Districts, Coast Region, and incorporates the former Banda and Kola Forest Reserves (Clarke & Dickinson, 1995). Ruvu is under extreme pressure from illegal logging and charcoal production. In addition, railway and road systems pass through it.

Since 1999, TFCG has been working with communities and other stakeholders in the area to establish Joint Forest Management (JFM) to empower local people to manage the reserve in partnership with the government and improve the management of the forest, including patches of forest adjacent to the reserve. The forest is an important resource for the surrounding communities and nationally important for water catchment.

1.4.1 Biodiversity and ecological value of Ruvu South Forest Reserve

The rich avifauna of Ruvu and other coastal forests of the Kisarawe District Coastal Forest IBA have been surveyed by Baker and Baker (2002) and Frontier-Tanzania. Twenty-five bird species including the Uluguru

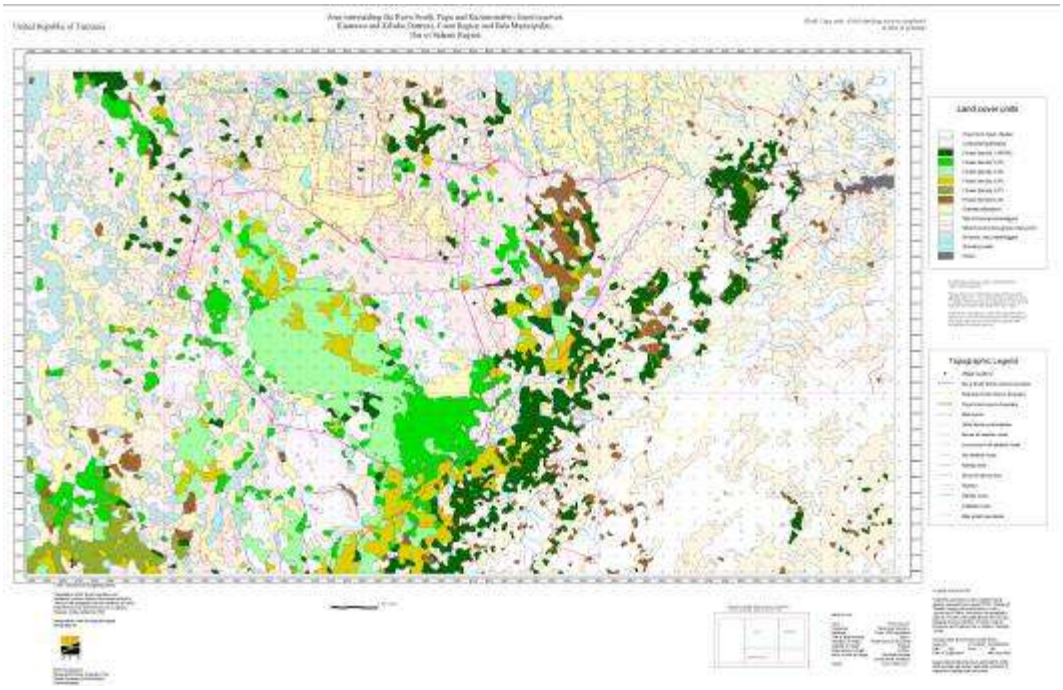
violet-backed sunbird *Anthreptes neglectus,* pale batis *Batis soror*, southern banded snake eagle *Circaetus fasciolatus,* east coast akalat *Sheppardia gunningi*, sokoke pipit *Anthus sokokensis*, and spotted ground thrush *Zoothera guttata* have been recorded in this IBA.

Ruvu South, like other coastal forests, is important for endemic and near-endemic elephant shrews such as *Rhynchocyon petersi*. Little is known about the reserve's bats and galagos. A population of elephant *Loxodonta africana* (VU) was associated with Ruvu South until c. 2004 purportedly moving between Ruvu forest and the northern approaches of the Selous Game Reserve (Birdlife, 2012). Other mammals that had been recorded within the reserve include four diurnal primates, black and white colobus *Colobus angolensis palliates*, yellow baboons *Papio cynocephalus*, Sykes monkeys *Cercopithecus mitis*, and vervet monkeys *C. aethiops pygerythrus*; the scrub hare *Lepus saxatalis*; red-legged sun squirrel *Heliosciurus rufobrachium*; and spotted hyaena *Crocucta crocuta*. A total of 36 mammal species in 31 genera and 19 families have been recorded including the vulnerable little-collared fruit bat *Myonycteris relicta* and vulnerable lesser poached rat *Beamys hindei* (Frontier Tanzania, unpublished report).

1.4.2 Deforestation in Ruvu South Forest Reserve

Conservation efforts in Ruvu South FR have included the Ruvu Fuelwood Pilot Project, a project of the Forestry and Beekeeping Division, responsible for the management of the reserve. Since 2000, the Tanzania Forest Conservation Group has been promoting Joint Forest Management (JFM) at Ruvu South initially as part of the Misitu Yetu Project, a partnership between the Forestry and Beekeeping Division, Kibaha and Kisarawe District Councils, TFCG, the Wildlife Conservation Society of Tanzania and CARE-Tanzania. TFCG worked with the eight villages and one sub-village that surround the reserve (Kipangege, Kibwemwenda, Chakenge, Kifuru, Bokomnemela, Soga, Mpiji and Kola).

Figure 3. Forest cover analysis based on 1995 Landsat image produced by the Misitu Yetu Project.



Following the closure of the Misitu Yetu Project in 2005, TFCG continued to promote JFM under a new project 'CREATE', Conservation of Ruvu South Forest through Education, Advocacy, Tree planting and Elimination of Poverty. As it became increasingly clear that the Government were not willing to sign the joint forest management agreements, TFCG has focused more on supporting community advocacy around JFM and equitable benefit sharing. Despite the obstacles to formalizing joint management TFCG has been supporting on-the-ground joint management by supporting joint patrols involving village natural resources committees and Government staff. Since 2011, through the Forest Justice in Tanzania project and more recently, through the Mama Misitu project, TFCG has continued to advocate for better reserve

management; and greater cooperation between the Government and the surrounding communities. The Government has responded to these calls for better management by removing the charcoaling camps that were expanding within the reserve by 2011; and by responding positively to initiatives aimed at greater cooperation with the surrounding communities to tackle threats including charcoal production and fire.

In the December 2011 issue of the *Arc Journal*, TFCG reported on findings of a deforestation analysis for Ruvu South, Kazimzumbwi, and Pugu Forest Reserves covering the period 2008-2010 (Morgan-Brown, MJUMITA, 2012). The results of the analysis showed alarming deforestation rates in all of these Greenbelt Forests concentrated in the most biologically unique forest areas and threatening to permanently alter the reserves' vegetation. Upon comparing what has happened in recent years to forest cover in Pande Game Reserve, a 1226ha reserve 25km north-west of Dar es Salaam city centre, TFCG found relatively less deforestation in Pande than in the more distant Ruvu South FR.

To get a better understanding of the nature of deforestation in Ruvu South Forest Reserve and the Pande Game Reserve, a cloud free Landsat image from June 29, 2000 was classified. This enabled differentiation between forests made up of predominately large trees and other closed canopy scrub forests (Fig. 1). The classification was done using Randomforest classification implemented in R with training regions selected from high resolution imagery in Google Earth. IR-MAD change detection and a decision tree were then used to compare the Landsat June 29, 2000 image to a Landsat July 7, 2011 image and detect deforestation and severe degradation (Fig. 1).

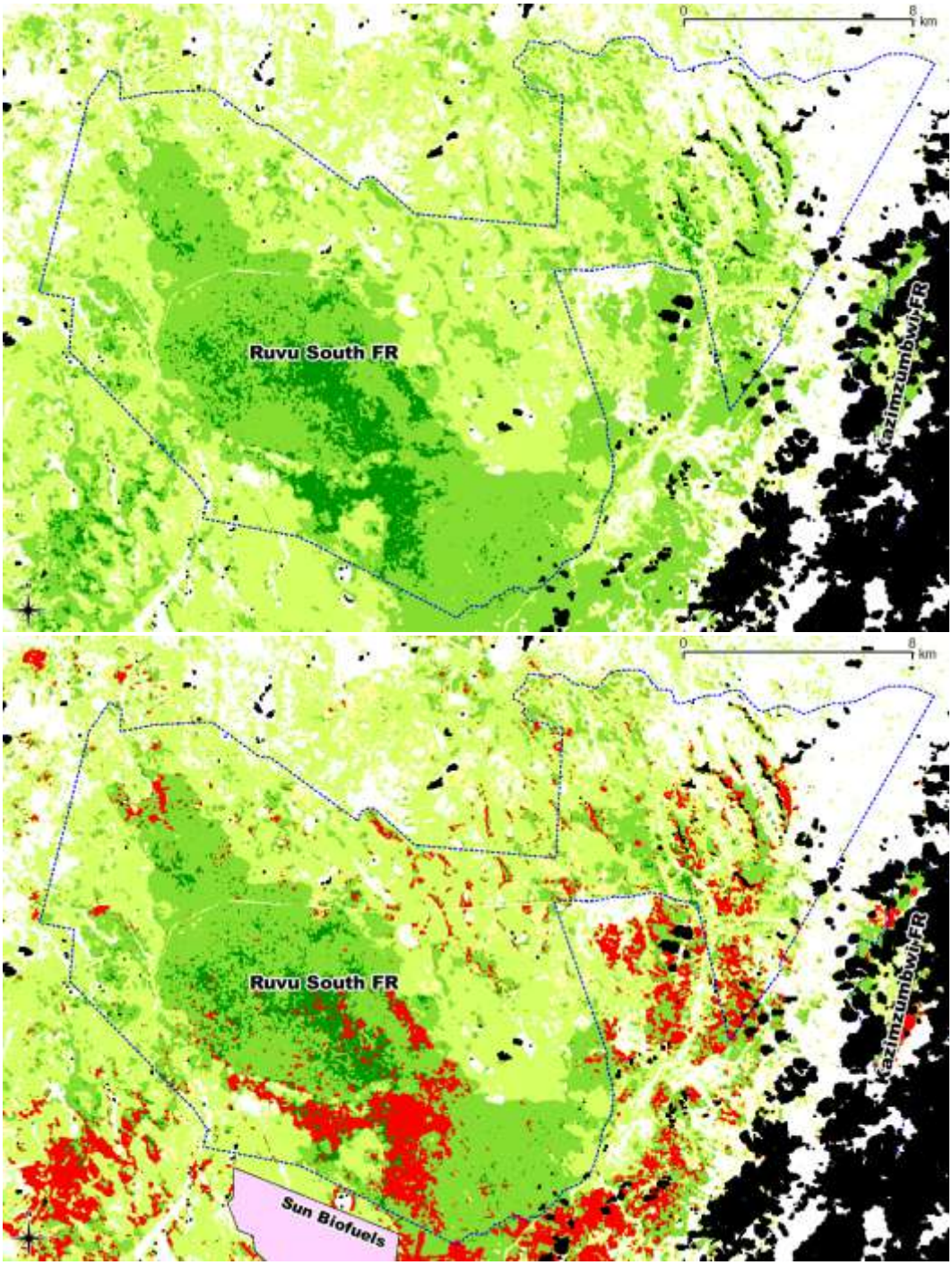
The results of the analysis show that in 2000, the Ruvu South Forest Reserve had 2,555ha of high forest and 11,870ha of thicket forest. Between 2000 and 2011, 950ha of high forest and 1,640ha of thicket forest were deforested or severely degraded. The map also shows that the largest patch of contiguous high forest was almost completely lost. Half of the forest clearance occurred in the two-year span 2008-2010, suggesting that deforestation rates rapidly accelerated after 2008. In summary, from 2000 to 2011, nearly 40% of Ruvu South's high forest was lost, with 20% lost between the years of 2008 and 2010.

If the rates of clearance observed in 2008-2010 persist, all of Ruvu South's high forest will be cleared or severely degraded by 2018. This is especially bad news for some of Tanzania's unique species that are found in Ruvu South, such as the Critically Endangered Rondo galago *Galagoides rondoensis*, which depend on the increasingly rare high coastal forest.

The pattern of deforestation in Ruvu South shows that deforestation can rapidly increase. It appears that the Sun Biofuel development to the south of the reserve that started in 2008 may have improved access for charcoal makers; and pulled in people in search of employment. This resulted in the clearance of the largest patch of high forest in the reserve and the collapse of the Black and white colobus population. Since then, charcoal makers have pushed into the heart of the reserve in search of the few remaining patches of high forest and created their own network of dirt roads visible in Google Earth.

Proximity and accessibility to Dar es Salaam are not the only factors driving deforestation in protected forests. In contrast with what TFCG has observed in Ruvu South, Kazimzumbwi, and Pugu Forest Reserves, the Pande Game Reserve have not suffered such large scale deforestation and degradation between 2008 and 2010 even though it is even closer to Dar es Salaam. Management appears to be the main determining factor of the fate of protected forests near Dar es Salaam, and the loss of forest in Ruvu, Kazimzumbwi and Pugu suggests serious failure in the management of these three Forest Reserves by the former Forestry and Beekeeping Division.

Figure 4a-b. Ruvu South forest cover in 2000 (a) and 2011 (b). Dark green = High forest. Light green = Thicket forest. Very light green = Wooded grassland. b. Deforestation in Ruvu South Forest Reserve between 2001 and 2011. Red = Deforestation 2001 – 2011. Dark green = High forest. Light green = Thicket forest. Very light green = Wooded grassland.



2) Forest Reserve Description

2.1 General description

Name: Ruvu South Forest Reserve

Size: 35,000ha of

Location: 6˚53'S - 7˚03'S, 38˚46'E - 39˚02'E
Kibaha and Kisarawe districts, Coast Region

Ruvu South Forest Reserve lies 45km south-west of Dar es Salaam city, 20 km from Kibaha town; the north-eastern corner of Ruvu South comes within 1 km of the north-western end of Pugu and is only 2 km from the western edge of Kazimzumbwi (Birdlife, 2012).

