Rufiji Environment Management Project[1]

Environmental Management and Biodiversity Conservation of Forests, Woodlands, and Wetlands of the Rufiji Delta and Floodplain

Biodiverstity of Rufiji District – A Summary

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[1] The Rufiji District Council implements Rufiji Environment Management Project with technical assistance from IUCN – The World Conservation Union, and funding from the Royal Netherlands Embassy.

Rufiji Environment Management Project - REMP

Project Goal
To promote the long-term conservation through 'wise use' of the lower Rufiji forests, woodlands and wetlands, such that biodiversity is conserved, critical ecological functions are maintained, renewable natural resources are used sustainably and the livelihoods of the area's inhabitants are secured and enhanced.

Objectives
- To promote the integration of environmental conservation and sustainable development through environmental planning within the Rufiji Delta and Floodplain.
- To promote the sustainable use of natural resources and enhance the livelihoods of local communities by implementing sustainable pilot development activities based on wise use principles.
- To promote awareness of the values of forests, woodlands and wetlands and the importance of wise use at village, district, regional and central government levels, and to influence national policies on natural resource management.

Project Area
The project area is within Rufiji District in the ecosystems affected by the flooding of the river (floodplain and delta), downstream of the Selous Game Reserve and also including several upland forests of special importance.

Project Implementation
The project is run from the district Headquarters in Utete by the Rufiji District Administration through a district Environmental Management Team coordinated by the District Executive Director. The Project Manager is employed by the project and two Technical Advisers are employed by IUCN.

Project partners, particularly NEMC, the Coast Region, RUBADA, The Royal Netherlands Embassy and the Ministry of Natural Resources and Tourism, collaborate formally through their participation in the Project Steering Committee and also informally.

Project Outputs
At the end of the first five –year phase (1998-2003) of the project the expected outputs are:
An Environmental Management Plan: an integrated plan for the management of the ecosystems (forests, woodlands and wetlands) and natural resources of the project area that has been tested and revised so that it can be assured of success - especially through development hand-in-hand with the District council and the people of Rufiji.

Village (or community) Natural Resource Management Plans: These will be produced in pilot villages to facilitate village planning for natural resource management. The project will support the implementation of these plans by researching the legislation, providing training and some support for zoning, mapping and gazettement of reserves.

Established Wise Use Activities: These will consist of the successful sustainable development activities that are being tried and tested with pilot village and communities and are shown to be sustainable

Key forests will be conserved: Forests in Rufiji District that have shown high levels of plant biodiversity, endemism or other valuable biodiversity characteristics will be conserved by gazettement, forest management for conservation, and /or awareness-raising with their traditional owners.

Executive Summary

This report summarises biodiversity information from a wide selection of sources. These are listed at the beginning of the relevant section. Where possible, details of species endemism, forest dependence and conservation status have been given for each species.

Table 1 below summaries the number of species, families, forest dependents, endemic species and species with conservation status.

Table 1: Summary number of species and families for different groups in Rufiji District.

Taxa	Number of Species	Number of Families	Number of Forest Dependents	Number of Endemic Species	Number of threatened species (i.e. listed by IUCN or CITES)
Plants	449	89	30	88	20
Marine Macro Algae	15	/	/	/	/
Sea grass	4	/	/	/	/
Amphibians	27	9	6	2	1
Reptiles	87	25	8	12	5
Birds	431	79	25	/	9
Mammals	117	39	11	/	24
Fish (Marine)	15	16	/	/	/
Fish (Freshwater)	46	15	/	/	/
Butterflies	42	8	18	14	/
Dragonflies	69	/	9	9	8 (pending)
Molluscs (Terrestrial)	16	/	/	/	/
Molluscs (Marine)	25	/	/	/	/
Echinoderm	11	/	/	/	/
Total	1354	280	107	125	59

The species lists presented are not presumed to be complete, the need for further research is fully recognised and encouraged.

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1 Introduction

1.1 Aim

The aim of this report is to compile biodiversity information for Rufiji District into one volume. It should be noted that no additional survey work was undertaken in compiling this report, and thus full acknowledgement is given to the authors of the various studies used to compile this report. The relevant studies are listed at the beginning each section.

This report compiles information known to date, it is not expected that species lists presented are exhaustive, particularly for little known groups such as invertebrates.

The species lists are assembled giving where possible details of forest dependence, endemism and conservation status, these are defined below in section 1.3.

1.2 Location

Rufiji District is located in Coast (Pwani) Region in Eastern Tanzania (see figure 1 below) and is dominated by the Rufiji River.

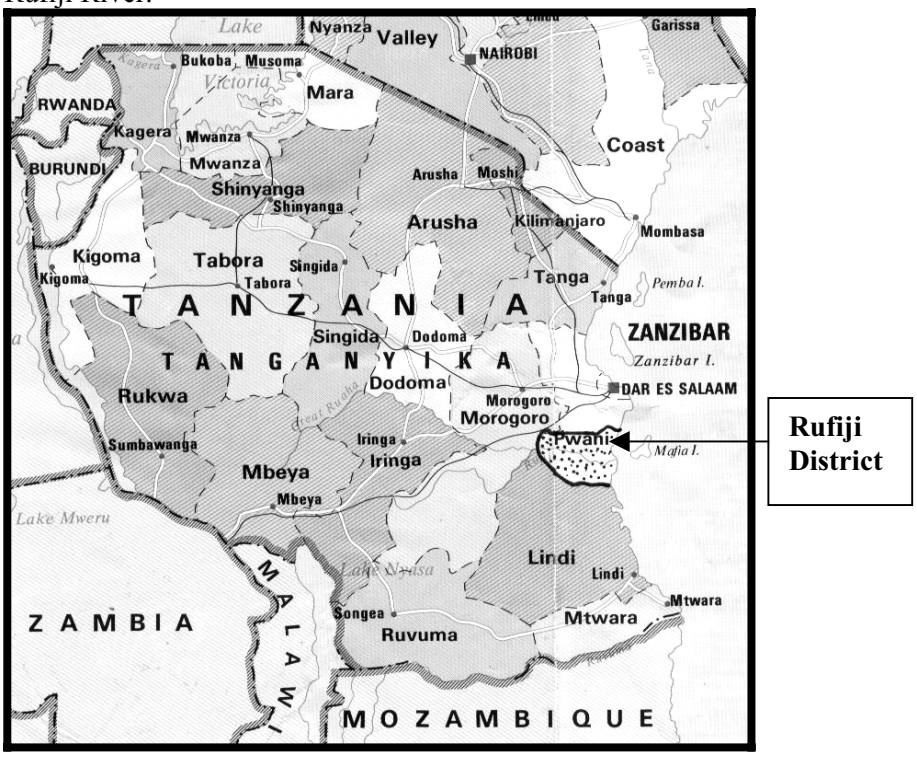

Figure 1: Location of Coast Region in Tanzania (Map from Durand, 2003)

'The lower Rufiji valley starts downstream from Stiegler's Gorge, some 180 km from the Indian Ocean, in the Selous Game Reserve. Below the gorge the river fans out in an inner delta with numerous lakes and subsequently enters its lower floodplain, which gradually widens until the river branches out and forms the Rufiji Delta. The floodplain, which covers approximately 1450 km², comprises a mosaic of former river channels, levees and shallow depressions supporting sparse shrub, intensive cultivation (mainly rice), scattered tree crops (mango, banana) or tall grassland. The floodplain also has palm (*Borassus*, *Hyphaene* and *Phoenix*) and *Acacia* woodland while riparian forest is found on the higher riverbanks. There is also riparian/groundwater forest around the edges of a series of lakes that are connected to the river during the annual floods. The large floodplain lakes in the Lower Rufiji valley occupy roughly 2850 ha (or 56 %) of the surface of standing water bodies in the valley (Mwalyosi, 1990). The higher ground North of the floodplain is covered by a woodland/coastal forest mosaic. To the south of the Rufiji river are a series of hills

with important forested areas, dense woodlands and coastal shrub (often referred to as "thicket")' (Ochieng, 2002). There is an as yet undefined relationship between coastal forests found in Rufiji District and the forests of the Eastern Arc Mountains. The details are not fully understood but a number of endemic plant and animal species occur in both the Coastal and Eastern Arc Forests.

'The Rufiji delta contains the largest area of estuarine mangrove in East Africa (approx. 532 km² in 1990 but increasingly cleared for rice farming). The deltaic plain formed at the Indian Ocean by the Rufiji river is approximately 23 km wide and 70 km long (Chen and Dyke, 1998). The wealth of natural resources in this area supports the livelihoods of some 150,000 people. The lower Rufiji and delta area has been identified as one of the most important wetland areas in East Africa, owing to its rich biodiversity and its high productivity' (Ochieng, 2002).

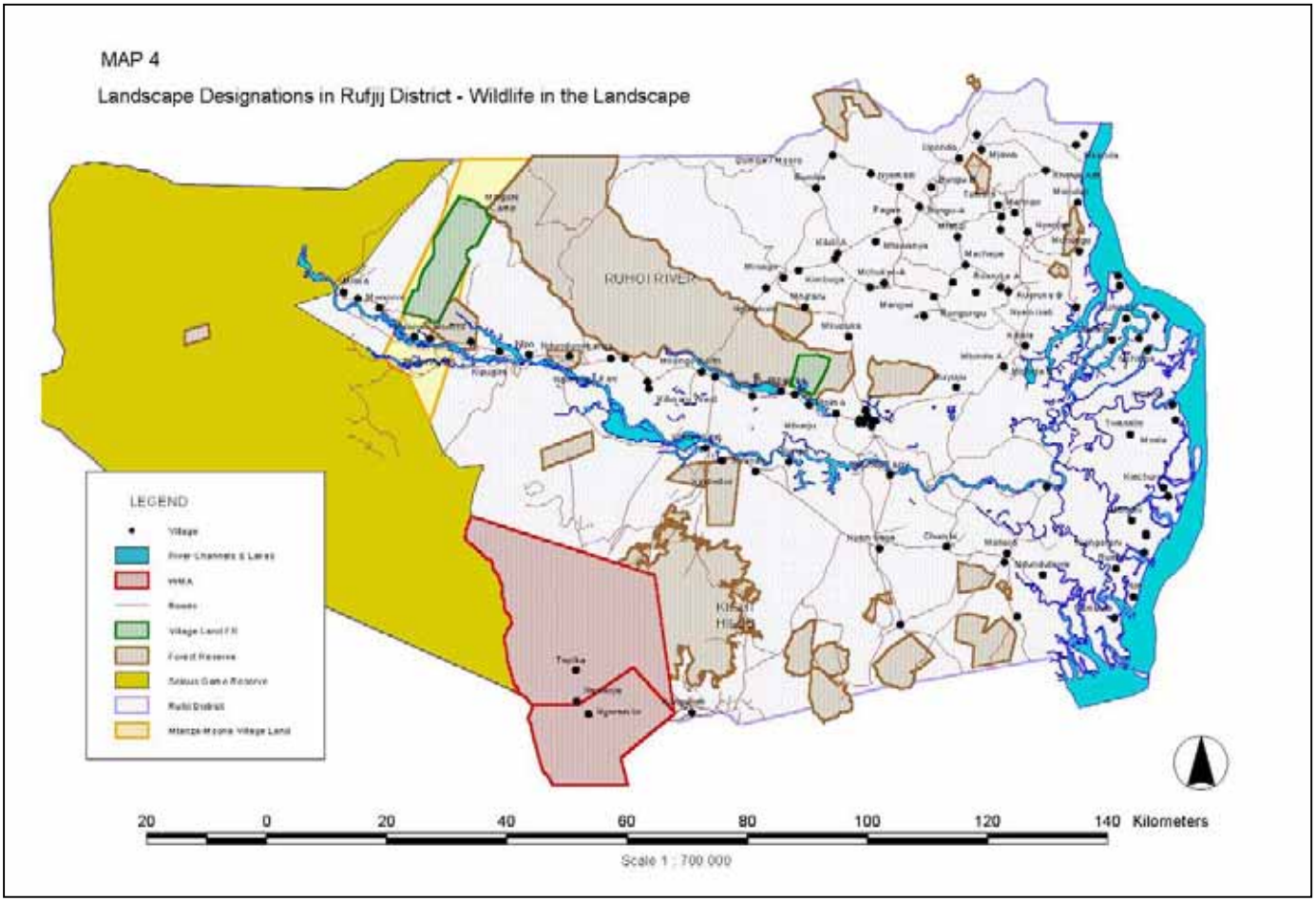

Figure 2: Landscape Designations in Rufiji District (Map from Durand, 2003)

1.3 Definitions

1.3.1 Habitat

For the purposes of this report the habitat presence for each species is listed where possible according to the following classification:

- F – Forest-dependent- species only found in and dependent on closed canopy forest.
- O - Other habitats – species may use forest edge, woodlands and wooded grasslands.
- N - Non-forest – species may use open wetlands, grasslands, savannah, cliffs and other open areas.
- Tr W – Tropical Waters

1.3.2 Conservation status

Where possible the conservation status of each species listed is given, these are based on IUCN red data categories (Hilton-Taylor, 2000)

- CRITICALLY ENDANGERED (CR) - A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the criteria (A to E) as described below.
- ENDANGERED (EN) - A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria (A to E) as described below.
- VULNERABLE (VU) - A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria (A to E) as described below.
- LOWER RISK (LR) - A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

  Conservation Dependent (cd). Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.

  Near Threatened (nt). Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.

  Least Concern (lc). Taxa which do not qualify for Conservation Dependent or Near Threatened.
- DATA DEFICIENT (DD) A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

1.3.3 Endemism

Where possible endemic species are noted.

- CF End – Coastal Forest Endemic – endemic to Coastal Forests as defined in Burgess, 2000.
- Tz End – Endemic to Tanzania
- N End – Near Endemic - occurs in Tanzania and few selected location in nearby countries.
- Tz/K End – Endemic to Tanzania and Kenya

2 Plants

2.1 Terrestrial and Freshwater Plants

A summary of terrestrial and freshwater plant species recorded in Rufiji District was compiled from various sources, detailed below:

- Mwasumbi *et al,* 2000. A Preliminary Biodiversity (Floral) Assessment of Selected Forests in Rufiji District. REMP Technical Report No. 10 (Mwa 2000)
- Malimbwi *et al*, 2000. Timber Resources of Rufiji District. REMP Technical Report 12. (Mal 02)
- Burgess, N.D. and Clarke, G.P. (eds) 2000. The Coastal Forests of Eastern Africa, IUCN Conservation Programme, Gland, Switzerland and Cambridge, England. (Bur00)
- Semesi, 1991. Management Plan for the Mangrove Ecosystem of Mainland Tanzania: Vol. 7 Mangrove Management Plan of Rufiji Delta. Forest and Beekeeping Division, MNRT Dar es Salaam. (Sem91)
- Durand, 2003. Implementation of the Rufiji Forest Action Plan. With Special Emphasis on Community Based Natural Resources Management and a Case Study of Ngumburuni Forest. REMP Technical Report 45. (Dur03)
- Pijnappel, H., 2002. Lakes of the Lower Rufiji Floodplain, Tanzania. The water balance of Lake Lugongwe and the ecohydrological connectivity of the Rufiji lakes with the Rufiji River. University of Nijmegen – Department of Environmental Studies (unpubl.), 170 pp. Note: information for 9 lakes (Mtanza, Zumbi, Lugongwe, Chem Chem, Ruwe, Uba, Weme and Zimbwini) have been combined into one column. (Pij 02)
- Songas, 2002. Assessment of the Flora Biodiversity along the Songo Songo Gas to Electricity Pipeline Corridor. Songas Dar es Salaam. (Son02)

Habitat descriptions and endemism are taken from Burgess *et al*, 2000. Conservation Status is taken from Hilton-Taylor, 2000.

A total of 449 plant species from 89 families have been recorded in Rufiji District, these are listed in Table 1 on page 6. Of these 88 species are endemic to Coastal Forests as defined by Burgess (2000), one is endemic to Kenya/Tanzania and another is a Tanzania endemic.

30 of the recorded species are forest dependent (but it should be noted that habitat information is not yet available for all species listed). 15 of the recorded plant species are listed as 'vulnerable' by IUCN (Hilton-Taylor, 2000), detailed below:

• *Lettowianthus stellatus Diels*	Annonaceae
• *Uvariodendron gorgonis Verdc.*	Annonaceae
• *Dialium holtzii Harms*	Caesalpinaceae
• *Isoberlinia scheffleri (Harmns) Greenway*	Caesalpinaceae
• *Milbraedia carpinifolia (Pax) Hutch.*	Euphorbiaceae
• *Erythrina sacleuxii Hua*	Fabaceae
• *Baphia kirkii Bak.*	Fabaceae
• *Xylotheca tettensis*	Flacoutiaceae
• *Newtonia paucijuga (Harms) Brenan*	Mimosaceae
• *Millettia bussei Harms*	Papilionaceae
• *Rothmannia macrosiphon (Engl.) Bridson*	Rubiaceae
• *Rytigynia binata (K. Schum.) Robyns*	Rubiaceae
• *Tarenna drummondii Brids.*	Rubiaceae
• *Zanthoxylum holtzianum (Engl.) Waterm.*	Rutaceae
• *Zanthoxylum lindense (Engl.) Kokwaro*	Rutaceae

Two species are listed as Endangered, detailed below:

- *Baikiaea ghesquireana J. Leonard* Caesalpinaceae
- *Tessmannia densiflora Harms* Caesalpinaceae

Three species are listed as Lower Risk Near Threatened, detailed below:

- *Dalbergia melanoxylon Guill. & Perr.* Fabaceae
- *Pterocarpus angolensis* Papilionaceae
- *Milicia excelsa (Welw.) C.C. Berg* Moraceae

Table 2: Plant Species recorded in Rufiji District

RL= Rufiji Lakes, MO= Mohoro Forest, CM= Chumbi-Msumi Floodplain, RU= Ruhoi River Bank, MV = Mangroves, NG= Ngumburuni Forest, KW = Kiwengoma Forest, NK - Namakutwa Forest, MC - Mchungu Forest, KH – Kichi Hills, WE – Weme Forest, IL – Ilu Forest. Mal 02 – Malimbwi, 2002. Ecol Status – based on Burgess (2000), Endemic Status based on Burgess (2000), Conservation Status based on Hilton-Taylor, (2000). Life Form based on Mwasumbi, (2000) and LEAP. Mwa 2000 – Mwasumbi *et al*, (2000) EX= Exotic Species

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
ACANTHACEAE																		
	Asystasia gangetica (L.) T. Anders														X	X	X	H
	Blepharis maderaspatensis (L.) Roth.														X			H
	Dicliptera sp.												X					
	Isoglossa lacteal														X	X	X	H
AGAVACEAE																		
	Dracaena deremensis Engl.											X						
	Dracaena usambarensis Engl.											X						
ALISMATACEAE																		
	Sagittaria guayanensis	O			X													
AMARANTHACEAE																		
	Achyranthes aspera L.																X	H
	Psilotricum scleranthum Thw.														X	X	X	S
ANACARDIACEAE																		
	Anacardium occidentale L.													X				
	Lannea antiscorbitica (Hiern) Engl.											X						
	Lannea humilis									X	X							T
	Lannea schweinfurthii (Engl)									X					X	X		ST
	Ozoroa insignis Del.														X			ST
	Rhus natalensis										X							T
	Sclerocarya birrea (A. Rich.) Hochst.									X						X	X	T
	Sorindeia madagascariensis DC.									X		X	X	X		X	X	T
ANNONACEAE																		
	Annona senegalensis Pers.									X					X			S/T
	Artabotrys brachypetalus Benth.															X	X	L
	Asteranthus lutea Vollesen	O	CF End									X						S
	Cleistochlamys kirkii (Benth.) Oliv.														X			T
	Isolona heinsii Engl. & Diels											X						

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Lettowianthus stellatus Diels	F	CF End	VU						X		X	X		X	X	X	T
	Monanthotaxis buchananii (Engl.) Verdc.									X						X	X	SS
	Monodora junodii Engl. & Diels											X						
	Monodora grandidieri		CF End							X								
	Ophrypetalum odoratum Diels	F	CF End									X			X			T, S
	Polyalthia tanganyikensis Vollesen	O	CF End												X			S
	Uvaria acuminata Oliv.	F	CF End												X			T, S, L
	Uvaria kirkii										X							S
	Uvariodendron gorgonis Verdc.	F	CF End	VU								X						T
	Xylopia odoratissima Oliv.																X	T
	Xylopia parviflora (A. Rich.) Benth.											X			X	X	X	T
ANTHERICACEAE																		
	Chlorophytum sp. nov.											X						
APOCYNACEAE																		
	Carissa edulis										X							S
EX	*Dicyophleba lucida*						X											L
	Diplorhynchus condylocarpon (Muell. Arg.) Pichon									X						X		S
	Landophia kirkii Dyeri														X	X		C
	Rauvolfia mombasiana Stapf	O	CF End													X	X	ST
EX	*Saba comorensis* (Bojer) Pichon						X								X		X	L
	Sapium armatum Pax & K. Schum.											X	X		X			S
	Schizozygia coffaeoides (Bojer) Baill.															X	X	S
	Strophanthus courmontii Franch.															X		C
	Tabernaemontana elegans Stapf.	O	CF End											X				T,S
	Voacanga africana									X	X							T
	Voacanga thouarsii Stapf														X	X	X	T
APOLACEAE																		
	Holarrhena pubescens (Burch. Ham.) Wall									X		X				X		T
ARACEAE																		
	Pistia stratiotes	O			X													
	Stylochiton natalensis Schott															X		H
ARALIACEAE																		

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Cussonia zimmermannii Harms	O	CF End									X			X			T
	Polyscias stuhlmannii										X							T
ARECACEAE																		
	Phoenix reclinata									X								
ASCLEPIADIACEAE																		
	Harrisonia abyssinica Oliv.											X						
EX	*Mondia ecornuta* Bullock						X											
ASPARAGACEAE																		
	Asparagus racemosus										X							H
ASTERACEAE																		
	Crassocephalum rubens (Jacq.) S. Moore															X		H
	Elephantopus scaber L.															X		S
AVICENNIACEAE																		
	Avicennia marina (Forsks.) Vierh.								X									
AZOLLACEAE																		
	Azolla africana	O			X													
BALANITACEAE																		
	Balanites maughamii Sprague													X				
	Balanites wilsoniana Dawe & Sprague	O	CF End														X	T
BARRINGTONIACEAE																		
	Barringtonia racemosa (L.) Spreng.													X				
BIGNONIACEAE																		
	Fernandoa magnifica Seem	O	CF End												X	X	X	T
	Kigelia africana (Lam.) Benth.									X		X			X	X	X	T
	Markhamia lutea (Benth.) K. Schum.									X						X		T
	Markhamia acuminata (Klotzsch.) K. Schum. Syn. M. zanzibarica												X				X	S
	Markhamia obtusifolia (Bak.) Sprague									X		X			X	X	X	T
	Stereospermum kunthianum Cham.											X				X	X	T
BOMBACACEAE																		
	Adansonia digitata										X							T
	Bombax rhodognaphalon K. Schum.	O	CF End							X		X	X				X	T

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
BORAGINACEAE																		
	Cordia goetzii										X							S
	Cordia faulkenerae Verdc.	O	CF End													X		S
	Ehretia cymosa Thonn.													X				
BURSERACEAE																		
	Commiphora eminii Engl.														X			T
	Commiphora serrata Engl.	O	CF End												X		X	T,S
	Commiphora zanzibarica (Baill.) Engl.	O	CF End												X			T
	Commiphora zimmermannii (Engl.) Gillett											X						
CAESALPINACEAE																		
	Afzelia quanzensis Welw.					X				X				X	X	X	X	T
	Baikiaea ghesquireana J. Leonard	F	CF End	EN									X					T
	Bauhinia tomentosa L.											X						
	Brachystegia bussei										X							
	Brachystegia microphylla Harms												X					
	Brachystegia sp.											X						
	Brachystegia spiciformis Benth.									X						X		T
	Bussea eggelingii	F	CF End								X							T
	Cassia burttii Baker f.	O	CF End									X	X					T, S
	Cassia petersiana (Bolle) Lock											X						
	Cassia sp. (Exotic)											X						
	Cassia zambesiaca Oliver	O	CF End											X				H
	Cassia abbreviata Oliv.											X			X	X	X	T
	Cordyla africana Lour.									X						X		T
	Cynometra suahiliensis									X	X							T
	Cynometra webberi Bak.f	F	CF End							X								
	Cynometra sp.											X						
	Dialium holtzii Harms	O	CF End	VU						X		X	X		X	X		T
	Hymenaea verrucosa Gaert..									X		X	X	X		X	X	T
	Isoberlinia scheffleri (Harmns) Greenway	F		VU								X						
	Julbernardia globiflora									X	X							T