Elevation: 120 - 260m a.s.l

Management: Designated as FR in 1967; a central government Forest Reserve

Status: Protective Forest Reserve
Variation Order 81 29/6/1979 incorporates the two former forest reserves into the new Ruvu South Forest Reserve; original Banda and Kola Forest Reserves were gazetted under notice no. 158 & 159 in 1958.

Major Threats: charcoal production and fire. The Tanzanian central line railway cuts through the reserves as does the Kazimzumbwi-Mzenga road.

Villages: 8 villages and one-subvillage surround the reserve including Kola, Kifuru, Kipangege, Kibwemwenda, Soga, Bokomnemela, Mpiji and Chakenge

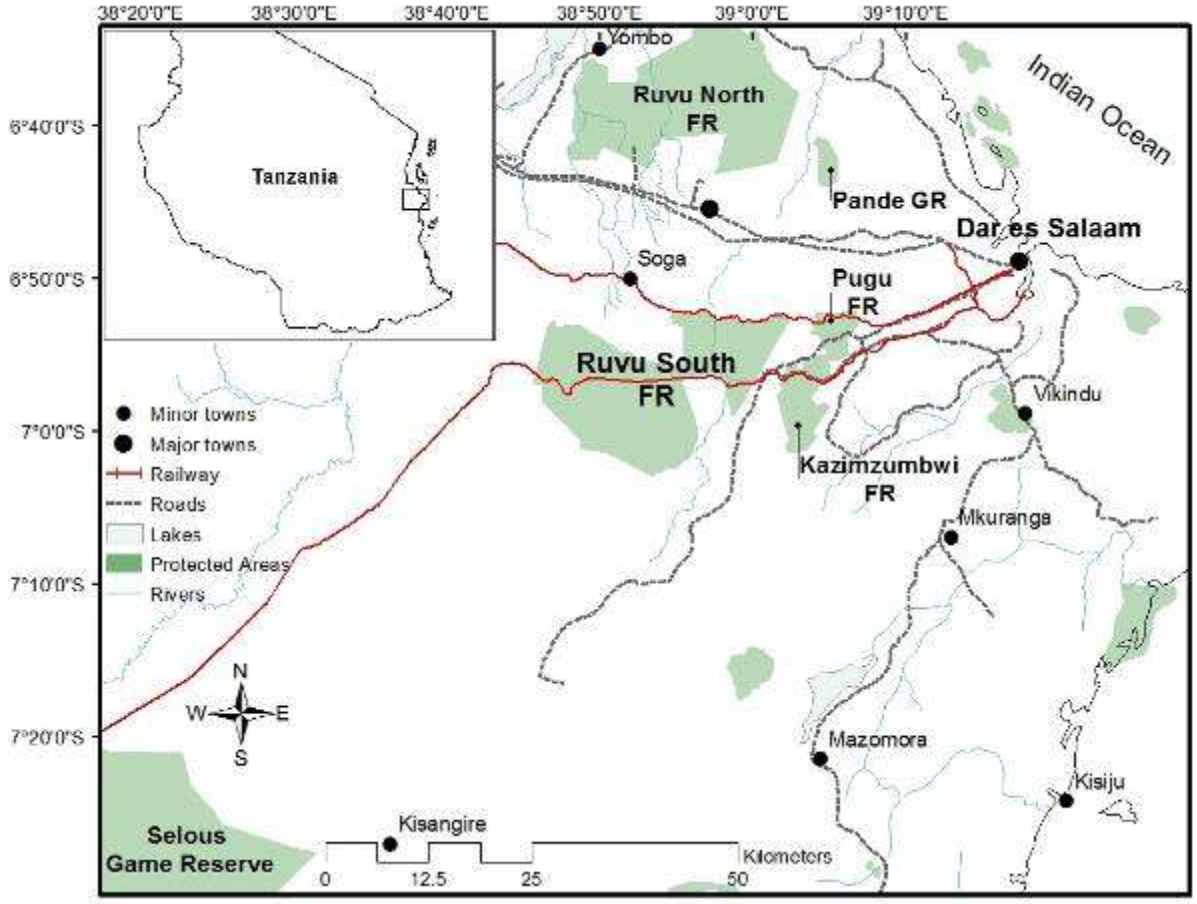


Figure 5. Map showing location of Ruvu South Forest Reserve in Coast Region.

2.2 Vegetation

Ruvu South Forest Reserve is characterized by extensive Zanzibar–Inhambane scrub-forest that may be natural climax vegetation (Birdlife, 2012). Nearly 10,000ha of the reserve is forest, much of it riparian forest, forest that is adjacent to water.

The forest supports several vegetation types including disturbed dry forest (e.g., *Hymanaea verrucosa* and *Baphia kirkii),* riverine forest (e.g., *Sorindeia madagascariensis),* thicket *(*e.g., *Dalbergia sp.),* woodland and scrub forest*.* Several swamps are also found in the centre of the reserve. There are large stands of riparian forest in Ruvu South, as well as areas of grass-covered flood-plain.

The site has two major railway systems passing through it (Fig. 2); the need to protect embankments and cuttings should help ensure some forest remains on the steeper slopes (Clarke & Dickinson, 1995).

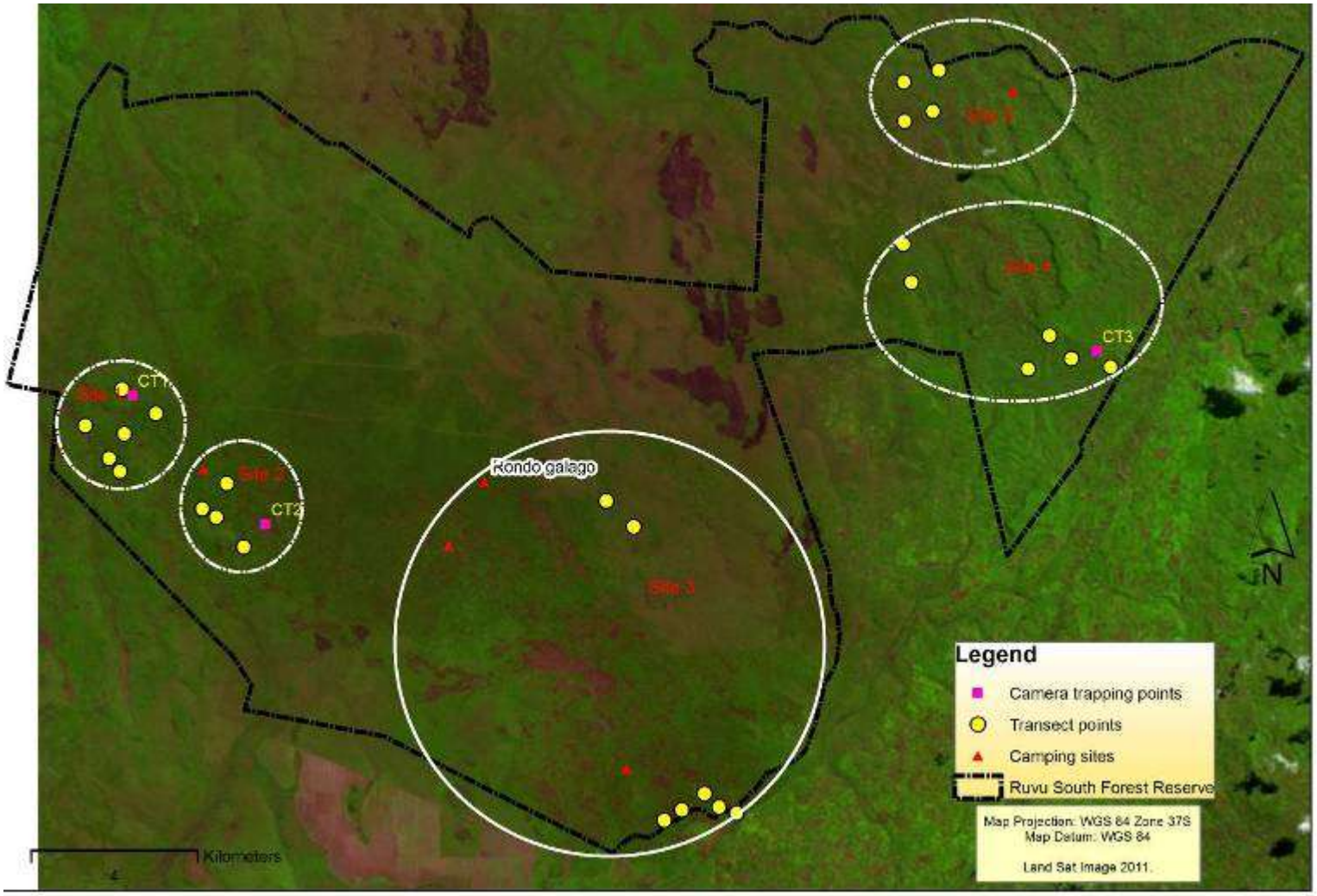
2.3. Climate

Like other Dar es Salaam Greenbelt Forests, Ruvu is influenced by East African oceanic temperatures slightly modified by altitude. Approximately 967mm of rainfall fall per year according to data recorded at the nearby Alavi Sisal Estate rainfall station from 1931-1960; the least rain (<50mm) falls between June and October (Clarke & Dickinson, 1995). Ruvu South Forest Reserves lies in the rain shadow of the Pugu Hills, where higher annual rainfall (>1200mm) has been recorded at Kisarawe (Frontier, unpublished report).

3) Survey Sites

Surveys were conducted at five sites in Ruvu South Forest Reserve (Figure 6). These five sites were: 1. Mtamba/Kola (good forest), 2. Chakenge (being cleared), 3. Mtamba/Chakenge (being cleared), 4. Kifuru (recently deforested), and 5. Mpiji/Kazimzumbwi (good forest). Characteristics of these sites, labeled 1-5 respectively, are described in further detail in the following sections.

Figure 6. Location of study sites and disturbance transects.



4) Mammals

4.1 Background

Frontier Tanzania recorded 12 mammal species including 5 bat and 2 rodent species in 1995 including the East African collared fruit bat *Myonycteris relicta* (VU) and the lesser pouched rat *Beamys hindei* (VU). Other Red-Listed species recorded by Frontier include the black-and-rufous elephant shrew *Rhynchocyon petersi petersi* (Rare) and the Zanzibar galago *Galagoides zanzibaricus* (VU). In 2002, another Frontier survey recorded 36 species of mammals (Frontier, unpublished report). African elephants have not been seen in the reserve since c. 2002.

4.2 Objectives

To provide an updated check-list of mammals in Ruvu South Forest Reserve. Transects and nocturnal surveys were conducted with a focus on primates and forest antelopes; camera-trapping was aimed at other, less conspicuous mammals such as elephant-shrews and carnivores.

4.3 Methods

4.3.1 Transects

The survey was conducted along recce transects of not less than 2 km and not exceeding 3 km from camp in four different directions (South, West, North and East at each site).

Along daytime transects, we recorded animal sightings, sounds, tracks and other signs (including faeces, digging, tree and fruit eating). These surveys were aimed at detecting diurnal species through direct observation or identification of vocalizations of primates and antelopes. Sighting locations were marked with a hand-held GPS.

Table 1. Transects along which primates and forest antelopes were surveyed.

Site number & name	Lat/long	Transect length (km)	No. of transects	Dates	Vegetation type
Site 1- Mtamba/Kola	488986/9223787	2.5	3	Nov. 18-20, 2011	Disturbed forest/shrubs
Site 2- Chakenge	475915/9230895	2.5	3	Nov. 14-15, 2011	Disturbed coastal forest
Site 3- Mtamba/Chakenge	478941/9228936	2.5	4	Nov. 15-17, 2011	Shrubs/thicket
Site 4- Kifuru	497013/9233504	2.5	2	Nov. 21-22, 2011	Miombo woodland/thicket
Site 5- Mpiji/Kazimzumbwi	496174/9239360	2.5	2	Nov. 23-24, 2011	Shrubs (Highly disturbed)

4.3.2 Camera traps

Three camera traps were set, one in Kifuru and two in Chakenge in November-December 2011.

Table 2. Locations of camera trapping sites in Ruvu South FR.

CT site	Site Name	Camera #	Number camera trap days	Location (lat/long)	Altitude (m)s	Vegetation type
1	Kifuru (Site 4)	CT3	31	0499513/9233121	243	Woodland/scrub
2	Mtamba/Chakenge (Site 3)	CT2	30	0479599/9228683	239	Disturbed dry forest
3	Chakenge (Site 2)	CT1	32	0476331/9232062	155	Disturbed dry forest

5.3.3 Galago surveys

Galagos are mostly or exclusively nocturnal so survey techniques are conducted at night.

Nocturnal transect surveys

Night walks were conducted along pre-existing paths or cut transects to reduce noise and disturbance. Galagos were detected visually by their eyeshine using head torches. Morphological details were noted with the aid of a spotting torch and binoculars. Photographs were also taken where possible. Visual descriptions were compared with published and unpublished descriptions and photographs. During the nocturnal census walks, galago vocalizations were tape-recorded and used for species identification. An analogue Marantz PMD-222 audiocassette recorder and a Sennheiser K6-ME66 directional microphone were used.

Night walks started just before dusk and continued between 18:45 and 22:00, then in the mornings from 05:00 – sunrise. During the night, data was taken advantageously around camp. Walks were conducted slowly at 0.5 km / hr pausing to observe any galagos and other target species when animals were seen and to record vocalizations. Start and finish times were noted as well as time taken to record and / or observe animals. The times at which animals were detected and any behavioural observations were also recorded (Perkin 2006). Surveys were conducted between 23/11 – 26/11/2011 for one night close to the southern border at Campsite 3 Mtamba/Chakenge (being cleared) and for two nights at Campsite 4. Kifuru (recently deforested).