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Piliostigma thonningii									X	X							T
	Tamarindus indica L.									X		X		X		X	X	T
	Tessmannia densiflora Harms	F	CF End	EN								X	X					T
	Scorodophloeus fischeri (Taub.) J. Leon.	F	CF End									X			X			T
	Swartzia madagascariensis											X						S
CAPPARACEAE																		
	Boscia salsifolia										X							T
	Capparis sepiaris L.														X	X		SS
	Thylachium africana Lour.															X		S
	Maerua kirkii (Oliv.) F. white															X		S
	Maerua triphylla A. Rich.											X						
CELASTRACEAE																		
	Elaeodendron schweinfurthianum (Loes.) Loes.	O	CF End													X	X	ST
	Elaeodendron schlechterina									X								
	Loesneriella africana															X		C
	Maytenus acuminata										X							S
	Maytenus undatus										X							S
	Maytenus putterlickioides										X							S
	Mystroxylon aethiopicum (Thunb.) Loes.													X				
	Salacia leptoclada Tul.														X			SS
	Salacia madagascariensis (Lam.) DC.												X		X	X		SS
CERATOPHYLLACEAE																		
	Ceratophyllum demersum	O			X													
CHARACEAE																		
	Chara sp.	O			X													
CHRYSOPHYLLACEAE																		
	Parinari curatellifolia Benth.													X				
COMBRETACEAE																		
	Combretum adenogonium A. Rich.											X	X					
	Combretum molle G. Don.														X		X	T
	Combretum pentagonum Laws.														X			SS
	Combretum zeyheri Sond.														X	X	X	S/T

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Pteleopis myrtifolia (Laws.) Engl. Diels									X					X	X	X	T
	Pteleopsis apetala Vollesen	O	CF End									X						
	Terminalia sericea DC.														X	X	X	T
COMMELINACEAE																		
	Aneilema aequinoctiale (P. Beauv.) Kunth.															X	X	H
	Commelina benghalensis L.														X	X	X	H
COMPOSITAE																		
EX	*Ageratum conyzoides*						X											
EX	*Bidens pilosa*						X											S
CONNARACEAE																		
	Agelaea setulosa Schellenb.	O	CF End														X	SS
	Byrsocarpus orientalis										X							SS
	Ellipanthus hemandradenioides Brenan	F	CF End									X						
	Rourea orientalis Baill.											X			X	X		S
CYPERACEAE																		
	Cyperus alopeculoides	O			X													
	Cyperus articulatus	O			X													
	Cyperus denudatus	O			X													
	Cyperus difformis	O			X													
	Cyperus digitatus	O			X													
	Cyperus esculentus	O			X													
	Cyperus exaltatus Retz.															X	X	G
	Cyperus longus	O			X													
	Kyllinga nemoralis	O			X													
	Mariscus hemisphaericus (Boeck.) C.B. Cl.														X			G
	Scirus sp.	O			X													
DICHAPETALACEAE																		
	Dichapetalum aneranium Bret.	O	CF End													X		SL
	Dichapetalum edule	O	CF End												X	X		SL
	Dichapetalum ruhlandii										X							S
	Dichapetalum stuhlmannii Engl.												X		X			SS
DILLENIACEAE																		

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Tetracera boiviniana Baill.	O	CF End												X			T, S
	Tetracera litoralis Gilg.	F	CF End													X		SS
EBENACEAE																		
	Diospyros kabuyeana F. White	F	CF End									X	X					T, S
	Diospyros loureireana	O	CF End														X	T
	Diospyros mespiliformis DC.											X			X	X		T
	Diospyros squarrosa Klotzsch											X						
	Diospyros usambarensis F. White											X						
	Diospyros verrucosa Hiern	O	CF End									X	X		X			ST
	Diospyros zombensis (B.L. Burtt.) F. White											X						
	Euclea divinorum										X							T
ERYTHROXYLACEAE																		
	Erythroxylum emarginatum Thonn.															X	X	S
EUPHORBIACEAE																		
	Acalypha gillmannii A. R. Smith	O	CF End												X			S
	Acalypha neptunica Muell. Arg.														X			S/T
	Alchornea laxiflora (Benth.) Pax. & Hoffm.											X	X		X	X		S
	Alchornea sp.(Kitwana)														X			S
	Antidesma venosum Tul.									X		X			X	X		S
	Bridelia cathartica Bertol.f.													X		X		SS/T
	Bridelia atroridis Mull. Arg.											X						
	Bridelia micrantha (Hochst.) Baill.												X					
	Croton macrostachyus Del.															X		T
	Croton pseudopulchellus Pax											X						
	Croton sylvaticus Hochst.											X	X					
	Drypetes arguta (Muell. Arg.) Hutch.														X		X	T
	Drypetes natalensis (Harv.) Hutch.														X	X		
	Drypetes reticulata Pax									X						X		ST
	Drypetes sp.													X				
	Euphorbia candelabrum Kotschy															X	X	T
	Euphorbia nyikae Pax & Burret																X	T
	Euphorbia usambarensis Pax	O	CF End											X				

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Euphorbia scarlatina										X							S
	Flueggea virosa Baill.															X		S
	Mallotus oppositifolius (Geisel.) Mull. Arg.											X	X					
	Margaritaria discoidea (Baill.) Webster														X	X	X	S
	Milbraedia carpinifolia (Pax) Hutch.	F	CF End	VU											X			S
	Phyllanthus amarus Schum. & Thonn.																X	A
	Phyllanthus leucanthus Pax														X			H
	Phyllanthus nummulariifolius Poir.											X						
	Phyllanthus reticulatus Poir														X			SS
	Phyllanthus rhizomatosus A.R. Sm.	O	CF End									X						H
	Phyllanthus sp.															X		S
	Pseudolachnostylis maprouneifolia Pax									X					X	X		T
	Ricinodendron heudelotii (Baill.) Pierre											X	X					
	Sapium ellipticum (Krauss) Pax											X						
	Spirostachys africana Sond.															X	X	T
	Suregada zanzibariensis Baill									X		X	X	X	X	X	X	S
	Synadenium sp.										X							
	Tragia brevipes										X							H
	Tragia furialis Prain														X			C
FABACEAE																		
	Abrus precatorius L.														X			C
	Crotolaria goodiiformis Vatke														X	X		S
	Dalbergia melanoxylon Guill. & Perr.			LR/nt						X						X		T
	Erythrina melanacantha										X							T
	Erythrina sacleuxii Hua	F	CF End	VU											X		X	T
	Lonchocarpus capassa Roffe														X	X	X	T
	Millettia stuhlmannii Taub.									X					X	X		T
	Xerroderis stuhlmannii (Taub.) Mend. & Souza									X					X	X	X	T
	Baphia kirkii Bak.	O	CF End	VU						X		X		X		X		T
FLACOURTIACEAE																		
	Casearia gladiformis										X							S

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Bivinia jalbertii Tul.											X	X					
	Caloncoba welwitschii (Oliv.) Gilg.											X	X		X	X		S
	Canthium mombazense Baill.												X					
	Flacourtia indica										X							S
	Lindackeria bukobensis Gilg														X			S
	Scolopia rhamniphylla Gilg												X					
	Xylotheca tettensis (Klotzsch)	O	CF End	VU								X		X		X	X	S
	Oncoba spinosa Forssk.											X				X	X	ST
FLAGELLARIACEAE																		
EX	*Flagellaria indica*						X											
GESNERIACEAE																		
	Saintpaulia ionantha H. Wendl.	F	CF End									X						H
GRAMINEAE																		
	Cynodon dactylon	O			X													
EX	*Digitaria abyssinica*						X											
	Digitaria gymnostachya Pilg											X						
	Echinochloa stagnina	O			X													
EX	*Pennisetum purpureum*						X											
	Phragmites mauritianus	O			X													
	Setaria megaphylla (Steud.) Th. Dur. & Schinz											X						
	Voscia cuspidata	O			X													
GUTTIFERAE																		
	Garcinia buchananii Bak.											X						
	Garcinia livingstonii T Anders									X				X		X	X	S/T
	Harungana madagascariensis Poir														X			ST
	Psorosperum febrifugum Spach											X						
	Vismia orientalis Engl.											X	X					
HYMENOCARDIACEAE																		
	Hymenocardia ulmoides Oliv.									X		X		X	X	X	X	T
ICACINACEAE																		
	Apodytes dimidiata									X	X							T
IXONANTHACEAE																		

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Phyllocosmus lemaireanus (De Wild. & Th. Dur.) Th. & H. Dur.													X				
LABIATAE																		
	Hoslundia opposita										X							
	Tinnea sp.										X							
LINACEAE																		
	Hugonia castaneifolia Engl.														X			L
LOGANIACEAE																		
	Strophanthus kombe Oliv.															X		SS
	Strychnos henningsii Gilg														X	X		ST
	Strychnos madagascariensis Poir														X	X	X	T
	Strychnos panganensis Gilg	O	CF End														X	C , S
	Strychnos spinosa									X	X							S
LORANTHACEAE																		
	Agelanthus longipes											X						
	Loranthus sp.										X							
MALIPIGHIACEAE																		
	Acridocarpus alopecuras Sprague											X						
MALVACEAE																		
	Gardenis ternifolia ssp. jovis tonantis									X					X			S
	Hibiscus surattensis L.															X	X	H
MELASTOMATACEAE																		
	Memecylon sansibaricum Taub.														X			S
MELIACEAE																		
	Bersama abyssinica (Sim.) Verdc.									X		X				X	X	T
	Khaya anthotheca (Welw.) C. DC.											X						
	Trichilia dregeana									X								
	Trichilia emetica Vahl									X		X						
	Turraea nilotica Kotschy & Peyr.														X		X	ST
	Xylocarpus granatum Koen.								X									
MENISPERMACEAE																		
	Albertisia undulata (Hiern) Forman.	F	CF End												X			SS
EX	*Cissampelos pareila*						X											

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Triclisia sacleuxii (Pierre) Diels															X		C
MIMOSACEAE																		
	Acacia adenocalyx Brenan & Exell	O	CF End									X						T, S
	Acacia nigrescens Oliv.															X		T
	Acacia nilotica (L.) Del.									X				X		X		T
	Acacia robusta Burch.															X	X	T
	Acacia sieberana DC.											X			X			S
	Acacia tortilis									X	X							T
	Albizia adianthifolia					X												
	Albizia glaberrima (Schum. & Thonn.) Benth.														X			T
	Albizia gummifera										X							T
	Albizia harveyi Fourn															X	X	T
	Albizia petersiana (Bolle) Oliv.											X			X			T
	Albizia versicolor Oliv.									X				X				
	Albizia seyal										X							T
	Amblygonocarpus andongensis (Oliv.) Exell & Torre									X					X			T
	Dichrostachys cinerea (L.) Wight & Arn.														X	X		ST
	Mimosa pigra	O			X						X							S
	Neptunia oleraceae	O			X													
	Newtonia buchananii (Bak.) Gilb. & Bout.														X			T
	Newtonia paucijuga (Harms) Brenan	F	CF End	VU								X						T
	Parkia filicoidea Oliv.											X						
MONTINIACEAE																		
	Grevea eggelingii Milne Redh.	O	CF End									X						T, S
MORACEAE																		
	Ficus bussei Mildbr.														X			T
	Ficus lingua De Wild. & Th. Dur.													X				
	Ficus natalensis (Miq.) Hochst.																X	T
	Ficus scassellattii Pamp.													X				
	Ficus sycomorus L.											X						

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Ficus thonningii										X							T
	Maclura africana (Bureau) Corner											X						
	Milicia excelsa (Welw.) C.C. Berg			LR/nt								X	X		X			T
	Streblus usambarensis (Engl.) C.C. Berg											X						
MYRTACEAE																		
	Eugenia capensis (Eckl. & Zeyh.) Sond.														X			S
	Syzygium guineense									X	X							
NYMPHACEAE																		
	Nymphaea capensis	O			X													
	Nymphaea lotus L	O			X											X		H
OCHNACEAE																		
	Ochna holstii Engl.									X						X	X	T
	Ochna mossambicensis K1.	O	CF End													X		ST
	Olax pentandra Sleumer	O	CF End									X			X	X		T
OLACACEAE																		
	Olax obtusifolia De Wild.											X						
	Ximenia caffra Sond.									X					X			S
	Chrebera trichoclada Welw.															X		T
	Jasminium fluminense Vell.																X	C
ONAGOLACEAE																		
	Ludwigia stolonifera	O			X													
ORCHIDACEAE																		
	Microcoelia exilis Lindl.	F	CF End	CITES II				X										
	Microcoelia megalorrhiza			CITES II				X										
PALMACEAE																		
	Borassus aethiopum Mart													X		X		T
	Hyphaene compressa H. Wendl.									X						X	X	T
PAPILIONACEAE																		
	Craibia zimmermannii (Harns) Dunn.											X		X				
	Dalbergia obovata E. Meyer											X						
	Dalbergia nitidula										X							T
EX	*Derris trifoliata*						X											L