Vocalization analysis

Vocalizations were imported into a computer and digitized using Avisoft-Sonapro (R. Spect, Berlin) software to generate sonograms, and spectrograms that graphically illustrate sound patterns. These can then be used to identify calls, make qualitative comparisons and descriptions and quantitative measurements. Galagos are identified mainly from their species specific advertising call and to a lesser extent their alarm calls (due to their complexity and variety).

4.4 Results

Sightings, sounds and/or signs of 21 mammal species were recorded: 13 on transects – 7 on mammal transects (Table 3), and 6 along disturbance transects (Appendices) – 7 with CTs (Table 4) and two during opportunistic surveys during evening / night.

4.4.1 Transects

Seven mammals were recorded along transects.

Table 3. Mammals recorded on transects.

Family	Scientific name	Taxon	Site					Total
			1	2	3	4	5	No. of encounters
CERCOPITHECIDAE	*Cercopithecus mitis*	Sykes monkeys	0	2	0	0	0	2
	Papio cynocephalus	Yellow baboons	4	0	0	0	0	4
BOVIDAE	*Tragelaphus scriptus*	Bushbuck	6	3	2	0	2	13
	Cephalophus natalensis	Red duiker	4	0	1	0	0	5
	Neotragus moschatus	Suni	4	0	5	2	4	15
MACROSCELIDIDAE	*Petrodromus tetradactylus*	Elephant shrew	4	8	0	0	0	12
SUIDAE	*Phacochoerus africanus*	Warthog	2	0	0	0	0	2

NB. Red = sighting, Green = hearing, Blue = old sign, orange = both fresh and old signs.

Signs of mammals were also seen on disturbance transects (see Appendices) including aardvark holes, and dung of hare, hyrax, hyena, bushpig and buffalo.

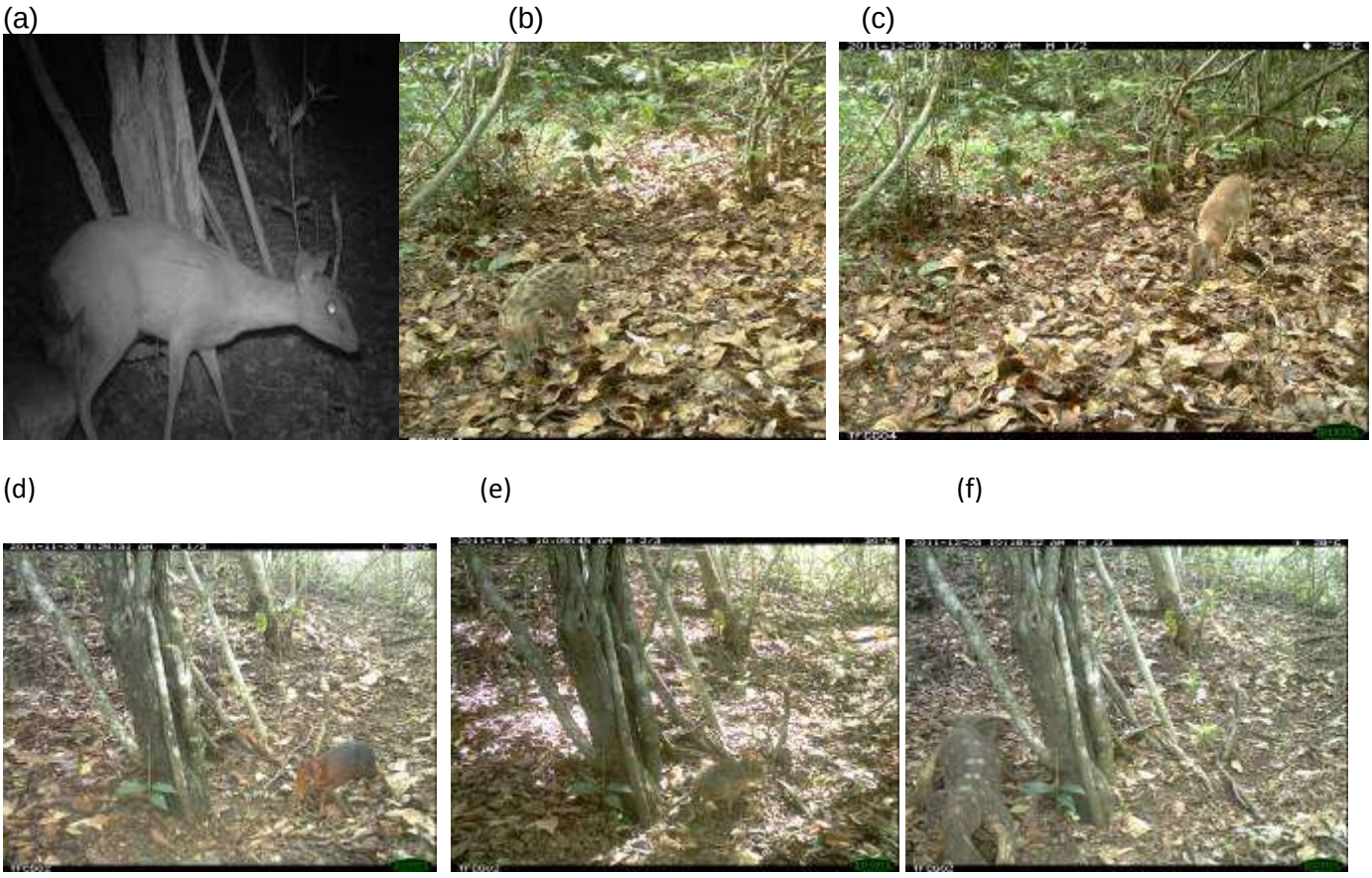
4.4.2 Camera traps

The three CTs captured 327 images of seven mammals, two birds, and one reptile. Of these 327 images, 84% (274 images) were of four-toed elephant shrews. Giant pouched rat (18 images) suni (13) and black-and-rufous elephant-shrews (12) were the most commonly captured mammals after the Four-toed elephant-shrew (Table 4).

Table 4. Species caught on camera trap in Ruvu South FR in November-December 2011. CT1 = Chakenge, CT2 = Kifuru and CT3 = Chakenge.

Family	Scientific name	Common name	Red List	CT1	CT2	CT3	Total images
BOVIDAE	*Neotragus moschatus*	Suni	LC	2	8	3	13
HERPESTIDAE	*Bdeogale crassicauda*	Bushy-tailed mongoose	LC			1	1
MACROSCELIDIDAE	*Petrodromus tetradactylus*	Four-toed elephant shrew	LC	43	65	166	274
MACROSCELIDIDAE	*Rhynchocyon petersi*	Rufous & black elephant shrew	VU		9	3	12
NESOMYIDAE	*Cricetomys sp.*	Giant pouched	LC	2	4	12	18
VIVERRIDAE	*Genetta tigrina*	Blotched genet	LC		1	1	2
VIVERRIDAE	*Civettictis civetta*	Civet	LC		1		1
COLUMBIDAE	?	Dove			1		1
PHASIANIDAE	*Francolinus sp.*	Francolin sp.				1	1
VARANIDAE	*Varanus niloticus*	Nile monitor			1	1	2
?	?	Unknown				2	2

Figure 7. Camera trap photographs from Ruvu South FR.



(a) Infant suni trying to suckle from her mother. (b) Small spotted genet captured during day time. (c) Suni. (d) Rufous and black elephant-shrew. (e) Four-toed elephant shrew (f) Monitor lizard

5.4.3 Galago surveys

The surveys recorded three species of galago: *Otolemur garnettii*, *Galagoides zanzibaricus* and *Galagoides rondoensis*. *O. garnettii* and *G. zanzibaricus* were recorded in both Campsites 3 and 4

whereas *G. rondoensis* was only recorded in the disturbed evergreen forest close to campsite 3 near the southern border of the reserve.

4.5 Discussion

The high abundance of elephant-shrews suggested from CT trapping rates is consistent with unpublished results from Frontier (Frontier Tanzania, unpublished report) in which the number of elephant-shrew records in RSFR was over twice that recorded in Kazimzumbwi FR.

Other small forest mammals are still present in Ruvu, including suni and blotched genet. CTs did not capture other mammals whose signs were seen on transect, including hare, hyrax, hyena, aardvark, bushpig and buffalo. We recorded one species of conservation concern on camera traps – the Rufous and black elephant shrew (VU).

The Critically Endangered (CR) Rondo galago was recorded at Campsite 3 by Andrew Perkin on the basis of sightings and recording vocalizations. The Rondo galago *Galago rondoensis* (RG), discovered in 1997 is classified as a top 25 most endangered primate by IUCN/SSC Primate Specialist Group. The galago is only from seven forest patches of <100km² and is lacking conservation attention.

5) Birds

5.1 Background

Like other coastal forests, Ruvu South FR is rich in avifauna. It falls within the Kisarawe District Coastal Forests IBA together with Pugu and Kazimzumbwi Forest Reserves. This IBA supports species of global conservation concern such as the East Coast akalat and southern banded snake-eagle, and biome-restricted species such as the Uluguru violet-backed sunbird (BirdLife, 2012). The forest has been surveyed by Baker and Baker (2002), and was the site of early collections by ornithologist Fuggles-Couchman in 1955 (Clarke & Dickinson, 1995).

5.2 Objectives

To provide an updated check-list of birds in Ruvu South Forest Reserves with special focus on threatened and coastal endemic species.

5.3 Methods

Two methods were used to assess bird fauna in the five selected survey sites in Ruvu South Forest Reserve: mist netting and direct observations. These methods were adapted from Doggart, 2006.

5.3.1 Observations

Eleven days were spent opportunistically surveying birds in this area. At each site, the birder walked in different directions from camp to compile a list of birds species present in the forest. At each site, the birder moved in four different directions: West, East, North and South. Every bird species seen or heard was recorded, and bird vocalizations were taped with an acoustic recording device. For each site, bird observation survey effort was 9 hours per day for each of the eleven days of the survey for a total of 99 hours of observation.

5.3.2 Mist netting

After selection of good vegetation structure where there was possibility of sampling a high diversity of bird species, mist nets were set early in the morning (at first light) on each day of the survey, then checked frequently at 10-15 minute intervals throughout the day until sunset. Captured birds were removed from the net, identified and then immediately released. Based on their physical features, birds were identified to species level (Table 9).

Table 5. Bird survey sampling intensity (mist netting).

Survey sites	Mist netting hours	GPS location (lat/long)	Altitudinal range (m)	Dates
Site 1-Mtamba/Kola	1008	0485612/9229805	224	Nov. 17-18, 2011
Site 5-Mpiji/Kazimzumbwi	1008	0498419/9238777	205	Nov. 21-22, 2011

NB. Mist net hours = Total length of the net x numbers of hours the net was up in the field.

5.3.3 Sites

Sites surveyed were as follows: Site 1 = Mtamba/Kola (Good forest); Site 2 = Chakenge (Being deforested); Site 3 = Mtamba/Chakenge (Being deforested); Site 4 = Kazimzumbwi/Kifuru (Recently deforested) and Site 5 = Mpiji (Good forest) (Table 7)

5.4 Results

A total of 88 birds species in 67 genera and 39 families were recorded during the 99-hour survey at five sites in Ruvu South FR. Of these, two species are Red-Listed, the bateleur (NT) and East Coast akalat (NT) (Table 6). The latter was seen at only one site – Mtamba/Kola (good forest) – while the bateleur was observed at three of the five survey sites. Between 26 (in disturbed forest in Chakenge) and 63 (in good forest Mtamba/Kola) species were recorded at the five survey sites (Table 6).

Table 6. Checklist of 88 bird species recorded in five different sites of Ruvu South FR. H = Habitat with F = forest, O = open; R = Range with W = Widespread, NE = Near Endemic; RL = Red List status; 1 indicates presence and total = total number of sites at which species was seen.

Family	Scientific name	Common name	Author	H	R	RL	1	2	3	4	5	Total
ACCIPITRIDAE	*Accipiter minullus*	Little sparrowhawk	Daudin, 1800		W	LC	1	0	0	0	0	1
ACCIPITRIDAE	*Gypohierax angolensis*	Palm-nut vulture	Gmelin, 1788	F	W	LC	1	0	0	1	1	3
ACCIPITRIDAE	*Terathopius ecaudatus*	Bateleur	Daudin, 1800	O	W	NT	1	0	0	1	1	3
ALAUDIDAE	*Mirafra Africana*	Rufous-naped lark	Smith, 1836		W	LC	0	0	0	1	1	2
ALAUDIDAE	*Mirafra rufocinnamomea*	Flappet lark	Salvadori, 1865		W	LC	0	1	1	1	1	4
ALCEDINIDAE	*Halcyon leucocephala*	Grey-headed kingfisher	Muller, 1776		W	LC	1	0	0	0	0	1
ALCEDINIDAE	*Halcyon senegalensis*	Woodland kingfisher	Linnaeus, 1766		W	LC	0	0	0	1	1	2
BUCEROTIDAE	*Bycanistes bucinator*	Trumpeter hornbill	Temminck, 1824	F	W	LC	0	0	0	1	1	2
BUCEROTIDAE	*Tockus alboterminatus*	Crowned hornbill	Buttikofer, 1889	F	W	LC	1	0	0	1	1	3
BUCEROTIDAE	*Tockus nasutus*	African grey hornbill	Linnaeus, 1766	O	W	LC	1	0	0	1	1	3
BUCEROTIDAE	*Tockus pallidirostris*	Pale-billed hornbill	Hartlaub&Finsch, 1870		W	LC	0	1	1	0	0	2
CAPITONIDAE	*Pogoniulus bilineatus*	Yellow–rumped tinkerbird	Sundevall, 1850	F	W	LC	1	1	1	1	1	5
CAPRIMULGIDAE	*Caprimulgus pectoralis*	Fiery–necked nightjar	Cuvier, 1816	O	W	LC	0	0	0	1	1	2
CISTICOLIDAE	*Camaroptera brachyura*	Grey–backed camaroptera	Vieillot, 1820	F	W	LC	1	0	0	0	0	1
CISTICOLIDAE	*Camaroptera undosa*	Miombo wren-warbler	Reichenow, 1882		W	LC	0	1	1	0	0	2
CISTICOLIDAE	*Cisticola cantans*	Singing cisticola	Heuglin, 1869		W	LC	1	0	0	0	0	1
CISTICOLIDAE	*Cisticola chiniana*	Rattling cisticola	Smith, 1843	O	W	LC	0	1	1	0	0	2
CISTICOLIDAE	*Prinia subflava*	Tawny–flanked prinia	Gmelin, 1789	O	W	LC	1	1	1	1	1	5
COLIIDAE	*Colius striatus*	Speckled mousebird	Gmelin, 1789	O	W	LC	1	0	0	0	0	1
COLUMBIDAE	*Streptopelia decipiens*	African mourning dove	Hartlaub&Finsch, 1870		W	LC	0	1	1	0	0	2
COLUMBIDAE	*Streptopelia semitorquata*	Red eyed dove	Ruppell, 1837			LC	1	0	0	1	1	3
COLUMBIDAE	*Treron calvus*	African green-pigeon	Temminck, 1808		W	LC	1	1	1	0	0	3
COLUMBIDAE	*Turtur tympanistria*	Tambourine dove	Temminck, 1809	F	W	LC	0	0	0	1	1	2
COLUMBIDAE	*Turtur chalcospilos*	Emerald spotted wood dove	Wagler, 1827		W	LC	1	0	0	1	1	3
CORACIIDAE	*Eurystomus glaucurus*	Broad–billed roller	Muller, 1776	O	W	LC	1	1	1	0	0	3
CUCULIDAE	*Centropus superciliosus*	White–browed coucal	Hemprich & Ehrenberg, 1833	O	W	LC	1	0	0	1	1	3
CUCULIDAE	*Chrysococcyx caprius*	Didric cuckoo	Boddaert, 1783		W	LC	1	0	0	1	1	3
CUCULIDAE	*Cuculus poliocephalus*	Lesser cuckoo	Latham, 1790		W	LC	1	0	0	0	0	1
CUCULIDAE	*Cuculus rochii*	Madagascar lesser cuckoo	Hartlaub, 1863		W	LC	0	1	1	0	0	2
DICRURIDAE	*Dicrurus adsimilis*	Fork-tailed drongo	Bechstein, 1794	O	W	LC	0	0	1	1	0	2
DICRURIDAE	*Dicrurus ludwigii*	Square-tailed drongo	Smith, 1834	F	W	LC	1	0	0	0	0	1

Family	Scientific name	Common name	Author	H	R	RL	1	2	3	4	5	Total
ESTRILDIDAE	*Lonchura cucullata*	Bronze mannikin	Swainson, 1837	O	W	LC	1	0	0	0	0	1
ESTRILDIDAE	*Uraeginthus angolensis*	Southern cordon bleu	Linnaeus, 1758		W	LC	1	1	1	0	0	3
HIRUNDINIDAE	*Hirundo smithii*	Wire-tailed swallow	Leach, 1818		W	LC	1	0	0	1	1	3
INDICATORIDAE	*Indicator variegatus*	Scaly-throated honey guide	Lesson, 1830	O	W	LC	0	0	0	1	1	2
LANIIDAE	*Lanius collurio*	Red-backed shrike	Linnaeus, 1758		W	LC	0	0	0	1	1	2
MALACONOTIDAE	*Tchagra australis*	Brown-crowned tchagra	Smith, 1836		W	LC	1	0	1	1	1	4
MALACONOTIDAE	*Telophorus nigrifrons*	Black-fronted bush-shrike	Reichenow, 1896		W	LC	1	0	0	0	0	1
MALACONOTIDAE	*T. sulfureopectus*	Sulphur-breasted bush shrike	Lesson, 1831		W	LC	0	0	0	1	1	2
MEROPIDAE	*Merops hirundineus*	Swallow-tailed bee-eater	Lichtenstein, 1793		W	LC	1	1	1	1	1	5
MEROPIDAE	*Merops pusillus*	Little bee–eater	Muller, 1776	O	W	LC	1	0	0	1	1	3
MONARCHIDAE	*Trochocercus cyanomelas*	Blue-mantled flycatcher	Vieillot, 1818	F	W	LC	0	0	0	1	1	2
MUSCICAPIDAE	*Muscicapa adusta*	African dusky flycatcher	Boie, 1828	O	W	LC	0	0	0	1	1	2
MUSCICAPIDAE	*Muscicapa striata*	Spotted flycatcher	Pallas, 1764	O	W	LC	1	1	1	0	0	3
MUSOPHAGIDAE	*Tauraco livingstonii*	Livingstone’s turaco	Gray, GR, 1864	F	W	LC	1	1	1	0	0	3
MUSOPHAGIDAE	*Tauraco porphyreolophus*	Purple-crested tauraco	Vigors, 1831	F	W	LC	1	0	0	0	0	1
NECTARINIIDAE	*Dryoscopus cubla*	Black backed puffback	Shaw, 1809	F	W	LC	1	0	0	1	1	3
NECTARINIIDAE	*Nectarinia bifasciata*	Purple banded sunbird	Shaw, 1812		W	LC	0	0	0	1	1	2
NECTARINIIDAE	*Anthreptes collaris*	Collared sunbird	Vieillot, 1819	F	W	LC	1	0	0	0	0	1
NECTARINIIDAE	*Anthreptes neglectus*	Uluguru violet–backed sunbird	Neumann, 1922	FF	W	LC	1	0	0	1	1	3
NECTARINIIDAE	*Laniarius aethiopicus*	Tropical boubou	Gmelin, 1788	O	W	LC	1	0	0	1	1	3
NECTARINIIDAE	*Nectarinia moreaui*	Amethyst sunbird	Shaw, 1812	O	W	LC	1	0	0	0	0	1
NECTARINIIDAE	*Nectarinia olivacea*	Olive sunbird	Smith, A, 1840	F	W	LC	1	0	0	1	1	3
NECTARINIIDAE	*Nectarinia veroxii*	Mouse-coloured sunbird	Smith, 1831			LC	1	0	0	0	0	1
NUMIDIDAE	*Guttera pucherani*	Crested guineafowl	Hartlaub, 1860	FF	W	LC	1	0	0	1	1	3
NUMIDIDAE	*Numida meleagris*	Helmeted guineafowl	Linnaeus, 1758		W	LC	1	1	1	1	1	5
ORIOLIDAE	*Oriolus auratus*	African golden oriole	Vieillot, 1817		W	LC	1	1	1	0	0	3
ORIOLIDAE	*Oriolus larvatus*	African black-headed oriole	Litchtenstein, 1823	F	W	LC	1	0	0	0	0	1
OTIDIDAE	*Eupodotis melanogaster*	Black-bellied bustard	Ruppell, 1835		W	LC	0	0	0	1	1	2
PHASIANIDAE	*Francolinus sephaena*	Crested francolin	Smith, 1836		W	LC	0	1	1	1	1	4
PHOENICULIDAE	*Phoeniculus purpureus*	Green wood hoopoe	Miller, 1784	O	W	LC	0	1	1	1	1	4
PHOENICULIDAE	*Rhinopomastus cyanomelas*	Common scimitarbill	Vieillot, 1819		W	LC	1	1	1	0	0	3
PICIDAE	*Dendropicos fuscescens*	Cardinal woodpecker	Vieillot, 1818	O	W	LC	1	0	0	0	0	1
PLATYSTEIRIDAE	*Batis soror*	Pale batis	Reichenow, 1903	O	W	LC	0	0	0	1	1	2

Family	Scientific name	Common name	Author	H	R	RL	1	2	3	4	5	Total
PLATYSTEIRIDAE	*Bias musicus*	Black & white shrike flycatcher	Vieillot, 1818		W	LC	0	1	1	0	0	2
PLATYSTEIRIDAE	*Platysteira peltata*	Black throated wattle-eye	Sundevall, 1850		W	LC	0	0	0	1	1	2
PLOCEIDAE	*Ploceus bicolor*	Dark-backed weaver	Vieillot, 1819		W	LC	1	0	0	0	0	1
PRIONOPIDAE	*Prionops retzii*	Retz's helmetshrike	Wahlberg, 1856	O	W	LC	0	1	1	0	0	2
PSITTACIDAE	*Poicephalus cryptoxanthus*	Brown parrot	Peters, 1854	O	W	LC	1	0	0	1	1	3
PYCNONOTIDAE	*Andropadus importunus*	Zanzibar sombre greenbul	Vieillot, 1818		W	LC	1	0	0	1	1	3
PYCNONOTIDAE	*Cercotrichas leucophrys*	White-browed scrub-robin	Vieillot, 1817	O	W	-	1	0	0	0	0	1
PYCNONOTIDAE	*Chlorocichla flaviventris*	Yellow-bellied greenbul	Smith, 1834		W	LC	1	1	1	0	0	3
PYCNONOTIDAE	*Cossypha heuglini*	White-browed robin-chat	Hartlaub, 1866	O	W	LC	0	0	0	1	1	2
PYCNONOTIDAE	*Cossypha natalensis*	Red-capped robin-chat	Smith, 1840	F	W	LC	1	0	0	1	1	3
PYCNONOTIDAE	*Pycnonotus barbatus*	Common bulbul	Desfontaine, 1789	O	W	LC	1	1	1	1	1	5
PYCNONOTIDAE	*Sheppardia gunningi*	East coast akalat	Haagner, 1909	F	NE	NT	1	0	0	0	0	1
PYCNONOTIDAE	*Phyllastrephus debilis*	Tiny greenbul	Sclater, 1899	FF	W	LC	1	0	0	1	1	3
PYCNONOTIDAE	*Turdus libonyanus*	Kurrichane thrush	Smith, 1836	O	W	LC	1	1	1	0	0	3
RAMPHASTIDAE	*Lybius torquatus*	Black-collared barbet	Dumont, 1816		W	LC	1	0	0	1	1	3
STRIGIDAE	*Glaucidium perlatum*	Pearl-spotted owlet	Vieillot, 1818		W	LC	1	0	0	0	0	1
STRIGIDAE	*Strix woodfordii*	African wood owl	Smith, 1834	F	W	LC	0	0	0	1	1	2
SYLVIIDAE	*Apalis melanocephala*	Black-headed apalis	Fischer & Reichenow, 1884	FF	W	LC	1	0	0	0	0	1
SYLVIIDAE	*Melocichla mentalis*	African moustached warbler	Fraser, 1843		W	LC	1	0	0	1	1	3
SYLVIIDAE	*Phylloscopus trochilus*	Willow warbler	Linnaeus, 1758		W	LC	1	0	0	0	0	1
SYLVIIDAE	*Apalis flavida*	Yellow-breasted apalis	Strickland, 1852	F	W	LC	1	1	1	1	1	5
TROGONIDAE	*Apaloderma narina*	Narina trogon	Stephens, 1815	F	W	LC	1	1	1	1	1	5
TURDIDAE	*Neocossyphus rufus*	Red–tailed ant-thrush	Fischer & Reichenow, 1884	FF	W	LC	1	0	0	1	1	3
TURNICIDAE	*Turnix sylvaticus*	Common button quail	Desfontaines, 1787		W	LC	1	0	0	1	1	3
Species richness							**63**	**26**	**28**	**52**	**51**	**220**

5.5 Discussion

Ruvu Forest still supports a diversity of forest birds. We recorded in 88 bird species of which two are of conservation concern, the bateleur (NT) and East Coast akalat (NT). The East Coast akalat is a locally common resident in the District Coastal Forest IBA, and Ruvu South may hold the largest population of this species within Tanzania (Birdlife, 2012).

We unfortunately did not observe other resident, coastal forest endemics such as the little yellow flycatcher, southern banded snake-eagle, and sokoke pipit, previously recorded and detailed in Clarke & Dickinson (1995) and listed by Birdlife (2012). We did record the red-capped robin chat, which, according to Birdlife, is a low-density resident within this IBA (*ibid*.).

One of our camera trap photos shows what we believe to be a francolin; however, Baker and Baker (1994) note the presence of a quail species from Ruvu South and this may be worth investigating further.

6) Forest Disturbance

6.1 Background

According to a forest cover change analysis carried out by TFCG, Ruvu South Forest Reserve in Coast Region is more disturbed than Pande Game Reserve, despite the former reserve being closer to Dar es Salaam. Here, we report results of surveys of human impact in the reserve, including pole and timber cutting and other forms of disturbance.

6.2 Objectives

The disturbance surveys were carried out to achieve the following aims:

1. To assess the level of disturbance in Ruvu South Forest Reserves by documenting all observations of disturbance and their intensities.
2. To gain a general understanding of the level of threats to Ruvu forest and its fauna and flora.
3. To devise site-specific priorities for conservation and management.

6.3 Methods

Thirteen disturbance transects were carried out at the five survey sites: two at Sites 2 and 5, and three at Sites 1, 3 and 4 (Tables 7-9). Methods were adapted from the TFCG survey manual (Doggart, 2006). A rope of 50m long was used to measure 50m sections along each 1km transect. The level of disturbance was assessed by the number of incidences of pole cutting, timber cutting, traps and other disturbances in a 10m strip (5m on either side of the transect line) along each transect line. The disturbance transect was sub-divided into 50m sections and data were recorded separately for each section. The longitude, latitude and altitude of the start and end points of each disturbance transect were marked with a GPS and transect bearing was recorded and followed using a compass.