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Desmodium velutinum										X							H
	Millettia bussei Harms			VU									X					
	Millettia impressa Harms											X						
	Pterocarpus angolensis			LR/nt		X				X	X							T
	Pterocarpus tinctorius Welw.											X	X					
PASSIFLORACEAE																		
	Adenia dolichosiphon Harms	O	CF End												X			C
	Adenia schlibenii	O	CF End									X						C
	Basananthe lanceolata (Engl.) De Wilde														X			CH
	Schlechterina mitostemmatoides Harms	O	CF End												X	X		L, S
POACEAE																		
	Digitaria milanjiana (Rendle) Stapf															X		G
	Hemarthria natans Stapf																X	G
	Hyparrhenia filipendula (Hochst.) Stapf														X			G
	Leptochloa chinensis (l.) Nees														X			G
	Panicum comorense Mez														X	X	X	G
	Panicum laticomum Nees	F	CF End												X	X		G
EX	*Panicum maximum* Jacq.	O			X		X								X	X	X	G
	Panicum peteri	O	CF End													X		G
	Panicum trichocladum K. Schum.														X	X		G
	Setaria homonyma (Steud) Chiov.														X			G
	Sporobolus pyramidalis P. Beauv.															X		G
	Vetiveria nigritana (Benth.) Stapf															X		G
RHAMNACEAE																		
	Ziziphus mucronata										X							S
	Ziziphus pubescens Oliv											X					X	T
RHIZOPHORACEAE																		
	Bruguiera gymnorrhiza(L.) Lam								X									
	Cassipourea euryoides Alston		CF End							X								
	Cassipourea malosana (Bak.) Alston														X			T
	Ceriops tagal (Perr*) C.B. Rob.*								X									
	Rhizophora mucronata Lam.								X									

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
RUBIACEAE																		
	Burttdavya nyasica Hoyle	F	CF End									X						T
	Caturanegan spinosa (Thunb.) Tirven														X	X		S/T
	Chazaliella abrupta (Hiern) Petit & Verdc.														X	X	X	S
	Crossopteryx febrifuga (G. Don.) Benth.										X				X	X		T
	Gardenia ternifolia Schum. & Thonn.													X				
	Gardenia ternifolia ssp. jovis tonantis										X							S
	Gardenia transvenulosa Verdc.	O	CF End										X					T, S
EX	*Keetia zanzibarica* (Klotzsch) Brids						X										X	SC
	Lamprothamnus zanguebaricus Hiern	O	CF End													X	X	S
	Leptactina oxyloba K. Schum.	O	CF End									X						S
	*Leptactina platyphylla (*Hiern) Wernhi	F	CF End												X	X		S
	Oldenlandia lancifolia (Schumach.) DC.															X		H
	Oxyanthus pyriformis (Hochst.) Skeels														X			S
	Oxyanthus speciosus										X							S
	Oxyanthus zanguebaricus Hiern) Brids.	F	CF End									X			X			S
	Pavetta holstii		Tz End								X							S
	Pavetta refractifolia K. Schum.															X		S
	Pavetta sp.											X						
	Pentas bussei K. Krause														X			S
	Polysphaeria dischistocalyx Brenan																X	S
	Polysphaeria multiflora Hiern											X	X			X		S
	Psychotria goetzei										X							S
	Psychotria lauracea (K. Schum.) Petit.											X						
	Psychotria punctata Vatke														X			S
	Pyrostria bibracteata (Bak.) Cavaco														X			S
	Rothmannia macrosiphon (Engl.) Bridson	F	CF End	VU									X					T, S
	Rothmannia manganjae (Hiern.) Keay											X						
	Rothmannia ravae (Chiov.) Brids.	O	CF End									X			X	X		S
	Rytigynia pergracilis Verdc.														X		X	S
	Rytigynia binata (K. Schum.) Robyns	O	CF End	VU											X	X		ST
	Rytigynia decussata (K. Schum.) Robyns	O	CF End									X						S

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Rytigynia pergracilis Verdc.	F	CF End									X						S
	Rytigynia uhligii									X	X							S
	Spermacoce sinensis (Klotzsch) Hiern														X			H
	Tapiphyllum burnettii Tennant											X						
	Tarenna drummondii Brids.	O	CF End	VU											X			ST
	Tarenna supra axittaris (Hamsley) Bremek.											X		X				
	Tricalysia ovalifolia Hiern														X			S
	Tricalysia pallens Hiern.											X						
	Tricalysia sp. nov.											X						
	Vangueria infausta Burch.									X					X			ST
	Vangueria madagascariensis Gmel.											X	X					
	Vangueria randii S. Moore															X		SS
RUTACEAE																		
	Clausena anisata (Willd.) Benth.											X						
	Teclea simplicifolia									X	X							T
	Zanthoxylum chalybeum Engl.									X					X		X	ST
	Zanthoxylum holtzianum (Engl.) Waterm.	O	CF End	VU											X	X		T,S
	Zanthoxylum lindense (Engl.) Kokwaro	O	CF End	VU								X						T, S
SALVADORACEAE																		
	Dobera loranthifolia (Warb.) Harms	O	CF End													X	X	T
SALVINIACEAE																		
	Salvinia auriculata	O			X													
SAPINDACEAE																		
	Allophylus abyssinicus (Hochst.) Radlk.															X	X	S
	Allophylus africanus P. Beav.											X						
	Aporrhiza paniculata Radlk.											X						
	Blighia unijugata Baker												X			X		T
	Deinbollia borbonica Scherffi									X		X	X			X	X	S
	Haplocoelopsis africana F.O. Davies			DD													X	T
	Haplocoelum inoploeum Radlk.	O	CF End													X	X	T
	Haplocoelum mombasense									X								
	Lepisanthes senegalensis (Poir.) Leenh.											X		X				

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Majidea zanguebarica Oliv. .															X		T
EX	*Paulinia pinnata* L						X								X			C
SAPOTACEAE																		
	Chrysophyllum gorungosanum Engl.															X		T
	Engleraphyton malagalismontanum (Sond) Pennigton											X						
	Inhambanella henriquensii (Engl. & Warb.) Dubard	F	CF End									X						T
	Manilkara discolor (Sond.) J.H. Hem.															X		T
	Manilkara sansibarensis (Engl.) Dubard	O	CF End							X		X						T
	Mimusopsis fruticosa A.DC.														X			T
	Mimusopsis riparia		K/Tz End								X							T
	Pancovia holtzii Gilg														X			S
	Pouteria alnifolia (Bak.) Robert											X	X					
	Sideroxylom inerme L.													X	X			T
SONNERATIACEAE																		
	Sonneratia alba Sm.								X									
SPHENOCLEACEAE																		
	Sphenoclea zeylanica	O			X													
STERCULIACEAE																		
	Byttneria glabra K Schum														X			T
	Cola clavata Mast.	O	CF End													X		T
	Cola discoglypremnophylla Brenan & Jones	F	CF End												X		X	S/T
	Cola microcarpa Brenan	F	CF End									X				X		S/T
	Dombeya rotundifolia										X							T
	Dombeya cincinnata K. Schum.														X			S
	Heritiera littoralis Dryland.								X									
	Nesogordonia holtzii (Engl.) Capuron	O	CF End													X		T
	Sterculia africana (Lour.) Fiori															X	X	T
	Sterculia appendiculata K. Schum.	O	CF End							X		X			X		X	T
	Sterculia quinqueloba (Garcke) K. Schum.									X					X	X		T
STRYCHNACEAE																		

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Strychnos sp.													X				
THYMELACEAE																		
	Synaptolepis kirkii Oliv.	F	CF End												X	X	X	SC
	Carpodiptera africana Mast.	O	CF End												X			S/T
TILIACEAE																		
	Gossypioides kirkii (Mast.) Hutch.														X			SS
	Grewia bicolor Juss.															X	X	S/T
	Grewia conocarpa K. Schum.	O	CF End									X						T, S
	Grewia forbesii Mast.	O	CF End													X	X	SS
	Grewia goetzeana K. Schum.	O	CF End	DD						X		X						T, S
	Grewia holstii Burret.	O	CF End												X	X		SS
	Grewia lepidopetala Garcke	O	CF End													X		T, S
	Grewia microcarpa K. Schum.															X		S
	Grewia monticola Sond.											X						
	Grewia trichocarpa									X	X							S
	Triumfetta rhomboidea Jacq.														X	X		H
TYPHACEAE																		
	Typha capensis	O			X													
UMBELLIFERAE																		
	Tetrapleura tetraptera (Schumach. & Thonn) Taub.											X						
VERBENACEAE																		
	Clerodendrum cephalanthum Oliv.															X		SS
	Clerodendrum myricoides (Hochst.) Vatke															X	X	SS
	Lippia javanica (Burm.f.)Spreng.														X			S
	Premna sp.										X							
	Vitex buchananii Gurke											X			X	X		S
	Vitex doniana Sweet									X				X			X	T
	Vitex mombassae										X							S
	Vitex payos										X							S
VIOLACEAE																		
	Rinorea angustifolia (Thon.) Baill.											X						
	Rinorea elliptica (Oliv.) Kuntze	F	CF End									X				X	X	S

Table 1: Plant Species In Rufiji District

Fam.	Species	Ecol Status	End. Status	Cons. Status	RL Pij 02	MO Son02	CM Son02	RU Son02/ Dur03	MV Sem 91	NG Son02	Mal 02	KW Mwa 00	NK Mwa 00	MC Mwa 00	KH Mwa 00	WE Mwa 00	IL Mwa 00	Life Form
	Rinorea sp. A. FTEA											X						
	Rinorea welwitschii (Oliv.) Kuntze.											X						
ZINGIBERACEAE																		
	Afromomum orientale		CF							X								

2.2 Marine Plants and Algae

The following list of species of 4 sea grass species and 15 species of macro-algae, is taken from Caras, (2002), REMP Technical Report Number 27. This report is based on findings of a survey of Simaya Island, just off-shore from Rufiji Delta.

Table 3: Marine Plants and Algae Species in Rufiji District

Group	Division	Scientific name	Common Name
Macro-algae : Seaweed	Chlorophyta: Green Algae	*Caulerpa* sp.	
Macro-algae : Seaweed	Chlorophyta: Green Algae	*Dictyospheria versluysii*	
Macro-algae : Seaweed	Chlorophyta: Green Algae	*Halimeda macroloba*	
Macro-algae : Seaweed	Chlorophyta: Green Algae	*Halemida sp.*	
Macro-algae : Seaweed	Chlorophyta: Green Algae	*Ulva sp.*	
Macro-algae : Seaweed	Chlorophyta: Green Algae	*Valonia ventricosa*	Sailor's eyeball
Macro-algae : Seaweed	Phaeophyta: Brown Algae	*Cystoseira myrica*	
Macro-algae : Seaweed	Phaeophyta: Brown Algae	*Cystoseria fragilis*	
Macro-algae : Seaweed	Phaeophyta: Brown Algae	*Dyctyota* sp.	
Macro-algae : Seaweed	Phaeophyta: Brown Algae	*Padina sp.*	
Macro-algae : Seaweed	Phaeophyta: Brown Algae	*Sargassum binderi*	Sargassum common
Macro-algae : Seaweed	Phaeophyta: Brown Algae	*Sargassum ilicifolium*	Sargassum big leeaves
Macro-algae : Seaweed	Phaeophyta: Brown Algae	*Turbinaria conoides*	
Macro-algae : Seaweed	Phaeophyta: Brown Algae	*Turbinaria sp.*	
Macro-algae : Seaweed	Rhodophyta: Red Algae	*Actinotrichia fragilis*	
Sea grass		*Cymodocea serrulata*	
Sea grass		*Cymodocea* sp.	
Sea grass		*Halodule* sp.	
Seagrass		*Thalasia hemprichii*	

3 Amphibians

The summary of Amphibian species recorded in Rufiji District was compiled from various sources, detailed below:

- Howell *et al,* 2000. A Preliminary Biodiversity (Fauna) Assessment of the Rufiji Floodplain and Delta. REMP Technical Report No. 9 (Howell, 2000)
- Burgess, N.D. and Clarke, G.P. (eds) 2000. The Coastal Forests of Eastern Africa, IUCN Conservation Programme, Gland, Switzerland and Cambridge, England. (Bur00)
- Sheil *et al*, 1990 Preliminary Results of Biological Surveys in Zaraninge and Kierengoma Coastal Forests, Tanzania. (She90)

Habitat descriptions and Endemism are taken from Burgess *et al*, 2000 and Howell *et al*, 2000. Conservation Status is taken from Howell *et al*, 2000.

A total of 27 amphibian species from nine families and two orders have been recorded in Rufiji District. Of these six are forest dependent, two of the forest dependent species are also endemic to coastal forests.

Amphibian species endemic to coastal forests recorded in Rufiji District.

- *Mertensophryne micranotis*
- *Stephopaedes loveridgei* Loveridge's Earless Toad

Mertensophryne micranotis is listed as 'vulnerable' IUCN.

This species list is not complete, due to poor amphibian sampling conditions (Howell, 2000) and a concentration on forest sites. It is likely that given further sampling the species list would be increased.