For the purposes of this survey, poles are defined as all trees with a diameter at breast height (DBH) of 5cm-15 cm. Timber trees are defined as all trees exceeding 15 cm DBH (see Appendices). All other forms of anthropogenic disturbance within 5 m of either side of each transect were also recorded for every 50-m section. Other forms of disturbance were defined as follows:

1. Fire damage: area affected by fire, evinced by burnt trees and ground vegetation.
2. Charcoal: area where charcoal was burnt in the forest, evidence included small patches of burnt ground with charcoal remains.
3. Pitsaw: area cleared for pitsaw activities, with pitsaw platform, or remains of such.
4. Timber/planks/poles: cut timber, planks or cut poles laying on the ground ready for transport.
5. Trapping: animal traps of all varieties whether set or sprung.
6. Cultivation: evidence of crop cultivation (past or present).
7. Grazing: direct evidence or remains of cattle or goat grazing.
8. Footpath: including all human used paths.
9. Clearing: well-established clearings within the forest as a consequence of human disturbance (usually short grassland, potentially previous settlement).

Table 7. Total number of disturbance transects carried out in RSFR.

S/N	Site Name	No. of transects	Dates	General Comments
1	Site1-Mtamba/Kola	2	Nov.17-18, 2011	High disturbance esp. fire & charcoal making
2	Site2-Chakenge	3	Nov.14-15, 2011	Medium disturbance mainly charcoal making with some fire incidence
3	Site3-Mtamba/Chakenge	3	Nov.15-16, 2011	High rates of timber & charcoal making
4	Site4-Kifuru/Kazimzumbwi	3	Nov.19-20, 2011	High fire incidence and charcoal making
5	Site5- Mpiji	2	Nov. 21-22, 2011	High fire incidence and charcoal making
Total no. of transects		**13**	**Nov. 14-22, 2011**	

Table 8. Details of disturbance transects including the length of each transect, its start and end points, orientation and habitat types.

Transect number	Transect length	Start point (UTM)	End point (UTM)	Survey date	Orientation	Habitat type
T_1R	1000(1)	475195/9231331	475775/9230541	14/11/2011	W	DWF/T
T_2R	1000(1)	476027/9230230	476138/9231141	14/11/2011	W	DWF/T
T_3R	1000(1)	476895/9231629	476085/9232213	15/11/2011	NW	DWF/T
T_4R	1000(1)	478014/9229328	478594/9229954	15/11/2011	W	DWF/T
T_5R	1000(1)	478347/9229130	479001/9228415	16/11/2011	SE	DWF/T
T_6R	1000(1)	490852/9222011	490084/9222486	17/11/2011	SE	DF/T
T_7R	1000(1)	489537/9222089	490436/9222159	17/11/2011	SE	DF/T
T_8R	1000(1)	487710/9229518	488383/9228905	18/11/2011	NE	DF/T
T_9R	1000(1)	499848/9232741	498897/9232949	19/11/2011	W	DF/T
$T_{10}R$	1000(1)	498369/9233504	497857/9232701	20/11/2011	SE	DF/T
$T_{11}R$	1000(1)	494854/9235700	495049/9234788	21/11/2011	SW	DF/T
$T_{12}R$	1000(1)	495711/9239885	495570/9238900	22/11/2011	SW	DF/T
$T_{13}R$	1000(1)	494892/92386559	494874/9239600	21/11/2011	NE	DF/T

6.4 Results

A total of 5521 disturbance events were recorded along the 13 transects at five sites with an overall disturbance rate of 425 events per hectare. Across the five sites, Mtamba/Kola (good forest) was most disturbed overall with 1427 disturbance events in total (764 poles, 495 timber and 168 other disturbances) and 476 events per hectare (Table 13).

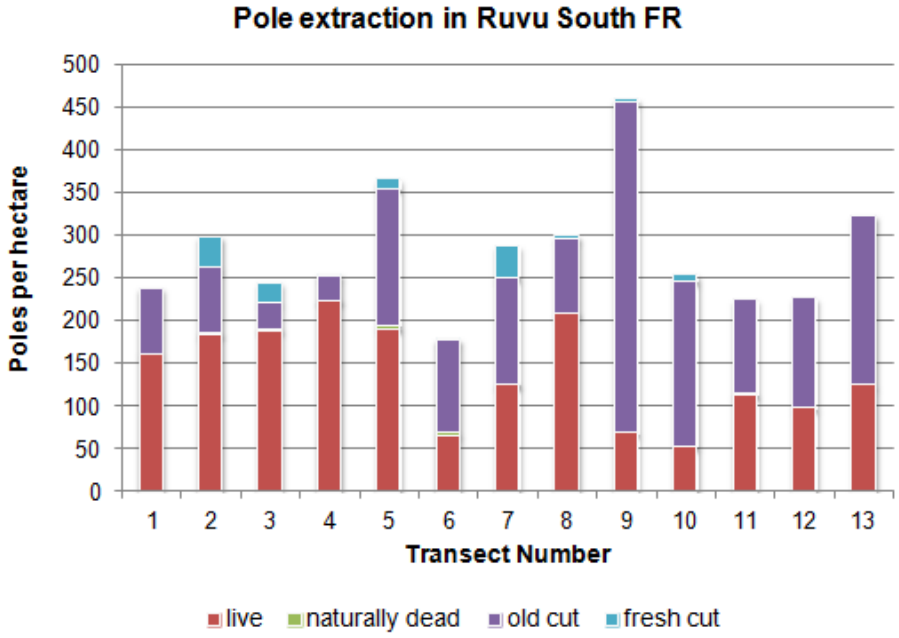
Table 9. Summary of results from disturbance surveys.

Site Number	Site Name	Category	Transect	No. Poles	No. Timbers	No. Other disturbances	Total number	Total per ha
1	Mtamba/Kola	Good forest	6	178	201	69		
1	Mtamba/Kola	Good forest	7	287	135	55		
1	Mtamba/Kola	Good forest	8	299	159	44		
Subtotal – Site 1				**764**	**495**	**168**	**1427**	371.67 **475.67**
2	Chakenge	Being deforested	1	238	78	40		
2	Chakenge	Being deforested	2	298	88	25		446.00
2	Chakenge	Being deforested	3	244	85	19		
Subtotal – Site 2				**780**	**251**	**84**	**1115**	**371.67**
3	Mtamba/Chakenge	Being deforested	4	253	128	12		
3	Mtamba/Chakenge	Being deforested	5	365	105	29		475.67
Subtotal – Site 3				**618**	**233**	**41**	**892**	**446.00**
4	Kifuru/Kazimzumbwi	Recently deforested	9	459	77	54		
4	Kifuru/Kazimzumbwi	Recently deforested	10	254	65	34		432.00
4	Kifuru/Kazimzumbwi	Recently deforested	11	224	77	52		
Subtotal – Site 4				**937**	**219**	**140**	**1296**	**432.00**
5	Mpiji	Good forest	12	226	61	51		395.50
5	Mpiji	Good forest	13	323	91	39		424.69
Subtotal – Site 5				**549**	**152**	**90**	**791**	**395.50**
Total – All Sites				**3648**	**1350**	**523**	**5521**	**424.69**

6.4.1 Pole extraction

A total of 3648 poles were recorded. Of these, 49% (n = 1793) were live, 46% (n = 1712) were old cut, 3.5% (n = 127) were fresh cut, and 0.5% (n = 16) were naturally dead. Transect 9 had the most old cut poles, and transects 2 and 7 had the most fresh cut poles (Figure 8).

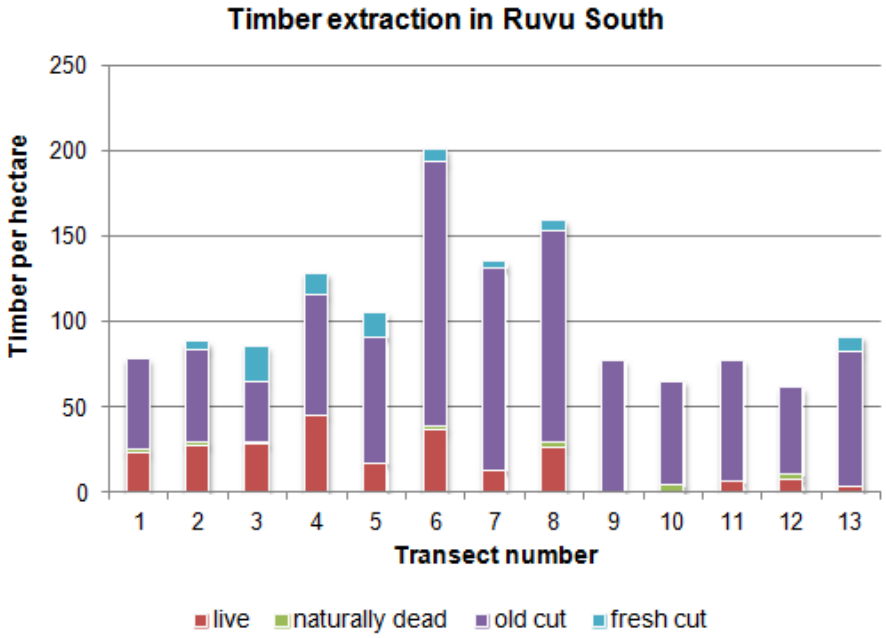
Figure 8. Number of live, naturally dead, old cut and fresh cut poles recorded in RSFR**.**



6.4.2 Timber extraction

A total of 1350 timber was recorded. Of this timber, 76% was old cut (n = 1022), 17% (n = 231) was live, 6% (n = 79) was fresh cut and the remaining 1% (n = 18) was naturally dead.

Figure 9. Number of live, naturally dead, old cut and fresh cut timber recorded in RSFR.

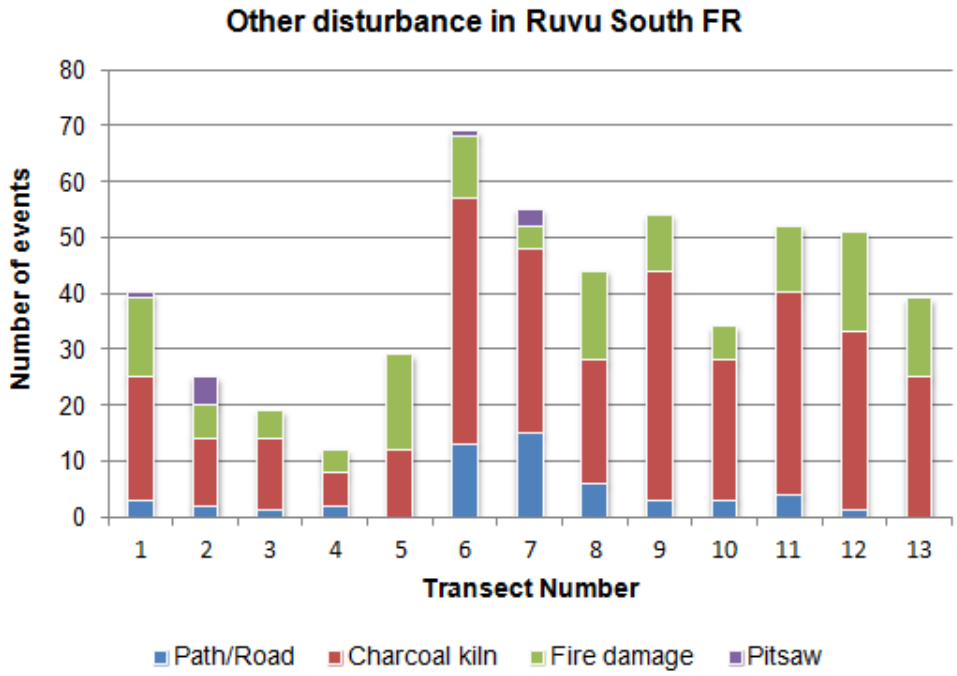


6.4.3 Other disturbance

In total, 523 other disturbance events were recorded on the 13 disturbance transects. Of these, 62% (n = 323) were charcoal kilns, 26% (n = 137) was fire damage, 10% (n = 52) were paths or roads and 2% (n =

10) were pitsaw. Transect 6 (Site 1, “good forest” near Kola) was the most disturbed of the 13 with 69 (>13%) of the 523 disturbance events (Figure 10). This suggests that the most intensive disturbance is concentrated into remaining patches of forest.

Figure 10. Other disturbances recorded in RSFR.



6.5 Discussion

All five sites were similarly disturbed with 372-476 disturbance events/hectare. The most intensive anthropogenic pressure is on remaining good forest, at Mtamba/Kola and Mpiji sites (transects 6-8 and 12-13 respectively). It appears that timber cutting is slightly more prevalent than pole cutting.

Charcoal kilns were the most frequent other disturbance type observed. Charcoal burning may be associated with high fire incidence in some areas of the reserve, and fire damage was the second most common disturbance type observed. Human footpaths, third most common disturbance type, traverse the reserve, facilitating access. Ten pitsaw sites were recorded.

The extent and rate of disturbance is high overall; however, no people were caught by camera traps in the 90+ camera trapping days of the CT survey.

7) Conclusions and Recommendations

Ruvu South FR still supports a wide diversity of mammals, and birds including 5 species of IUCN conservation concern species (53 Red-Listed bird species, and two Red-Listed mammal species). The heavy pressure on remaining good forest will inevitably threaten these and other, still common taxa.

Among the major ongoing threats, previously reported (CARE Tanzania, 2006), is population pressure from people living around RSFR, uncontrolled issuing of licenses for charcoal production and timber harvesting, and failure of TFS and Kisarawe District Council to enforce forest laws.

The following recommendations apply to Ruvu South FR and the other two forest reserves, Pugu and Kazimzumbwi, of the Kisarawe District:

- Forest laws should be enforced with consistent follow-up to ensure that cases that reach court are followed through on;
- Law enforcement plans should involve TFS, local government and the surrounding communities;
- Fire fighting and fire prevention plans should be prepared and implemented including provision of training and fire fighting equipment to Village Natural Resources Committee;
- JFM agreements should be signed and plans and by-laws should implemented;
- Tourism should be developed in the reserve;
- Community development schemes should be supported for the surrounding communities;
- Equitable benefit sharing through JFM with the surrounding communities should be established and implemented.