Doggart,/TFCG 2002

Mertensophryne micranotis
Forest Dependent / Coastal Forest Endemic

Table 1: Amphibian Species in Rufiji District

Classification	Species	Common name	Ecol. Status	End. Status	Cons. Status	Weme	Kichi Hills	Kiwengoma	Mchungu	Namakutwa	Dist / Notes	Reference
ANURA												
ARTHROLEPTIDAE												
	Arthroleptis stenodactylus	Common Squeaker	O			X	X	X	X	X	Widespread	How00, Bur00
	Schoutedenella xenodactyloides	Dwarf Squeaker	F					X		X		How00, Bur00
BUFONIDAE												
	Bufo gutturalis	Guttural Toad	O			X		X		X	Widespread	How00, She90
	Bufo lindneri		O			X						How00
	Mertensophryne micranotis		F	CF End	VU		X	X				How00, She90
	Stephopaedes loveridgei	Loveridge's Earless Toad	F	CF End			X	X				How00
HEMISIDAE												
	Hemisus marmoratus	Mottled Shovel-snouted Frog	O			X		X		X	Widespread	How00, She90, Bur00
HYPEROLIIDAE												
	Afrixalus brachycnemis	Golden Leaf-folding Frog	O			X		X			Widespread	How00, She90
	Afrixalus fornasinii	Fornasini's Leaf-folding Frog	O						X		Widespread	How00
	Hyperolius mitchelli	Mitchell's Reed Frog	F					X				How00, She90
	Hyperolius nasutus	Gunther's Sharp-nosed Reed Frog	O						X		Widespread	How00
	Hyperolius parkeri	Parker's Reed Frog	O						X		Widespread, coastal	How00
	Hyperolius tuberilinguis	Tinker Reed Frog	O					X			Widespread	How00, She90
	Kassina senegalensis	Bubbling Kassina	O						X		Widespread	How00
	Leptopelis argenteus		O					X			Widespread, E. Tanzania	How00, She90
	Leptopelis flavomaculatus	Yellow-spotted Tree Frog	F					X		X	Widespread, forest	How00, She90, Bur00

Classification	Species	Common name	Ecol. Status	End. Status	Cons. Status	Weme	Kichi Hills	Kiwengoma	Mchungu	Namakutwa	Dist / Notes	Reference
MICROHYLIDAE												
	Breviceps mossambicus	Mozambique Rain Frog	O			X	X	X		X	Widespread	How00, She90
PIPIDAE												
	Xenopus muelleri	Muller's Clawed Frog	O					X			Widespread	How00, She90
RANIDAE												
	Hildebrandtia ornata	Hildebrandt's Burrowing Frog									Widespread	How00
	Phrynobatrachus acridoides	East African Puddle Frog	O			X		X	X	X	Widespread	How00, Bur00
	Phrynobatrachus mababiensis	Common Puddle Frog	O			X				X	Widespread	How00, Bur00
	Ptychadena anchietae	Savanna Ridged Frog	O					X		X	Widespread	How00, Bur00
	Ptychadena mascareniensis	Mascarene Ridged Frog	O			X					Widespread	How00
	Rana angolensis	Dusky-throated Rana	O					X			Widespread	How00
RHACOPHORIDAE												
	Chiromantis xerampelina	Grey Foam-nest Tree Frog	O				X	X		X	Widespread	How00, She90
APODA											Probably occurs since known from mud at edge of Ngatana, Wami and Rufiji rivers.	
CAECILIIDAE												
	Schistometopum gregorii	Mud-dwelling Caecilian				?						How00

Table 2: Amphibian Species in Rufiji District

4 Reptiles

The summary of Reptile species recorded in Rufiji District was compiled from various sources, detailed below:

- Howell *et al,* 2000. A Preliminary Biodiversity (Fauna) Assessment of the Rufiji Floodplain and Delta. REMP Technical Report No. 9 (Howell, 2000)
- Burgess, N.D. and Clarke, G.P. (eds) 2000. The Coastal Forests of Eastern Africa, IUCN Conservation Programme, Gland, Switzerland and Cambridge, England. (Bur 00)
- Per. comm. REMP. Personal Observations by REMP Staff.

Habitat descriptions and Endemism are taken from Spawls, *et al*, 2002. Conservation Status is taken from Hilton-Taylor, 2000 and Howell *et al*, 2000.

In total, 87 species (from 25 families/subfamilies from 5 orders) are recorded. Of these, eight species are forest dependent, and thus are vulnerable to forest loss. Of these forest dependent species five species are also endemic to Coastal Forests or Tanzania. A further 60 species may use forest edges and other habitats including woodland and wooded grassland.

Twelve reptile species recorded show some level of endemism, five of which are endemic to Coastal Forests. Endemic reptile species are listed below:

Table 2: Endemic Reptile Species

Family/Subfamily	Species	Common Name	End. Status
COLUBRINAE	*Philothamnus macrops*	Usambara Green Snake	CF end
GEKKONIDAE	*Cnemaspis uzungwae*	Udzungwa Forest Gecko	CF End
LEPTOTYPHLOPIDAE	*Leptotyphlops macrops*	Large-eyed Worm Snake	CF end
SCINCIDAE: SCINCINAE	*Sepsina tetradactyla*	Four-toed Fossorial Skink	CF end
TYPHLOPIDAE	*Typhlops rondoensis*	Rondo Plateau Blind Snake	CF end
BOIGINI	*Crotaphopeltis tornieri*	Tornier's Cat Snake	N End
AMPHISBAENIDAE	*Loveridgea ionidesi*	Liwale Round-snouted Worm Lizard	Tz End
ATRACTASPIDIDAE	*Ambylodipsas katangensis*	Ionides' Purple-Glossed Snake	TZ End
ATRACTASPIDIDAE	*Aparallactus werneri*	Usambara Centipede-eater	Tz End
GEKKONIDAE	*Lygodactylus viscatus*	Copal Dwarf Gecko	TZ End
GEKKONIDAE	*L. broadleyi*	Broadley's Dwarf Gecko	TZ End
GEKKONIDAE	*L. luteopicturatus*	Yellow-headed Dwarf Gecko	Tz/K End

CF End – Coastal Forest Endemic, TZ End – Tanzania Endemic, N End – Near Endemic, Tz/K End – Tanzania / Kenya Endemic

One species, Green Turtle (*Chelonia mydas*), is listed as Endangered on the IUCN red data lists (Hilton-Taylor, 2000).

Four reptile species, Green Turtle (*Chelonia mydas*), Flap-necked Chameleon (*Chamaeleo dilepis*) Giant One-horned Chameleon (*Chamaeleo melleri*) and the Southern African Rock Python (*Python natalensis*) are protected under CITES, restricting trade in those species.

Table 3:Reptile Species recorded in Rufiji District

Order	Family /Subfamily	Species	Common Name	Ecol. Status	End. Status	Cons Status	Dist	WE	KH	SGR	MK	KG	TO	NK	Other sites	Reference
TESTUDINES																
	TESTUDINIDAE															
		Geochelone pardalis	Leopard Tortoise	**N**			Widespread								Ruhoi F	Per. comm. REMP
		Cycloderma frenatum	Zambezi Soft-shelled Turtle	**N**			Widespread								Lugongwe	Per. comm. REMP
		Pelusios sinuatus	Serrated Hinged Terrapin	**N**			Widespread								Lugongwe	Per. comm. REMP
	CHELONIIDAE															
		Chelonia mydas	Green Turtle	Tr W		EN CITES I									Rufiji Coastline	Per. comm. REMP
SAURIA (LIZARDS)																
	GEKKONIDAE															
		Cnemaspis uzungwae	Udzungwa Forest Gecko	F	CF End				X			X	X			Howell 2000
		Hemidactylus mabouia	Tropical House Gecko	O			Widespread				X			X		Howell 2000
		H. platycephalus	Tree Gecko	O			Widespread						X	X		Howell 2000
		Lygodactylus broadleyi	Broadley's Dwarf Gecko	O	TZ End						X					Howell 2000
		L. capensis grotei	Grote's Cape Dwarf Gecko	O						X		X				Howell 2000
		L. viscatus	Copal Dwarf Gecko	F	TZ End							X	X	X		Howell 2000
		L. luteopicturatus	Yellow-headed Dwarf Gecko	N	Tz/K End					X		X				Howell 2000
		Pachydactylus turneri	Turner's Thick-toed Gecko	O			Widespread			X						Howell 2000
	SCINCIDAE: LYGOSOMATINAE															
		Sepsina tetradactyla	Four-toed Fossorial Skink	O	CF end			X	X	X		X				Howell 2000
		Melanoseps loveridgei	Loveridge's Limbless Skink	F								X				Howell 2000
		Mabuya boulengeri	Boulenger's Skink	O			Widespread			X		X		X		Howell 2000
		Mabuya maculilabris	Speckle-lipped Skink	O			Widespread	X						X		Howell 2000

Table 4: Reptile Species In Rufiji District

Order	Family /Subfamily	Species	Common Name	Ecol. Status	End. Status	Cons Status	Dist	WE	KH	SGR	MK	KG	TO	NK	Other sites	Reference
		Mabuya megalura	Grass-top Skink/Long-tailed Skink	N			Widespread	X								Howell 2000
		Mabuya planifrons	Tree Skink	O			Widespread			X						Howell 2000
		Mabuya quinquetaeniata	Five-lined Skink	N			Widespread			X						Howell 2000
		Mabuya striata	Striped Skink	O			East Africa	X		X		X				Howell 2000
		Mabuya varia	Variable Skink	O			Widespread			X						Howell 2000
		Lygosoma afrum	Peter's Writhing Skink	O			Widespread			X				X		Howell 2000
		Panaspis wahlbergi	Wahlberg's Snake-eyed Skink	O			Widespread	X		X		X	X			Howell 2000
	LACERTIDAE															
		Gastropholis vittata	Striped Keel-bellied Lizard	O			East Africa			X						Howell 2000
		Holaspis guentheri	Blue-bellied Gliding Lizard	O			Widespread			X				X		Howell 2000
		Nucras boulengeri	Boulenger's Scrub Lizard	O						X						Howell 2000
		Ichnotropis squamulosa	Mozambique Rough-scaled Lizard	O			Widespread			X						Howell 2000
		Latastia johnstoni	Johnston's / Malawi Long-tailed Lizard	N			Widespread			X						Howell 2000
	CORDYLIDAE															
		Cordylus tropidosternum	Tropical Girdled Lizard	O			Widespread		X	X		X				Howell 2000
	GERRHOSAURIDAE															
		Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	O			Widespread									Howell 2000
		Gerrhosaurus major	Great Plated Lizard	O			Widespread		X	X						Howell 2000
		Gerrhosaurus nigrolineatus	Black-lined Plated Lizard	O			Widespread			X						Howell 2000

Table 4: Reptile Species In Rufiji District

Order	Family /Subfamily	Species	Common Name	Ecol. Status	End. Status	Cons Status	Dist	WE	KH	SGR	MK	KG	TO	NK	Other sites	Reference
	AGAMIDAE															
		Acanthocerus atricollis	Blue-headed Tree Agama	O			Widespread			X						Howell 2000
		Agama mossambica	Mozambique Agama	O			Widespread			X		X	X	X		Howell 2000
	CHAMAELEONIDAE															
		Chamaeleo dilepis	Flap-necked Chameleon	O		CITES II	Widespread		X	X		X		X		Howell 2000
		Chamaeleo melleri	Giant One-horned Chameleon	O		CITES II	Widespread			X		X				Howell 2000
		Rhampholeon brachyurus	Beardless Pygmy-Chameleon	F						X		X				Howell 2000
		Rhampholeon brevicaudatus	Bearded Pygmy-Chameleon / Short-tailed Pygmy-Chameleon	F								X	X			Howell 2000
	VARANIDAE															
		Varanus albigularis	White-throated Savanna Monitor-Lizard	O			Widespread			X						Howell 2000
		Varanus niloticus	Nile Monitor Lizard	O			Widespread			X						Howell 2000
AMPHISBAENIA (WORM LIZARDS)																
	AMPHISBAENIDAE															
		Loveridgea ionidesi	Liwale Round-snouted Worm Lizard	O	Tz End					X				X		Howell 2000
CROCODYLIA																
	CROCODYLIDAE															
		Crocodylus niloticus	Nile Crocodile	N			Widespread									Per. comm. REMP