8) References

Baker, N.E. & Baker, E.M. (2002). *Important Bird Areas in Tanzania: A first inventory.* Wildlife Conservation Society of Tanzania. DSM, Tanzania.

BirdLife International (2012) Important Bird Areas factsheet: Kisarawe District Coastal Forests. Downloaded from http://www.birdlife.org on 07/12/2012

CARE Tanzania (2006). Msitu Yetu Project: Final evaluation report. Prepared by Kaale, B.K. and Mwakifwamba, S. January 2006. In partnership with TFCG and WCST.

Clarke, G.P. & Dickinson, A. (1995). Status reports for 11 coastal forests in Coast Region, Tanzania. *Frontier Tanzania Technical Report* No. 17. The Society for Environmental Exploration, London, UK & The University of DSM, Tanzania.

Doggart, N. (2006). Filling the knowledge gap: Methods manual. Tanzania Forest Conservation Group/ Museo Tridentino di Scienze Naturali, Dar es salaam, Tanzania.

Frontier Tanzania (unpublished report). Ruvu South Forest Reserve. Frontier-Tanzania Forest Research Programme.

IPP Media (2012). Three tree species on verge of extinction. 20 April 2012, http://www.ippmedia.com/frontend/index.php?l=40722

IUCN (2012). IUCN Red List of Threatened Species. Version 2012.1. www.iucnredlist.org. Downloaded on 7 December 2012.

Lovett, J. & Clarke, G.P. (1998). *Leptactina papyrophloea*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on 14 January 2013.

MOBOT (2012). List of Targeted Plant Taxa in the EACF. www.mobot.org/MOBOT/Research/tanzania/cepf3.shtml

Morgan-Brown T. (2012) The Tale of Two Forests. MJUMITA.

Msuya, T. S., M. A. Mdnolwa, A. Kindo, and E. Shilogile. (2004). Role of Joint Forest Management in Poverty Alleviation and Sustainable Livelihoods Four Years Experience - A Case Study of Ruvu Fuelwood Pilot Project. Gender and Forestry: Challenges to Sustainable Livelihoods and Forestry Management, Second World Wide Symposium on Gender and Forestry. UN Forum on Forests. Kilimanjaro, Tanzania.1-10 August, 2004.

Ngana J., Mahay F., Cross K. (2010) Ruvu Basin: A situation analysis. IUCN Eastern and Southern Africa Programme. 96pp.

Vorontsova, M.S. & Mbago, F.M. (2010). New *Solanum* species from Tanzanian coastal forests may already be extinct. *Journal of East African Natural History* 99(2): 227-234.

Appendices

Appendix I: Disturbance Transect 1

Site 2: Chakenge (Being deforested)

Names of recorders: Justine Gwegime & Yahaya Mponda

Date of survey: 14/11/2011 **District:** Kisarawe

Village: Chakenge **Nearest sub-village:** Mtamba

Village Forest Reserve: Ruvu South FR **Transect Number:** 1

Dominant vegetation: Being deforested **Bearing:** West

Start Point: Lat 9231331, Long 475195 **Altitude:** 158m

End Point: Lat 9230541, Long 475775 **Altitude:** 154m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
Section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect**	**Outside transect**
			old	**fresh**			**old**	**fresh**		
0-50	4	0	0	0	5	0	0	0	K(3)&F	
50-100	14	0	0	0	1	0	0	0	F	
100-150	12	0	0	0	0	0	1	0	F	
150-200	5	0	3	0	1	0	3	0	F&K(1)	
200-250	4	0	6	0	0	0	6	0	K(2)	
250-300	10	0	5	0	1	0	3	0	K(1)&F	
300-350	2	0	25	0	1	0	3	0	K(2)&F	
350-400	0	0	16	0	0	0	5	0	K(1)&F	
400-450	16	0	0	0	5	2	0	0		
450-500	5	0	3	0	0	0	7	0	K(2)	
500-550	10	0	0	0	2	0	5	0	K(1),R(1)&F	
550-600	1	0	6	0	0	0	8	0	F	
600-650	12	0	5	0	1	0	2	0	F	
650-700	5	0	0	0	0	0	0	0	F&R(1)	
700-750	13	0	0	0	4	0	3	0	F&P(1)	
750-800	10	0	0	0	0	0	0	0	K(1)&F	
800-850	11	0	0	0	1	0	0	0	R(1)&F	
850-900	11	0	1	0	1	0	2	0	K(5)	
900-950	10	0	6	0	0	0	2	0	K(1)	
950-1000	6	0	1	0	0	0	3	0	K(2)	
Total	**161**	**0**	**77**	**0**	**23**	**2**	**53**	**0**	**K(22),R(3), P(1)&F(14)**	

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower	**SMS**	Steep mid-slope	**SUS**	Steep upper	VF	Valley floor

	slope				slope	

Key to vegetation cover

1	< 10 % cover	**2**	10 – 50 % cover	**3**	> 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	**Topography**	**Canopy cover**	**Shrub layer**	**Ground layer**	**Invasive alien species**	**High conservation values**	**Other observations**
0-50	GLS	1	2	2			
50-100	GLS	1	2	2			
100-150	GLS	1	2	2			
150-200	GLS	1	2	2			
200-250	GLS	2	2	2			Millipedes
250-300	GLS	2	2	2			
300-350	GLS	2	2	2			
350-400	GLS	2	2	2			
400-450	GLS	2	2	2			
450-500	GLS	2	2	2			
500-550	GLS	2	2	2			
550-600	GLS	2	1	2			
600-650	GLS	3	1	2			
650-700	GLS	3	1	2			
700-750	GLS	3	2	2			
750-800	GLS	2	2	2			
800-850	GLS	3	2	2			
850-900	GLS	3	2	2			
900-950	GLS	2	2	2			
950-1000	GLS	2	2	2			

Appendix 2: Disturbance Transect 2

Names of recorders: Justine Gwegime & Yahaya Mponda

Date of survey: 14/11/2011 **District:** Kisarawe

Village: Chakenge **Nearest sub-village:** Mtamba

Village Forest Reserve: Ruvu South FR **Transect Number:** 2

Dominant vegetation: Bush **Bearing:** East

Start Point: Lat 9230230, Long 476027 **Altitude:** 167m

End Point: Lat 9231141, Long 476138 **Altitude:** 172m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
Section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	3	0	5	0	1	0	7	0	K(2)&P(1)	
50-100	3	0	6	0	4	0	3	0	P(1)	
100-150	15	0	1	0	0	0	1	0		
150-200	5	0	1	7	0	0	4	1		
200-250	12	0	2	2	2	0	0	0	P(1)	
250-300	13	0	4	0	0	0	3	0	R(1)	
300-350	5	0	6	0	0	0	5	0	K(1)&F	
350-400	5	0	4	0	0	0	2	0	F	
400-450	5	2	2	0	0	0	6	0	K(1)	
450-500	5	0	0	10	2	0	0	1	F&K(1)	
500-550	2	0	10	8	0	0	2	3		
550-600	17	0	7	2	0	0	1	0	K(1)&R(1)	
600-650	10	0	4	0	0	0	4	0	F&K(2)	
650-700	11	0	7	4	1	0	2	0		
700-750	3	0	11	0	0	0	5	0	F	
750-800	15	0	0	0	3	1	0	0	K(1)&F	
800-850	12	0	1	0	5	0	3	0	K(3)	
850-900	15	0	0	0	3	1	0	0	P(1)	
900-950	12	0	1	0	5		3	0		
950-1000	15	0	4	4	1		3	0	P(1)	
Total	**183**	**2**	**76**	**37**	**27**	**2**	**54**	**5**	**K(12),P(5), R(2)&F(6)**	

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	2			
50-100	GUS	2	2	2			Elephant shrew path and millipedes
100-150	GUS	2	2	2			Dikdik footprints/ Duiker pellets and Dikdik trail
150-200	GUS	2	2	2			Dikdik path
200-250	GUS	2	2	2			Elephant shrew path
250-300	GUS	2	2	2			Giant pouched rat trail
300-350	GUS	2	2	2			Dikdik path
350-400	GUS	2	1	2			
400-450	GUS	2	1	2			Elephant shrew trail
450-500	GUS	2	1	2			Dikdik trail
500-550	GUS	2	1	2			
550-600	GUS	2	2	2			
600-650	GUS	2	2	2			
650-700	GUS	2	2	2			Elephant shrew trail
700-750	GUS	2	2	2			Dikdik footprints & trail
750-800	GUS	2	2	2			
800-850	GUS	2	2	2			Elephant shrew trail
850-900	GUS	2	2	2			
900-950	GUS	2	2	2			Elephant shrew trail
950-1000	GUS	2	2	2			Dikdik footprints, millipedes

Notes: Perhaps this is good habitat for shrews and antelopes.

Appendix 3: Disturbance Transect 3

Names of recorders: Justine Gwegime & Yahaya Mponda

Date of survey: 15/11/2011 **District:** Kisarawe

Village: Chakenge **Nearest sub-village:** Mtamba

Village Forest Reserve: Ruvu South FR **Transect Number:** 3

Dominant vegetation: Bush **Bearing:** NorthWest

Start Point: Lat 9231629, Long 476895 **Altitude:** 153m

End Point: Lat 9232213, Long 476085 **Altitude:** 154m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	15	0	0	0	0	0	0	0		
50-100	8	0	0	0	0	0	0	0		
100-150	13	0	0	0	0	0	0	0		
150-200	22	0	0	0	1	0	0	0		
200-250	7	0	0	0	3	0	0	0	F&K(1)	
250-300	15	0	2	0	1	0	4	0		
300-350	25	0	0	0	1	1	0	0		
350-400	10	0	0	0	1	0	0	1	F&K(1)	
400-450	5	1	2	6	2	0	0	6	K(1)	
450-500	10	0	0	3	1	0	3	5	F	
500-550	0	0	11	3	0	0	8	2	K(2)	
550-600	0	0	2	0	3	0	7	0	F&K(1)	
600-650	3	0	3	0	3	0	2	0	F	
650-700	11	0	5	0	3	0	0	0	K(1)	
700-750	9	0	4	0	1	0	3	0		
750-800	16	0	1	0	1	0	2	0		
800-850	4	0	2	0	5	0	2	0	K(1)	
850-900	3	0	0	0	2	0	1	1	K(2)	
900-950	4	0	0	8	0	0	4	1	K(3)	
950-1000	8	0	0	3	0	0	0	4	R(1)	
Total	**188**	**1**	**32**	**23**	**28**	**1**	**36**	**20**	**K(13),R(1) & F(5)**	

GLS Gentle lower **GMS** Gentle mid-slope **GUS** Gentle upper CL Cliffs

	slope				slope		
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	2	1	1			
50-100	GLS	2	1	1			
100-150	GLS	2	1	1			Snail
150-200	GLS	2	1	1			Duiker footprints
200-250	GLS	2	1	1	LC		
250-300	GLS	2	2	1			Elephant shrew trails, giant pouched rat pit
300-350	GLS	2	2	1			Millipedes, elephant shrew trail
350-400	GLS	2	2	1			
400-450	GLS	2	2	1			Rodents trails
450-500	GUS	2	2	2			
500-550	LUS	2	2	2			Snail, dikdik footprints
550-600	GLS	2	2	2			
600-650	GLS	2	2	2			Dikdik footprints
650-700	GLS	2	2	2			
700-750	GLS	2	2	2			
750-800	GLS	2	2	2			
800-850	GLS	2	2	2			Millipedes
850-900	GLS	2	2	1			
900-950	GUS	2	2	1			Rodents pit, Millipedes
950-1000	GUS	2	2	1			

Notes: Good habitat for rodents and antelopes.

Appendix 4: Disturbance Transect 4

Site 3: Mtamba/Chakenge (Being deforested)

Names of recorders: Justine Gwegime & Yahaya Mponda

Date of survey: 15/11/2011 **District:** Kisarawe

Village: Chakenge/Mtamba **Nearest sub-village:** Chakenge/Mtamba

Village Forest Reserve: Ruvu South FR **Transect Number:** 4

Dominant vegetation: Bush; being deforested **Bearing:** West

Start Point: Lat 9229328, Long 478014 **Altitude:** 173m

End Point: Lat 9229954, Long 478594 **Altitude:** 210m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	7	1	0		7	0	0	0	F&K(1)	
50-100	3	0	1		2	0	2	0	F&K(1)	
100-150	3	0	0		0	0	4	1	F	
150-200	5	0	2		2	0	3	0		
200-250	17	0	0		1	0	6	0		
250-300	3	0	3		2	0	6	0	K(1)	
300-350	17	0	2		3	0	12	0	K(1)	
350-400	2	0	1		1	0	8	0	F&K(1)	
400-450	1	0	0		5	0	8	0	K(1)&R(2)	
450-500	18	0	4		0	0	1	0		
500-550	33	0	2		0	0	1	1		
550-600	3	0	0		2	0	0	3		
600-650	10	0	1		2	0	1	1		
650-700	25	0	0		1	0	1	0		
700-750	6	0	2		1	0	2	0		
750-800	10	0	0	1	7	0	2	4		
800-850	10	0	3		2	0	6	0		
850-900	15	0	5		3	0	1	3		
900-950	22	0	1		3	0	2	0		
950-1000	12	0	2		1	0	4	0		
Total	**222**	**1**	**29**	**1**	**45**	**0**	**70**	**13**	**K(6),R(2)&F(4)**	

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	**Topography**	**Canopy cover**	**Shrub layer**	**Ground layer**	**Invasive alien species**	**High conservation values**	**Other observations**
0-50	GLS	1	2	2			
50-100	GLS	1	2	2			
100-150	GLS	2	2	2			
150-200	GLS	2	2	2			
200-250	GLS	2	2	2			
250-300	GLS	2	2	2			
300-350	GLS	2	2	2	LC		
350-400	GLS	2	2	2			
400-450	GLS	2	2	3			
450-500	GLS	2	2	3			
500-550	GLS	2	2	3			Dikdik trail
550-600	GLS	2	2	3			
600-650	GLS	3	2	3			Elephant shrew trails
650-700	GLS	3	2	2			Dikdik footprints
700-750	GLS	3	2	2			
750-800	GLS	3	2	2			
800-850	GLS	3	2	2			
850-900	GLS	3	2	2			
900-950	GLS	2	2	2			
950-1000	GLS	2	2	2			Duiker pellets and trail

Notes: The area is highly disturbed.