Table 4: Reptile Species In Rufiji District

Order	Family /Subfamily	Species	Common Name	Ecol. Status	End. Status	Cons Status	Dist	WE	KH	SGR	MK	KG	TO	NK	Other sites	Reference
SERPENTES (SNAKES)																
	TYPHLOPIDAE															
		Typhlops rondoensis	Rondo Plateau Blind Snake	O	CF end					X						Howell 2000
		Rhinotyphlops schlegelii						-				X				Howell 2000
	LEPTOTYPHLOPIDAE															
		Leptotyphlops scutifrons	Peter's Worm Snake	O			Widespread					X				Howell 2000
		Leptotyphlops macrops	Large-eyed Worm Snake	O	CF end						X					Howell 2000
		Leptotyphlops longicaudus	Long-tailed Worm Snake	O			Widespread			X						Howell 2000
	BOIDAE															
		Python natalensis	Southern African Rock Python	O		CITES II	Widespread			X						Howell 2000
	LAMPROPHIINAE															
		Lamprophis fuliginosus	Brown House Snake	O			Widespread			X		X	X			Howell 2000
		Lycophidion capense	Cape Wolf Snake	N			Widespread			X		X				Howell 2000
		Mehelya capensis	Cape File Snake	O			Widespread			X						Howell 2000
		Mehelya nyassae	Dwarf File Snake	O			Widespread			X						Howell 2000
	COLUBRIDAE															
		Meizodon semiornatus	Semi-ornate Snake	O			Widespread			X						Howell 2000
		Prosymna stuhlmanni	East African Shovel-Snout Snake	N			Widespread			X						Howell 2000
		Philothamnus hoplogaster	South-Eastern Green Snake	O			Widespread			X		X	X			Howell 2000
		Philothamnus macrops	Usambara Green Snake	F	CF end							X				Howell 2000
		Philothamnus punctatus	Speckled Green Snake	O			Widespread									Howell 2000

Table 4: Reptile Species In Rufiji District

Order	Family /Subfamily /Tribe	Species	Common Name	Ecol. Status	End. Status	Cons Status	Dist	WE	KH	SGR	MK	KG	TO	NK	Other sites	Reference
SERPENTES (SNAKES) cont.																
	COLUBRIDAE cont.															
		Telescopus semiannulatus	Tiger Snake	O			Widespread			X						Howell 2000
		Crotaphopeltis hotomboeia	White-lipped Snake	O			Widespread	X		X		X				Howell 2000
		Crotaphopeltis tornieri	Tornier's Cat Snake	F	N End							X				Howell 2000
		Dipsadoboa flavida broadleyi	Cross-barred Tree Snake	O			Widespread			X						Howell 2000
	DISPHOLIDINI															
		Dispholidus typus	Boomslang	O			Widespread			X						Howell 2000
		Thelotornis capensis	Savanna Vine/Twig Snake	O			Widespread			X		X	X	X		Howell 2000
	PSAMMOPHIINAE															
		Hemirhagerrhis nototaenia	Bark Snake	N			Widespread			X	X					Howell 2000
		Psammophis angolensis	Dwarf Sand Snake	N			Widespread			X						Howell 2000
		Psammophis phillipsii syn. *P., mossambicus*	Olive Sand Snake							X				X		Howell 2000
		Psammophis subtaeniatus syn. *P. sudanensis*	Northern Stripe-bellied Sand Snake							X		X	X			Howell 2000
		Psammophylax tritaeniatus	Southern Striped Skaapsteker	N			Widespread			X						Howell 2000
		Rhamphiophis rostratus	Rufous Beaked Snake	O			Widespread			X						Howell 2000
	NATRICINAE															
		Natriciteres olivacea	Olive Marsh Snake	O			Widespread			X		X	X			Howell 2000
	DASYPELTINI															
		Dasypeltis medici	Rufous Egg-eater /East African Egg-eater	O			Widespread			X						Howell 2000
		Dasypeltis scabra	Common /Rhombic Egg-eater	O			Widespread			X						Howell 2000

Table 4: Reptile Species In Rufiji District

Order	Family /Subfamily	Species	Common Name	Ecol. Status	End. Status	Cons Status	Dist	WE	KH	SGR	MK	KG	TO	NK	Other sites	Reference
	ATRACTASPIDIDAE															
		Aparallactus capensis	Cape Centipede-eater	O			Widespread			X						Howell 2000
		Aparallactus guentheri	Black Centipede-eater	O			Widespread			X						Howell 2000
		Aparallactus werneri	Usambara Centipede-eater	F	Tz End					X		X				Howell 2000
		Chilorhinophis butleri	Butler's Black and Yellow Burrowing Snake	N			Widespread			X						Howell 2000
		Ambylodipsas katangensis	Ionides' Purple-Glossed Snake	O	TZ End					X						Howell 2000
		Atractaspis bibronii	Bibron's Burrowing Asp	O			Widespread			X		X		X		Howell 2000
	ELAPIDAE															
		Elapsoidea semiannulata	?							X						Howell 2000
		Naja melanoleuca	Forest Cobra	O			Widespread			X		X				Howell 2000
		Naja mossambica	Mozambique Spitting Cobra	O			Widespread						X	X		Howell 2000
		Naja nigricollis	Black-necked Spitting Cobra	O			Widespread			X						Howell 2000
		Dendroaspis angusticeps	Green Mamba	O			Widespread			X						Howell 2000,Per. comm. REMP
		Dendroaspis polylepis	Black Mamba	O			Widespread			X						Howell 2000
	VIPERIDAE															
		Causus defilippii	Snouted Night Adder	O			Widespread		X	X			X			Howell 2000
		Bitis arietans	Puff Adder	O			Widespread			X				X		Howell 2000
		Bitis gabonica	Gaboon Viper	O			Widespread		X					X		Howell 2000

CF End – Coastal Forest Endemic, TZ End – Tanzania Endemic, N End – Near Endemic, Tz/K End – Tanzania / Kenya Endemic
F – Forest Dependent, O - Other habitats (may use forest edge, woodlands and wooded grasslands), N - Non-forest
CR – Critical y Endangered, EN - Endangered, VU – Vulnerable, LR/cd – Lower Risk Conservation Dependent, LR/nt – Lower Risk Near Threatened, DD – Data Deficient

Table 4: Reptile Species In Rufiji District

5 Birds

A summary of bird species recorded in Rufiji District was compiled from several data sources, detailed below:

Data source	Notation
Hamerlynck 2003 Update of list by Hamerlynck	Ham03
Baker 2003 – Update from Tanzanian Bird Atlas 2003	Bak 03
Burgess et al 2000	Bur00
Baker 1998	Bak98
Hillman 1998	Hil98
Waters et al 1994	Wat94
Burgess et al 1991	Bur91
Haldane 1946	Hal46
Boswell et al. 2002 (Ngumburuni Forest)	Bos02
Mbilinyi et al. 2002 (Kichi Hills Forest)	Mbi02

Table 6: overleaf lists the bird species recorded in Rufiji District.

In Haldane (1946) a distinction has to be made between his A list, i.e. birds observed by himself between August 1943 and September 1944 and his B list which derives from 'the District book' with notes of Mrs. Barker and Hall. This B list contains many of the rather unlikely observations such as Egyptian Vulture, Buff-spotted flufftail, Baillon's Crake, Purple Swamphen, African finfoot, Wattled Lapwing, Marsh Owl, Verreaux's Eagle Owl, Mottled Swift, White-necked Raven, etc. It is hard to evaluate the ornithological knowledge of these two observers, nor do we know which field guides and optical equipment they may have been using. Though some of their observations could be accurate they may concern birds observed outside of the Rufiji District boundaries. Therefore, only those species with confirmed subsequent observations have been retained. In contrast, Haldane's A list contains only few mysterious observations, such as Blue-spotted Wood Dove, Kitlitz's Plover and Plain-backed Pipit, that have not been recorded subsequently and were therefore removed.

The main source is the Tanzania Bird Atlas database, which includes the observations of a multitude of observers but is also functions as a clearing house, e.g. all observations in Rufiji of Short-toed Eagle *Circaetus gallicus,* a rare palaearctic migrant to Kenya are changed by Neil and Liz Baker into Black-chested Snake Eagle *Circaetus pectoralis* as the immature of both species are indistinguishable except to the most experienced of observers. Another advantage of the Bird Atlas is that individual observers, whose experience is known, can be identified and therefore the reliability of the observations assessed. For example, most of the observations in square 3808B were done by Neil Stronach, who resided in Kingupira and is a meticulous ornithologist. Other, unique and apparently out of range observations such as Ovambo sparrowhawk and Speckled Pigeon, were done by Liz Baker who knows her birds.

There still remain doubts on species such as the Grey Kestrel observed in Mtanza Msona. Though easy to confuse with the more commonly observed Dickinson's Kestrel this particular bird was observed for a long time in excellent light and from all angles (including the diagnostic tail), as it was circling around the Msona school. It is therefore allowed on the list and ornithologists visiting the District are requested to pay particular attention to greyish kestrel like birds. Another controversial issue are the Burchell's and White-browed Coucal. Before the existence of the Stevenson and Fanshawe (2002) field guide many people were using Zimmerman et al. (1996) which does not include Burchell's. To further complicate matters the juveniles of both species are indistinguishable and therefore many of the 'white-browed' birds seen in the field may actually be Burchell's. Provisionally both species were kept in the list.

REMP contributed both through observations by its staff and a systematic bird count in the Delta (Nasirwa et al. 2000) and two mist netting surveys in the Kichi Hills Forest (Mbilinyi et al 2002) and the Ngumburuni Forest (Boswell et al. 2003).

A total of 431 species from 79 families have been recorded in Rufiji District. Of these, nine species are listed on the IUCN Red Data lists, five as 'Vulnerable' (VU) and four as Lower risk/ near threatened (LR/nt).

Vulnerable species include:

Madagascar Squacco Heron	*Ardeola idea*
Lappet-faced Vulture	*Torgos tracheliotus*
Imperial Eagle	*Aquila heliaca*
Corncrake	*Crex crex*
East Coast Akalat	*Sheppardia gunningi*

Lower Risk / near threatened species include:

Lesser Flamingo	*Phoeniconaias minor*
Southern Banded Snake Eagle	*Circaetus fasciolatus*
Great Snipe	*Gallinago media*
African Skimmer	*Rynchops flavirostris*

25 of the species are forest dependent, a further 231 species may be found in forest edges but also use other habitats such as woodland and wooded grasslands. 172 species are Non-forest species, many of these are wetland species utilising lakes, rivers, mudflats, sandbars and coastline.

Special mention should be made of the record of the puguensis race of the Pale-breasted Illadopsis *Illadopsis rufipennis* in Ngumburuni forest. This race is likely to become a full species when genetic analysis of this complex group with a patchy distribution and long isolation gets underway, In that case the species would most likely immediately be upgraded to threatened status. Previously it had only been recorded in the Pugu and Kazimzumbwi Forests. The latter has already almost entirely been converted to charcoal in spite of efforts by a variety of individuals and organisations.

Table 6: Bird species recorded in Rufiji District

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
PODICIPEDIDAE – GREBES																
Tachybaptus ruficollis	Little Grebe	N			X								X			**2**
PHALACROCORACIDAE – CORMORANTS																
Phalacrocorax carbo	Great Cormorant	N					X						X			**2**
Phalacrocorax africanus	Long-tailed Cormorant	N					X	X		X			X			**4**
ANHINGIDAE - DARTERS																
Anhinga rufa	African Darter	N						X	X	X			X			**4**
PELECANIDAE – PELICANS																
Pelecanus onocrotalus	Great White Pelican	N									X		X			**2**
Pelecanus rufescens	Pink-backed Pelican	N					X		X				X			**3**
ARDEIDAE - BITTERNS, EGRETS and HERONS																
Ixobrychus minutus	Little Bittern	N			X											**1**
Ixobrychus sturmii	Dwarf Bittern	N														
Nycticorax nycticorax	Black-crowned Night Heron	N					X	X		X			X	X		**5**
Gorsachius leuconotus	White-backed Night Heron															**0**
Ardeola ralloides	Common Squacco Heron	N					X	X		X	X		X	X		**6**
Ardeola idae	Madagascar Squacco Heron	N	VU		X											**1**
Bubulcus ibis	Cattle Egret	N					X			X						**2**
Butorides striatus	Green-backed Heron	N					X		X	X			X			**4**
Egretta ardesiaca	Black Heron	N					X						X			**2**
Egretta (g.) dimorpha	Dimorphic Egret	N					X									**1**
Egretta garzetta	Little Egret	N					X		X	X	X		X			**5**
Egretta alba	Great Egret	N					X	X	X	X			X			**5**
Egretta intermedia	Yellow-billed Egret	N					X	X	X				X			**4**
Ardea purpurea	Purple Heron	N							X	X			X			**3**
Ardea cinerea	Grey Heron	N					X		X	X			X	X		**5**
Ardea melanocephala	Black-headed Heron	N							X				X			**2**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Ardea goliath	Goliath Heron	N					X		X				X			**3**
SCOPIDAE – HAMERKOP																
Scopus umbretta	Hamerkop	N					X	X	X	X	X		X	X		**7**
CICONIIDAE - STORKS																
Mycteria ibis	Yellow-billed Stork	N					X		X	X			X	X		**5**
Anastomus lamelligerus	African Open-billed Stork	N					X	X	X	X			X			**5**
Ciconia abdimii	Abdim's Stork	N			X											**1**
Ciconia episcopus	Woolly-necked Stork	N					X		X		X		X			**4**
Ciconia ciconia	White Stork	N							X							**1**
Ephippiorhynchus senegalensis	Saddle-billed Stork	N											X			**1**
Leptoptilos crumeniferus	Marabou Stork	N									X		X	X		**3**
THRESKIORNITHIDAE - IBIS and SPOONBILLS																
Threskiornis aethiopicus	Sacred Ibis	N					X				X		X			**3**
Bostrychia hagedash	Hadada Ibis	O					X	X	X	X	X			X		**6**
Platalea alba	African Spoonbill	N					X		X				X			**3**
PHOENICOPTERIDAE - FLAMINGOS																**0**
Phoenicopterus ruber roseus	Greater Flamingo	N					X									**1**
Phoeniconaias minor	Lesser Flamingo	N	LR/nt				X									**1**
ANATIDAE - DUCKS and GEESE																
Dendrocygna bicolor	Fulvous Whistling Duck	O						X								**1**
Dendrocygna viduata	White-faced Whistling Duck	N					X	X	X	X			X			**5**
ANATIDAE - DUCKS and GEESE cont.																
Alopochen aegyptiacus	Egyptian Goose	N						X		X			X			**3**
Plectopterus gambensis	Spur-winged Goose	N		X									X			**2**
Sarkidiornis melanotos	Knob-billed Duck	N											X			**1**
Nettapus auritus	African Pygmy Goose	N						X								**1**
Anas erythrorhyncha	Red-billed Teal	N		X												**1**
ACCIPITRIDAE - VULTURES, EAGLES, KITES, HAWKS etc																