Appendix 5: Disturbance Transect 5

Names of recorders: Justine Gwegime, Yabay, Subira, & Yahaya Mponda

Date of survey: 16/11/2011 **District:** Kisarawe

Village: Mtamba **Nearest sub-village:** Chakenge

Village Forest Reserve: Ruvu South FR **Transect Number:** 5

Dominant vegetation: Bush & Shrubs **Bearing:** Southeast

Start Point: Lat 9229130, Long 478347 **Altitude:** 186m

End Point: Lat 9228415, Long 479001 **Altitude:** 209m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	9	0	6	0	1	0	4	0	F	
50-100	4	0	1	0	0	0	5	0	F	
100-150	4	0	6	0	2	0	2	0		
150-200	2	0	4	0	1	0	4	0	F	
200-250	8	0	1	0	0	0	1	0		
250-300	21	2	2	0	0	0	4	0	F	
300-350	7	2	2	0	0	0	1	0	F&K(1)	
350-400	7	0	7	2	1	0	2	0	F	
400-450	20	0	15	0	1	0	2	0	F	
450-500	17	0	10	0	3	0	5	0	F	
500-550	5	0	30	0	0	0	4	0	F	
550-600	10	0	15	0	0	0	2	0	F&K(2)	
600-650	23	0	8	0	0	0	9	0	F&K(1)	
650-700	2	0	7	0	0	0	2	0	F&K(2)	
700-750		0	6	4	1	0	8	5	F&K(1)	
750-800	6	0	6	0	4	0	3	0	F&K(1)	
800-850	16	0	11	0	1	0	4	0	F&K(1)	
850-900	18	0	10	0	0	0	5	0	F&K(1)	
900-950	6	0	7	0	1	0	2	0	F	
950-1000	5	0	6	5	1	0	5	9	K(2)	
Total	**190**	**4**	**160**	**11**	**17**	**0**	**74**	**14**	**F(17)&K(12)**	

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	**Topography**	**Canopy cover**	**Shrub layer**	**Ground layer**	**Invasive alien species**	**High conservation values**	**Other observations**
0-50	GLS	1	2	2			
50-100	GLS	1	2	2			
100-150	GLS	1	2	2			
150-200	GLS	1	2	2			
200-250	GLS	1	2	2			
250-300	GLS	1	2	2			Giant pouched rat pit
300-350	GLS	1	2	2			
350-400	GLS	1	2	2			
400-450	GLS	1	2	2			
450-500	GLS	1	2	2			
500-550	GLS	1	2	2			
550-600	GLS	1	2	2			
600-650	GLS	1	2	2			
650-700	GLS	1	2	2			
700-750	GLS	2	2	2			
750-800	GLS	2	2	2			
800-850	GLS	2	2	2			
850-900	GLS	2	2	2			
900-950	GLS	2	2	2			
950-1000	GLS	2	2	2			

Appendix 6: Disturbance Transect 6

Site 1: Mtamba/Kola (Good Forest)

Names of recorders: Justine Gwegime, Yabay, Subira, & Yahaya Mponda

Date of survey: 17/11/2011 **District:** Kisarawe

Village: Kola **Nearest sub-village:** Mtamba

Village Forest Reserve: Ruvu South FR **Transect Number:** 6

Dominant vegetation: Good forest **Bearing:** Southeast

Start Point: Lat 9222011, Long 490852 **Altitude:** 224m

End Point: Lat 9222486, Long 490084 **Altitude:** 258m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	10		4	1	2		6	1	K(3)&R(1)	
50-100	4		3		7		6		R(2)&K(2)	
100-150	2		4		1		7		K(1)	
150-200	2		4		3		10		K(2)&R(2)	
200-250	2	1	4		2		8		F&K(2)	
250-300	1		4				12		F&K(2)	
300-350	8					1	7		F&K(2)	
350-400		2	10				7		F&R(2)	
400-450	2		3			1	7		K(2)&R(1)	
450-500			5		2		6		K(2)&R(1)	
500-550	2		3	1	1		10		K(3)&F	
550-600	5		8				6		K(2)&R(2)	
600-650	4		19		1		3		F&K(2)	
650-700	2		12				15		F,K(4)&R(1)	
700-750	4		7		3		6		F,K(3)&P(1)	
750-800	4		3		11	1	2		K(4)	
800-850		1	6		1		8		K(1)	
850-900	6		3		1		12		F,K(1)&R(1)	
900-950	4		5				7	4	K(2)&F	
950-1000	3				1		9	3	K(4)&F	
Total	**65**	**4**	**107**	**2**	**36**	**3**	**154**	**8**	**K(44),R(13),P(1)&F(11)**	

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	**Topography**	**Canopy cover**	**Shrub layer**	**Ground layer**	**Invasive alien species**	**High conservation values**	**Other observations**
0-50	GLS	1	2	2			
50-100	GLS	1	2	2			
100-150	GLS	1	2	2			
150-200	GLS	1	2	2			
200-250	GUS	1	2	2			
250-300	GUS	1	2	2			
300-350	GLS	1	2	2			
350-400	GLS	1	2	2			Hyrax pellets
400-450	GLS	2	2	2			
450-500	GLS	2	2	2			
500-550	GLS	2	2	2			
550-600	GLS	2	2	2			Dikdik pellets
600-650	GUS	2	2	2			
650-700	GUS	1	2	2			
700-750	GUS	1	2	2			
750-800	GUS	1	2	2			
800-850	GLS	1	2	2			
850-900	GLS	1	2	2			
900-950	GLS	1	2	2			Giant pouched rat pit
950-1000	GLS	1	2	2			

Notes: The area is highly affected by charcoal making.

Appendix 7: Disturbance Transect 7

Names of recorders: Justine Gwegime, Yabay, Subira, & Yahaya Mponda

Date of survey: 17/11/2011 **District:** Kisarawe

Village: Mtamba **Nearest sub-village:** Kola

Village Forest Reserve: Ruvu South FR **Transect Number:** 7

Dominant vegetation: Bush/Shrubs **Bearing:** Southeast

Start Point: Lat 9222089, Long 489537 **Altitude:** 262m

End Point: Lat 9222159, Long 490436 **Altitude:** 263m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
Section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	0	0	5	0	1	0	7	0	K(3)&R(1)	
50-100	0	0	8	4	0	0	5	1	F,K(2)&R(2)	
100-150	0	0	13	0	0	0	14	0	F,K(2)&R(2)	
150-200	3	0	12	0	0	0	8	1	K(2)	
200-250	8	0	5	0	1	0	5	0	K(1)&R(1)	
250-300	5	0	1	0	0	0	12	0	K(2)	
300-350	5	0	6	0	1	0	7	0	K(2)&R(2)	
350-400	1	0	10	0	0	0	7	1	K(2)	
400-450	0	0	10	0	0	0	10	0	K(2)&P(1)	
450-500	1	0	8	0	0	0	8	0	F,K(6)&R(1)	
500-550	3	0	9	0	0	0	9	0	F,K(2)&R(1)	
550-600	3	0	4	0	0	0	3	0	P(1)&R(1)	
600-650	9	1		0	0	0	5	0	K(3)&R(1)	
650-700	1	0	1	0	2	0	1	0		
700-750	17	0		2	0	0	0	1		
750-800	18	0	5	0	1	0	5	0	K(1)	
800-850	26	0	4	1	0	0	0	0	R(1)	
850-900	6	0	9	1	3	0	4	0	K(3)&P	
900-950	3	0	5	27	4	0	2	0	R(1)	
950-1000	15	0	9	3	0	0	6	0	R(1)	
Total	**124**	**1**	**124**	**38**	**13**	**0**	**118**	**4**	**K(33),R(15), P(3)&F(4)**	

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	2	2	2			
50-100	GLS	2	2	2			
100-150	GLS	2	2	2			
150-200	GLS	2	2	2			Giant pouched rat
200-250	GLS	2	2	2			Millipedes
250-300	GLS	2	2	2			
300-350	GLS	2	2	2			
350-400	GLS	2	2	2			
400-450	GLS	2	2	2			
450-500	GLS	2	2	2			
500-550	GLS	2	2	2			Mushroom
550-600	GLS	2	2	2			
600-650	GLS	2	2	2			
650-700	GLS	2	2	2			
700-750	GLS	2	2	2			Shrews trails, Animal footprints
750-800	GLS	2	2	2			Shrews trails and footprints
800-850	GLS	2	2	2			
850-900	GLS	2	2	2			Dikdik footprints
900-950	GLS	2	2	2			
950-1000	GLS	2	2	2			

Notes: The area is highly affected by charcoal making and footpaths.

Appendix 8: Disturbance Transect 8

Names of recorders: Justine Gwegime, Yabay, Subira, & Yahaya Mponda

Date of survey: 18/11/2011 **District:** Kisarawe

Village: Mtamba **Nearest sub-village:** Kola

Village Forest Reserve: Ruvu South FR **Transect Number:** 8

Dominant vegetation: Woodland **Bearing:** Northeast

Start Point: Lat 9229518, Long 487710 **Altitude:** 208m

End Point: Lat 9228905, Long 488383 **Altitude:** 221m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
Section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	10	0	1	0	1	0	2	3	F	
50-100	16	0	7	0	1	0	5	1	F,K(1)&R(1)	
100-150	19	0	7	0	1	0	1	0	N(1) &F	
150-200	21	0	21	0	0	0	8	1	K(1) &F	
200-250	25	0	10	0	3	0	2	0	K(1) &F	
250-300	11	0	0	0	0	0	7	0	F	
300-350	8	0	7	0	3	0	7	0	K(1),R(1)&F	
350-400	5	1	0	0	4	0	10	0	K(1)&F	
400-450	10	0	4	0	1	0	6	0	K(2)&F	
450-500	5	0	1	1	2	0	7	0	K(2)&F	
500-550	5	0	4	0	2	0	6	0	K(1)&F	
550-600	4	0	6	0	3	0	5	0	K(1),R(1)&F	
600-650	4	0	3	0	0	0	6	0	K(2)&F	
650-700	12	0	1	0	2	0	9	0	K(2)&F	
700-750	15	0	5	0	1	0	7	0	K(1)	
750-800	17	0	4	0	1	0	4	0	K(2)&F	
800-850	2	0	0	1	0	0	7	1	K(1),R(1)&F	
850-900	3	0	3	2	0	2	8	0	K(1) &R(1)	
900-950	7	0	2	0	0	1	10	0	K(1)	
950-1000	8	0	1	0	1	0	7	0	K(1)&R(1)	
Total	**207**	**1**	**87**	**4**	**26**	**3**	**124**	**6**	**F(16),K(22)& R(6)**	

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	**Topography**	**Canopy cover**	**Shrub layer**	**Ground layer**	**Invasive alien species**	**High conservation values**	**Other observations**
0-50	GLS	2	2	2			
50-100	GLS	2	2	2			
100-150	GLS	2	2	2			Snail carapace
150-200	GLS	2	2	2			
200-250	GLS	2	2	2			
250-300	GLS	2	2	2			
300-350	GLS	2	2	2			
350-400	GLS	2	2	2			
400-450	GLS	2	2	2			
450-500	GLS	2	2	2			
500-550	GLS	2	2	2			Centipede
550-600	GLS	2	2	2			
600-650	GLS	1	2	2			
650-700	GLS	1	2	2			
700-750	GLS	1	2	2			
750-800	GLS	1	2	2			
800-850	GLS	2	2	2			
850-900	GLS	2	2	2			
900-950	GLS	2	2	2			
950-1000	GLS	2	2	2			Rabbit(seen)

Appendix 9: Disturbance Transect 9

Site 4: Kifuru/Kazimzumbwi (Recently deforested)

Names of recorders: Justine Gwegime

Date of survey: 19/11/2011 **District:** Kisarawe

Village: Kifuru/Kazimzumbwi **Nearest sub-village:** Kifuru

Village Forest Reserve: Ruvu South FR **Transect Number:** 9

Dominant vegetation: Miombo woodland **Bearing:** West

Start Point: Lat 9232741, Long 499848 **Altitude:** 234m

End Point: Lat 9232949, Long 498897 **Altitude:** 223m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside ttransect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	0	0	25	0	0	0	3	0	K(2)	
50-100	1	0	30	0	0	0	7	0	K(1),R(1)&F	
100-150	0	0	25	0	0	0	3	0	K(4),R(1)&F	
150-200	1	0	47	0	0	0	3	0	K(1)	
200-250	0	0	27	0	0	0	1	0	K(3)	
250-300	3	0	19	0	0	0	7	0	K(3)	
300-350	3	0	16	0	0	0	6	0	K(2)	
350-400	5	0	29	0	0	0	4	0	K(1)	
400-450	0	0	12	0	0	0	6	0	K(5)	
450-500	2	0	29	0	0	0	2	0	K(5)	
500-550	7	0	12	0	0	0	6	0	K(2)	
550-600	6	0	35	0	0	0	7	0	K(1)&F	
600-650	3	0	5	0	0	0	1	0	K(3)&F	
650-700	4	0	19	0	0	0	11	0	K(2)&F	
700-750	6	0	15	0	0	0	1	0	K(1)&F	
750-800	5	0	3	0	0	0	3	0	K(1)&F	
800-850	5	0	20	3	0	0	1	0	K(1)&F	
850-900	6	0	7	0	0	0	4	0	K(1)&R(1)	
900-950	6	0	3	0	0	0	0	0	K(1)&F	
950-1000	5	0	10	0	0	0	1	0	K(1)&F	
Total	**68**	**0**	**388**	**3**	**0**	**0**	**77**	**0**	**K(41),R(3)&F(10)**	

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	1	2	2			
50-100	GLS	1	2	2			
100-150	GLS	1	2	2			
150-200	GLS	1	2	2			
200-250	GLS	1	2	2			
250-300	GLS	2	2	2			
300-350	GLS	2	2	2			Rodent pit, aardvark path
350-400	GLS	2	2	2			Dikdik trail
400-450	GLS	2	2	2			
450-500	GLS	2	2	2			
500-550	GLS	2	2	2			Dikdik pellets, duiker trail
550-600	GLS	2	1	2			Dikdik pellets, duiker trail
600-650	GLS	2	1	2			
650-700	GLS	2	1	2			
700-750	GLS	2	1	2			
750-800	GLS	2	1	2			
800-850	GLS	2	2	2			
850-900	GLS	2	2	2			
900-950	GLS	1	2	2			
950-1000	GLS	1	2	2			

Notes: Reasonable number of duiker and dikdik pellets recorded.

Appendix 10: Disturbance Transect 10

Names of recorders: Justine Gwegime

Date of survey: 19/11/2011 **District:** Kisarawe

Village: Kazimzumbwi/Kifuru **Nearest sub-village:** Kifuru

Village Forest Reserve: Ruvu South FR **Transect Number:** 10

Dominant vegetation: Disturbed evergreen forest **Bearing:** Southeast

Start Point: Lat 9233504, Long 498369 **Altitude:** 274m

End Point: Lat 9232701, Long 497857 **Altitude:** 214m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	1	0	8	0	0	0	6	0	F	F
50-100	0	0	20	0	0	0	6	0	K(1)	
100-150	0	0	5	0	0	0	0	0	K(1)	
150-200	5	0	15	2	0	0	2	0	R(1)&F	F
200-250	0	0	11	0	0	0	1	0	K(1)&F	
250-300	10	0	0	0	0	0	1	0	K(2)	
300-350	7	0	6	0	0	0	3	0	K(2)	
350-400	6	0	3	0	0	0	4	0	K(2)&F	
400-450	6	0	13	0	0	0	1	0	F	
450-500	0	0	5	0	0	0	5	0	R(1)	
500-550	0	0	4	0	0	0	2	0	K(1)	
550-600	3	0	10	0	0	0	2	0	K(1)	
600-650	3	0	16	0	0	0	12	0	K(2)	
650-700	0	0	15	0	0	0	5	0	K(3)	
700-750	0	0	4	0	0	0	1	0	K(1)	
750-800	2	0	7	0	0	4	0	0	K(1)	
800-850	3	0	12	0	0	0	1	0	K(1)	
850-900	0	0	16	1	0	0	7	0	K(2)&R(1)	
900-950	0	0	14	5	0	0	1	0	K(3)	
950-1000	6	0	10	0	0	0	1	0	K(1)&F	
Total	**52**	**0**	**194**	**8**	**0**	**4**	**61**	**0**	**F(6),K(25) &R(3)**	F(2)

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	SUS	1	1				Duiker footprints
50-100	SUS	1	1				
100-150	SUS	1	1				
150-200	SLS	1	1				
200-250	SLS	1	1				
250-300	SLS	1	1				
300-350	SLS	1	2				
350-400	SLS	1	2				
400-450	GUS	1	2				
450-500	GUS	1	2				
500-550	GUS	2	2				
550-600	GUS	2	2				
600-650	GUS	2	2				
650-700	GUS	2	2				
700-750	GUS	2	2				Bushpig dung and footprints
750-800	GUS	1	2				Bushpig footprints
800-850	GUS	1	2				
850-900	GUS	1	2				Bushpig footprints
900-950	GUS	1	2				Bushpig footprints
950-1000	GUS	1	2				

Notes: The site is likely to be bush pig playing /resting ground.

Appendix 11: Disturbance Transect 11

Names of recorders: Justine Gwegime

Date of survey: 20/11/2011 **District:** Kisarawe

Village: Kazimzumbwi/Kifuru **Nearest sub-village:** Kifuru

Village Forest Reserve: Ruvu South FR **Transect Number:** 11

Dominant vegetation: Scrubs **Bearing:** Southwest

Start Point: Lat 9235700, Long 494854 **Altitude:** 176m

End Point: Lat 9234788, Long 495049 **Altitude:** 186m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
Section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	5	0	0	0	0	0	3	0	K(1)&F	F
50-100	7	0	11	0	0	0	4	0	K(2)	
100-150	10	0	5	0	0	0	6	0	K(2)&F	
150-200	11	0	8	0	0	0	7	0	K(2)	F
200-250	6	0	1	0	0	0	4	0	K(2)	
250-300	11	0	9	0	1	0	8	0	K(1)	F
300-350	4	0	2	0	1	0	2	0	K(2)&F	
350-400	3	0	3	0	1	0	1	0	R(2),K(1)&F	F
400-450	6	0	5	0	0	0	3	0	K(2),R(1)&F	
450-500	6	0	12	0	0	0	7	0	K(2)&F	
500-550	1	0	8	0	0	0	7	0	K(4),F&R(1)	F
550-600	0	0	6	0	2	0	2	0	K(4)&F	
600-650	15	0	5	0	0	0	0	0	K(2),R(1)&F	
650-700	7	0	11	0	1	0	3	0	K(1)	
700-750	3	0	1	0	0	0	8	0	K(2)&F	
750-800	3	2	7	0	0	0	1	0	K(2)	
800-850	2	0	0	0	0	0	2	0		
850-900	4	0	4	0	0	0	1	0	K(2)	
900-950	2	0	1	0	0	0	1	0	F	F
950-1000	6	0	11	0	0	0	1	0	F&K(2)	
Total	**112**	**2**	**110**	**0**	**6**	**0**	**71**	**0**	**K(36),F(12)& R(4)**	F(6)

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	1	2	3			Hyena dung, bushpig pellets,dikdik footprints
50-100	GUS	1	2	3			
100-150	GUS	1	2	3			
150-200	GUS	1	2	3			
200-250	GUS	1	2	2			
250-300	GUS	2	2	2			
300-350	GLS	2	2	2			Dikdik footprint
350-400	GLS	2	2	2			Rabbit
400-450	GLS	2	2	2			
450-500	GLS	1	2	2			Bushpig footprints
500-550	GLS	1	2	2			
550-600	GLS	2	2	2			
600-650	GLS	2	2	2			
650-700	GLS	2	2	2			Dikdik/Suni trail, duiker footprints
700-750	GLS	2	2	2			
750-800	GLS	2	2	2			Bushpig footprints
800-850	GLS	2	2	2			
850-900	GLS	2	2	2			Bushpig footprints
900-950	GLS	2	2	2			
950-1000	GLS	2	2	2			

Notes: The site is highly affected by charcoal making.

Appendix 12: Disturbance Transect 12
Site 5: Mpiji (Good Forest)

Names of recorders: Justine Gwegime

Date of survey: 21/11/2011 **District:** Kisarawe

Village: Mpiji/Kazimzumbwi **Nearest sub-village:** Kifuru

Village Forest Reserve: Ruvu South FR **Transect Number:** 12

Dominant vegetation: Scrub/Acacia Woodland **Bearing:** Southwest

Start Point: Lat 9239885, Long 495711 **Altitude:** 152m

End Point: Lat 9238900, Long 495570 **Altitude:** 158m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
Section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	0	0	2	0	0	0	1	0	F	F
50-100	0	0	3	0	0	0	0	0	F	F
100-150	0	0	8	0	0	0	0	0	F	F
150-200	8	0	3	0	1	0	1	0	F	F
200-250	2	0	11	0	0	0	2	0	K(4)	F
250-300	5	0	7	0	1	0	4	0	K(1)&F	F
300-350	5	0	3	0	0	0	1	0	K(3)&F	F
350-400	1	0	0	0	0	3	0	0	F	
400-450	8	0	9	0	0	0	1	0	K(2)&F	F
450-500	3	0	6	0	0	0	4	0	K(1)&F	
500-550	4	0	5	0	0	0	4	0	K(3)&F	F
550-600	4	0	18	0	0	0	4	0	K(3)&F	F
600-650	8	0	2	0	0	0	3	0	K(2)&F	F
650-700	3	0	0	0	2	0	3	0	F&R(1)	F
700-750	5	0	7	0	0	0	3	0	K(1)&F	
750-800	11	0	12	0	0	0	4	0	K(4 &F	F
800-850	9	0	8	0	3	0	7	0	K(1)&F	F
850-900	14	0	7	0	0	0	3	0	K(3)&F	
900-950	6	0	6	0	0	0	5	0	K(1)&F	F
950-1000	1	0	12	0	0	0	1	0	K(3)	
Total	**97**	**0**	**129**	**0**	**7**	**3**	**51**	**0**	**F(18),K(32)& R(1)**	F(15)

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	**Topography**	**Canopy cover**	**Shrub layer**	**Ground layer**	**Invasive alien species**	**High conservation values**	**Other observations**
0-50	GLS	1	1	2			
50-100	GLS	1	1	2			
100-150	GLS	1	1	2			
150-200	GLS	1	1	2			
200-250	GLS	1	2	2		S	
250-300	GLS	1	2	2		S	
300-350	GLS	1	2	2		S	
350-400	GLS	1	2	2			
400-450	GLS	1	2	2		S	
450-500	GLS	2	2	2			
500-550	GLS	2	2	3			
550-600	GLS	2	2	3			
600-650	GLS	2	2	3			
650-700	GLS	1	2	3			Bushpig footprint
700-750	GLS	1	2	3			
750-800	GLS	1	2	3			Aardvark pit
800-850	GLS	1	2	2			
850-900	GLS	1	2	2			
900-950	GLS	1	2	2			
950-1000	GLS	1	2	2			

Appendix 13: Disturbance Transect 13

Names of recorders: Justine Gwegime

Date of survey: 21/11/2011 **District:** Kisarawe

Village: Mpiji **Nearest sub-village:** Kazimzumbwi

Village Forest Reserve: Ruvu South FR **Transect Number:** 13

Dominant vegetation: Woodland **Bearing:** Northeast

Start Point: Lat 92386559, Long 494892 **Altitude:** 178m

End Point: Lat 9239600, Long 494874 **Altitude:** 188m

Key to disturbance categories

P	Pitsaw	**S**	Settlement	**T**	Timber, planks, poles	**R**	Path or road
F	Fire damage	**B**	Bark or root harvesting	**K**	Charcoal kiln	**G**	Gunfire
C	Cultivation	**M**	Mining	**N**	Traps or snares	**O**	Other

	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
Section (m)	**Live**	**Naturally dead**	**Cut**		**Live**	**Naturally dead**	**Cut**		**Within transect (qty)**	**Outside transect (qty)**
			old	**fresh**			**old**	**fresh**		
0-50	0	0	3	0	0	0	3	0	K(1)&F	F
50-100	2	0	6	0	0	0	4	0	K(1)&F	F
100-150	0	0	9	0	0	0	5	0	K(1)&F	F
150-200	0	0	10	0	0	0	4	0	K(1)&F	F
200-250	10	0	9	0	1	0	3	0	F	
250-300	16	0	4	0	0	0	4	9	K(1)&F	F
300-350	10	0	1	0	0	0	6	0	K(1)	
350-400	16	0	6	0	1	0	4	0	K(1)	F
400-450	3	0	5	0	0	0	7	0	K(1)	F
450-500	8	0	10	0	0	0	0	0		F
500-550	0	0	9	0	0	0	4	0	K(3)&F	F
550-600	6	0	28	0	0	0	8	0	K(1)&F	
600-650	0	0	28	0	0	0	5	0	K(2)&F	F
650-700	10	0	11	0	1	0	7	0	K(3)&F	
700-750	0	0	14	0	0	0	2	0	F	F
750-800	5	0	8	0	0	0	3	0	K(1)	
800-850	12	0	12	0	0	0	2	0	K(1)&F	
850-900	6	0	6	0	0	0	1	0	K(3)&F	F
900-950	15	0	15	0	0	0	2	0	K(1)	
950-1000	5	0	5	0	0	0	5	0	K(2)&F	
Total	**124**	**0**	**199**	**0**	**3**	**0**	**79**	**9**	**K(25)&F(14)**	F(12)

GLS	Gentle lower slope	**GMS**	Gentle mid-slope	**GUS**	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	**SMS**	Steep mid-slope	**SUS**	Steep upper slope	VF	Valley floor

Key to vegetation cover

1 < 10 % cover **2** 10 – 50 % cover **3** > 50 % cover

Invasive alien species

LC	*Lantana camara*	CO	*Cedrela odorata*	RU	*Rubus* sp.	SJ	*Stachytarpheta jamaicensis*	O	Other (specify)

High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms

Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	1	2	2			
50-100	GLS	1	2	2			
100-150	GLS	1	2	2			
150-200	GLS	1	2	2			
200-250	GLS	1	2	2			
250-300	GLS	1	2	2			Dikdik pellets
300-350	GLS	1	2	3			Duiker footprints
350-400	GLS	1	2	3			
400-450	GLS	1	1	3			
450-500	GLS	1	1	3			Bushpig footprints
500-550	GLS	1	1	3			
550-600	GLS	1	2	3			bushpig footprints, buffalo footprints, duiker footprints
600-650	GLS	1	2	3		S	
650-700	GLS	1	2	3			
700-750	GLS	1	1	2			
750-800	GLS	1	1	2			
800-850	GLS	1	1	2			
850-900	GLS	1	1	3			Duiker/suni footprints
900-950	GLS	1	1	3			
950-1000	GLS	1	2	3			

Notes: Area appears to be used by medium to large mammals.