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Aviceda cuculoides	African Cuckoo Hawk	O			X				X							**2**
Pernis apivorus	Eurasian Honey Buzzard	O							X							**1**
Macheiramphus alcinus	Bat Hawk	O									X					**1**
ACCIPITRIDAE - VULTURES, EAGLES, KITES, HAWKS cont.																
Elanus caeruleus	Black-shouldered Kite	O					X	X	X				X			**4**
Milvus migrans	Black Kite	O					X			X	X		X	X		**5**
Haliaeetus vocifer	African Fish Eagle	N					X		X	X	X		X	X		**6**
Gypohierax angolensis	Palm-nut Vulture	O					X		X	X			X	X		**5**
Necrosyrtes monachus	Hooded Vulture	O					X		X					X		**3**
Gyps africanus	African White-backed Vulture	N					X		X				X	X		**4**
Gyps rueppellii	Rüppell's Griffon Vulture	N							X							**1**
Torgos tracheliotus	Lappet-faced Vulture	N	VU						X							**1**
Trigonoceps occipitalis	White-headed Vulture	N								X			X		X	**3**
Circaetus pectoralis	Black-chested Snake Eagle	N					X			X			X			**3**
Circaetus cinereus	Brown Snake Eagle	N					X			X	X		X	X		**5**
Circaetus fasciolatus	Southern Banded Snake Eagle	O	LR/nt			X						X	X	X		**4**
Terathopius ecaudatus	Bateleur	N					X		X	X	X		X	X		**6**
Polyboroides typus	African Harrier-Hawk/ Gymnogene	O					X				X		X	X	X	**5**
Circus aeruginosus	Eurasian Marsh Harrier	N					X	X	X					X		**4**
Circus ranivorus	African Marsh Harrier	O		X												**1**
Circus macrourus	Pallid Harrier	N			X											**1**
Circus pygargus	Montagu's Harrier	N			X											**1**
Melierax metabates	Dark Chanting Goshawk	O					X		X	X			X			**4**
Melierax poliopterus	Eastern / Pale Chanting Goshawk	N			X											**1**
Micronisus gabar	Gabar Goshawk	N											X			**1**
Accipiter melanoleucus	Great Sparrowhawk	O											X		X	**2**
Accipiter ovampensis	Ovambo Sparrowhawk	O			X											**1**
Accipiter minullus	Little Sparrowhawk	O									X			X	X	**3**
Accipiter tachiro	African Goshawk	O				X					X	X	X	X	X	**6**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Accipiter badius	Shikra	O											X			**1**
Kaupifalco monogrammicus	Lizard Buzzard	O							X	X			X			**3**
Buteo buteo	Common Buzzard	O							X							**1**
Aquila wahlbergi	Wahlberg's Eagle	N					X		X	X			X			**4**
ACCIPITRIDAE - VULTURES, EAGLES, KITES, HAWKS cont.																
Aquila pomarina	Lesser Spotted Eagle	O			X											**1**
Aquila rapax	Tawny Eagle	N											X			**1**
Aquila nipalensis	Steppe Eagle	N					X									**1**
Aquila heliaca	Imperial Eagle	?	VU		X											**1**
Hieraaetus spilogaster	African Hawk Eagle	O			X											**1**
Hieraaetus pennatus	Booted Eagle	O							X							**1**
Hieraaetus ayresii	Ayres' Hawk Eagle	O												X		**1**
Lophaetus occipitalis	Long-crested Eagle	O					X						X			**2**
Stephanoaetus coronatus	African Crowned Eagle	F				X					X	X		X	X	**5**
Polemaetus bellicosus	Martial Eagle	N							X							**1**
Pandion haliaetus	Osprey	N					X							X		**2**
FALCONIDAE – FALCONS																
Falco ardosiaceus	Grey Kestrel	O			X											**1**
Falco dickinsoni	Dickinson's Kestrel	N								X	X					**2**
Falco amurensis	Amur Falcon	N							X							**1**
Falco chicquera	Red-necked Falcon	N							X				X			**2**
Falco subbuteo	Eurasian Hobby	N						X								**1**
Falco cuvierii	African Hobby	O												X		**1**
Falco eleonorae	Eleonora's Falcon	N								X						**1**
Falco concolor	Sooty Falcon	N					X									**1**
Falco biarmicus	Lanner Falcon	N								X						**1**
Falco peregrinus	Peregrine Falcon	N											X			**1**
PHASIANIDAE - FRANCOLINS and QUAILS																
Francolinus coqui	Coqui Francolin	O							X							**1**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Francolinus sephaena	Crested Francolin	O							X	X	X			X		**4**
Francolinus afer	Red-necked Spurfowl	O							X	X			X			**3**
Coturnix delegorguei	Harlequin Quail	N											X			**1**
Coturnix adansonii	Blue Quail	N			X											**1**
NUMIDIDAE - GUINEAFOWLS																
Guttera pucherani	Crested Guineafowl	O				X			X		X	X			X	**5**
Numida meleagris	Helmeted Guineafowl	N					X		X	X				X		**4**
TURNICIDAE - BUTTONQUAILS																
Turnix sylvatica	Button Quail	N			X											**1**
RALLIDAE - RAILS and CRAKES																
Crex crex	Corncrake	N	VU		X								X			**2**
Crex egregia	African Crake	N			X											**1**
Amaurornis flavirostra	Black Crake	N								X	X			X		**3**
Porphyrio porphyrio	Purple Swamphen	N									X		X			**2**
Gallinula chloropus	Lesser Moorhen	N			X											**1**
OTIDIDAE - BUSTARDS																
Eupodotis melanogaster	Black-bellied Bustard	O											X	X		**2**
JACANIDAE - JACANAS																
Actophilornis africanus	African Jacana	N						X	X	X	X		X			**5**
Microparra capensis	Lesser Jacana	N							X				X			**2**
ROSTRATULIDAE - PAINTED SNIPES																
Rostratula benghalensis	Greater Painted Snipe	N							X							**1**
HAEMATOPODIDAE - OYSTERCATCHERS																
Haematopus ostralegus	Eurasian Oystercatcher	N					X		X							**2**
RECURVIROSTRIDAE - STILTS and AVOCETS																
Himantopus himantopus	Black-winged Stilt	N			X				X							**2**
DROMADIDAE - CRAB PLOVER																

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Dromas ardeola	Crab-plover	N							X							**1**
BURHINIDAE - STONE CURLEWS																
Burhinus vermiculatus	Water Thick-knee	N			X		X	X	X				X			**5**
Burhinus capensis	Spotted Thick-knee	O			X								X			**2**
GLAREOLIDAE - COURSERS and PRATINCOLES																
Rhinoptilus chalcopter	Violet-tipped Courser	O			X											**1**
Cursorius temminckii	Temminck's Courser	O			X											**1**
GLAREOLIDAE - COURSERS and PRATINCOLES cont.																
Glareola pratincola	Collared Pratincole	N			X		X	X	X							**4**
Glareola ocularis	Madagascar Pratincole	N			X											**1**
CHARADRIIDAE - PLOVERS																
Charadrius hiaticula	Ringed Plover	N					X	X	X							**3**
Charadrius tricollaris	Three-banded Plover	N					X						X			**2**
Charadrius marginatus	White-fronted Plover	N					X		X				X			**3**
Charadrius mongolus	Lesser Sandplover	N			X		X		X							**3**
Charadrius leschenaultii	Greater Sandplover	N					X		X							**2**
Pluvialis squatarola	Grey Plover	N					X		X							**2**
Vanellus albiceps	White-crowned Plover	N					X	X					X			**3**
Vanellus spinosus	Spur-winged Plover	N			X											**1**
Vanellus lugubris	Senegal Plover	N											X			**1**
Vanellus coronatus	Crowned Plover	N			X											**1**
Vanellus crassirostris	Long-toed Plover	N											X			**1**
SCOLOPACIDAE - SNIPES, GODWITS, SANDPIPERS etc																
Gallinago gallinago	Common Snipe	N			X											**1**
Gallinago media	Great Snipe	N	LR/nt		X											**1**
Numenius phaeopus	Whimbrel	N					X									**1**
Numenius arquata	Curlew	N					X		X				X			**3**
Tringa stagnatilis	Marsh Sandpiper	N					X		X				X			**3**
Tringa nebularia	Greenshank	N					X		X				X			**3**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Tringa ochropus	Green Sandpiper	N							X				X			**2**
Tringa glareola	Wood Sandpiper	N							X							**1**
Xenus cinereus	Terek Sandpiper	N					X		X							**2**
Actitis hypoleucos	Common Sandpiper	N					X	X	X				X			**4**
Arenaria interpres	Ruddy Turnstone	N			X		X	X	X	X						**5**
Calidris alba	Sanderling	N					X		X							**2**
Calidris minuta	Little Stint	N					X	X	X				X			**4**
Calidris ferruginea	Curlew Sandpiper	N					X		X							**2**
SCOLOPACIDAE - SNIPES, GODWITS, SANDPIPERS cont.																
Philomachus pugnax	Ruff	N					X									**1**
LARIDAE - GULLS																
Larus fuscus	Lesser Black-backed Gull	N					X		X							**2**
Larus heuglini	Heuglin's Gull	N							X							**1**
Larus ridibundus	Black-headed Gull	N					X									**1**
Larus dominicanus	Kelp Gull	N		X												**1**
STERNIDAE - TERNS																
Gelochelidon nilotica	Gull-billed Tern	N					X		X							**2**
Sterna caspia	Caspian Tern	N					X	X	X							**3**
Sterna bergii	Greater Crested Tern	N			X		X		X							**3**
Sterna bengalensis	Lesser Crested Tern	N					X		X							**2**
Sterna hirundo	Common Tern	N					X		X							**2**
Sterna albifrons	Little Tern	N			X											**1**
Sterna (a.) saundersi	Saunder's Tern	N					X	X	X							**3**
Chlidonias hybridus	Whiskered Tern	N					X									**1**
Chlidonias leucopterus	White-winged Tern	N			X											**1**
RYNCHOPIDAE - SKIMMERS																
Rynchops flavirostris	African Skimmer	N	LR/nt					X	X	X			X			**4**
COLUMBIDAE - PIGEONS and DOVES																
Columba guinea	Speckled Pigeon	O							X							**1**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Streptopelia senegalensis	Laughing Dove	N					X		X							**2**
Streptopelia capicola	Ring-necked Dove	O					X		X	X	X		X		X	**6**
Streptopelia semitorquata	Red-eyed Dove	O					X		X	X	X		X	X	X	**7**
Turtur chalcospilos	Emerald-spotted Wood Dove	O					X		X	X	X			X		**5**
Turtur tympanistria	Tambourine Dove	O				X	X				X	X	X	X	X	**7**
Oena capensis	Namaqua Dove	N					X			X			X			**3**
Treron calva	African Green Pigeon	O				X	X		X	X	X		X	X		**7**
PSITTACIDAE - PARROTS																
Poicephalus robustus	Brown-necked Parrot	O							X						X	**2**
Poicephalus cryptoxanthus	Brown-headed Parrot	O				X	X				X	X	X			**5**
Agapornis lilianae	Lillian's Lovebird	O			X								X			**2**
MUSOPHAGIDAE - TURACOS and GO-AWAY BIRDS																
Tauraco livingstonii	Livingstone's Turaco	F				X					X	X	X	X	X	**6**
Tauraco porphyreolophus	Purple-crested Turaco	O			X				X	X			X			**4**
Corythaixoides concolor	Grey Go-away-bird	O											X			**1**
CUCULIDAE - CUCKOOS																
Clamator glandarius	Great Spotted Cuckoo	O											X			**1**
Oxylophus jacobinus	Jacobin Cuckoo / Black & white Cuckoo	O								X			X			**2**
Oxylophus levaillantii	Levaillant's Cuckoo	O			X								X			**2**
Cuculus solitarius	Red-chested Cuckoo	O					X			X				X		**3**
Cuculus clamosus	Black Cuckoo	O							X	X						**2**
Cuculus canorus	Eurasian Cuckoo	O											X			**1**
Cuculus gularis	African Cuckoo	O			X											**1**
Cercococcyx montanus	Barred Long-tailed Cuckoo	F				X						X				**2**
Chrysococcyx cupreus	African Emerald Cuckoo	O							X	X				X	X	**4**
Chrysococcyx klaas	Klaas's Cuckoo	O					X		X				X	X		**4**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Chrysococcyx caprius	Diederik Cuckoo	O					X		X	X						**3**
CENTROPODIDAE - COUCALS																
Ceuthmochares aereus	Yellowbill	F				X					X		X		X	**4**
Centropus grillii	Black Coucal	N			X											**1**
Centropus superciliosus	White-browed Coucal	O							X	X	X		X		X	**5**
Centropus burchellii	Burchell's Coucal	O												X		**1**
TYTONIDAE - BARN OWLS																
Tyto alba	Barn Owl	N								X			X			**2**
STRIGIDAE – OWLS																
Otus senegalensis	African Scops Owl	O														**0**
Bubo africanus	Spotted Eagle-Owl	O								X						**1**
STRIGIDAE – OWLS cont.																
Scotopelia peli	Pel's Fishing Owl	O											X			**1**
Strix woodfordii	African Wood Owl	O				X				X	X	X		X		**5**
Glaucidium perlatum	Pearl-spotted Owlet	O			X											**1**
Glaucidium capense	African Barred Owlet	O			X											**1**
CAPRIMULGIDAE - NIGHTJARS																
Caprimulgus europaeus	Eurasian Nightjar	N			X											**1**
Caprimulqus pectoralis	Fiery-necked Nightjar	O				X					X				X	**3**
Caprimulqus fossii	Gabon Nightjar	O			X				X				X	X		**4**
APODIDAE - SWIFTS																
Telacanthura ussheri	Mottle-throated Spinetail	O													X	**1**
Neafrapus boehmi	Böhm's Spinetail	O				X			X					X	X	**4**
Cypsiurus parvus	African Palm Swift	N					X		X		X		X	X	X	**6**
Apus apus	Eurasian Swift	N							X				X	X		**3**
Apus affinis	Little Swift	N					X		X	X				X	X	**5**
Apus horus	Horus Swift	N							X				X			**2**
Apus caffer	White-rumped Swift	N							X							**1**
COLIIDAE – MOUSEBIRDS																

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Colius striatus	Speckled Mousebird	O					X		X		X		X			**4**
Urocolius macrourus	Blue-naped Mousebird	O							X		X					**2**
TROGONIDAE - TROGONS																
Apaloderma narina	Narina's Trogon	O				X			X		X	X		X		**5**
ALCEDINIDAE – KINGFISHERS																
Corythornis cristata	Malachite Kingfisher	O					X		X	X			X	X		**5**
Ceyx picta	African Pygmy Kingfisher	O					X		X		X	X		X	X	**6**
Halcyon albiventris	Brown-hooded Kingfisher	O					X		X	X	X		X	X		**6**
Halcyon leucocephala	Grey-headed / Chestnut Bellied Kingfisher	N			X		X		X							**3**
Halcyon senegalensis	Woodland Kingfisher	O							X		X					**2**
Halcyon senegaloides	Mangrove Kingfisher	O					X		X		X					**3**
Halcyon chelicuti	Striped Kingfisher	O					X		X					X		**3**
ALCEDINIDAE – KINGFISHERS cont.																
Megaceryle maxima	Giant Kingfisher	O							X	X			X			**3**
Ceryle rudis	Pied Kingfisher	N					X		X	X	X		X	X		**6**
MEROPIDAE - BEE-EATERS																
Merops pusillus	Little Bee-eater	O					X		X	X	X		X	X	X	**7**
Merops hirundineus	Swallow-tailed Bee-eater	O											X	X		**2**
Merops bullockoides	White-fronted Bee-eater	O					X		X	X						**3**
Merops albicollis	White-throated Bee-eater	N					X						X		X	**3**
Merops boehmi	Böhm's Bee-eater	F											X	X	X	**3**
Merops superciliosus	Madagascar Bee-eater	N							X				X		X	**3**
Merops persicus	Blue-cheeked Bee-eater	N					X		X				X			**3**
Merops apiaster	Eurasian Bee-eater	O							X				X			**2**
Merops nubicus	Carmine Bee-eater	O					X		X	X			X			**4**
CORACIIDAE - ROLLERS																
Coracias garrulus	Eurasian Roller	O											X			**1**
Coracias caudata	Lilac-breasted Roller	O					X		X		X		X	X		**5**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Coracias spatulata	Racket-tailed Roller	O											X			**1**
Eurystomus glaucurus	Broad-billed Roller	O					X		X	X				X		**4**
PHOENICULIDAE - WOOD HOOPES																
Phoeniculus purpureus	Green Wood-hoopoe	O					X		X	X			X	X	X	**6**
Rhinopomastus cyanomelas	Common Scimitarbill	O							X	X	X		X			**4**
UPUPIDAE - HOOPOES																
Upupa epops	Hoopoe	O											X			**1**
BUCEROTIDAE - HORNBILLS																
Tockus erythrorhynchus	Red-billed Hornbill	N							X							**1**
Tockus deckeni	Von der Decken's Hornbill	O			X											**1**
Tockus alboterminatus	Crowned Hornbill	O					X		X	X	X		X	X	X	**7**
Tockus pallidirostris	Pale-billed Hornbill	O							X							**1**
Tockus nasutus	African Grey Hornbill	O			X		X		X	X			X			**5**
Bycanistes bucinator	Trumpeter Hornbill	O				X		X	X	X	X	X		X	X	**8**
BUCEROTIDAE - HORNBILLS cont.																
Bucorvus cafer	Southern Ground Hornbill	O							X	X				X		**3**
LYBIIDAE - BARBETS and TINKERBIRDS																
Stactolaema leucotis	White-eared Barbet	O				X						X				**2**
Pogoniulus simplex	Eastern Green Tinkerbird	F				X					X					**2**
Pogoniulus bilineatus	Yellow-rumped Tinkerbird	O				X	X				X	X		X	X	**6**
Tricholaema lacrymosa	Spot-flanked Barbet	O		X												**1**
Lybius torquatus	Black-collared Barbet	O											X	X		**2**
Lybius melanopterus	Brown-breasted Barbet	O					X		X	X	X					**4**
Trachyphonus vaillanti	Crested Barbet	O			X											**1**
Trachphorus erythrocephalus	Red & Yellow Barbet	N		X												**1**
INDICATORIDAE - HONEYGUIDES																
Indicator variegatus	Scaly-throated Honeyguide	O									X				X	**2**
Indicator indicator	Greater Honeyguide	O					X						X	X	X	**4**
Indicator minor	Lesser Honeyguide	O								X	X					**2**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Indicator meliphilus	Pallid Honeyguide	O		X												**1**
PICIDAE - WOODPECKERS																
Campethera nubica	Nubian Woodpecker	O		X												**1**
Campethera abingoni	Golden-tailed Woodpecker	O				X	X		X	X		X	X		X	**7**
Campethera cailliautii	Little Spotted / Green-backed Woodpecker	O					X		X		X	X	X	X	X	**7**
Denropicos fuscescens	Cardinal Woodpecker	O					X						X	X		**3**
Thripias namaquus	Bearded Woodpecker	O							X				X	X		**3**
EURYLAIMIDAE - BROADBILLS																
Smithornis capensis	African Broadbill	F				X			X		X	X		X	X	**6**
PITTIDAE - PITTAS																
Pitta angolensis	African Pitta	F				X			X			X		X		**4**
ALAUDIDAE - LARKS																
Mirafra rufocinnamomea	Flappet Lark	O								X			X	X		**3**
Pinarocorys nigricans	Dusky Bush Lark	O		X												**1**
Eremopterix leucopareia	Fischer's Sparrow Lark	N		X												**1**
HIRUNDINIDAE - SWALLOWS and MARTINS																
Psalidoprocne holomelas	Black Roughwing	O					X					X			X	**3**
Riparia riparia	Sand Martin	N		X												**1**
Riparia paludicola	African Sand Martin	O			X				X				X			**3**
Hirundo griseopyga	Grey-rumped Swallow	N		X												**1**
Hirundo senegalensis	Mosque Swallow	O							X	X			X			**3**
Hirundo abyssinica	Lesser Striped Swallow	O			X		X		X	X			X			**5**
Hirundo fuligula	African Rock Martin	O		X												**1**
Hirundo smithii	Wire-tailed Swallow	N					X		X	X			X			**4**
Hirundo rustica	Barn Swallow	O					X			X			X	X		**4**
Delichon urbica	House Martin	N		X												**1**
MOTACILLIDAE - WAGTAILS, PIPITS, LONGCLAWS																
Motacilla flava	Yellow Wagtail	O							X							**1**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Motacilla aguimp	African Pied Wagtail	O					X		X	X			X			**4**
Anthus cinnamomeus	Grassland Pipit	N			X		X		X							**3**
Macronyx croceus	Yellow-throated Longclaw	N							X					X		**2**
CAMPEPHAGIDAE - CUCKOO SHRIKES																
Campephaga flava	Black Cuckoo-shrike	O								X	X		X		X	**4**
Coracina pectoralis	White-breasted Cuckoo-shrike	O											X			**1**
PYCNONOTIDAE – GREENBULS																
Andropadus virens	Little Greenbul	O				X					X			X		**3**
Andropadus importunus	Zanzibar Sombre Greenbul	O					X		X	X	X		X	X	X	**7**
Chlorocichla flaviventris	Yellow-bellied Greenbul	O				X			X		X	X		X	X	**6**
Phyllastrephus terrestris	Terrestrial Brownbul	F					X								X	**2**
Phyllastrephus cerviniventris	Grey-olive Greenbul	F			X											**1**
Phyllastrephus fischeri	Fischer's Greenbul	F				X			X		X	X		X	X	**6**
Phyllastrephus flavostriatus	Yellow-streaked Greenbul	F				X			X			X		X	X	**5**
Phyllastrephus debilis	Tiny Greenbul	F				X			X		X	X		X	X	**6**
Pycnonotus barbatus	Common Bulbul	O					X		X	X	X		X	X	X	**7**
TURDIDAE - THRUSHES, ROBINS, WHEATEARS, CHATS																
Neocossyphus rufus	Red-tailed Ant Thrush	F				X						X		X	X	**4**
Monticola saxatilis	Common Rock Thrush	O			X					X						**2**
Turdus libonyanus	Kurrichane Thrush	O							X	X			X			**3**
Sheppardia gunningi	East Coast Akalat	F	VU											X		**1**
Luscinia luscinia	Sprosser	O			X											**1**
Cossypha heuglini	White-browed Robin-Chat	O					X									**1**
Cossypha natalensis	Red-capped Robin-Chat	O				X	X		X		X	X			X	**6**
Cichladusa arquata	Collared Palm Thrush	O			X		X									**2**
Cichladusa guttata	Spotted Morning Thrush	O											X			**1**
Cercotrichas quadrivirgata	Eastern Bearded Scrub Robin	O							X			X		X	X	**4**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Cercotrichas leucophrys	White-browed Scrub Robin	O							X	X			X			**3**
Oenanthe oenanthe	Northern Wheatear	O			X											**1**
Oenanthe pileata	Capped Wheatear	N			X											**1**
Myrmecocichla arnoti	Arnot's Chat	O			X					X			X			**3**
SYLVIIDAE - WARBLERS																
Bradypterus baboecala	Little Rush Warbler	N												X		**1**
Melocichla mentalis	African Moustached Warbler	N											X			**1**
Acrocephalus schoenobaenus	Sedge Warbler	N							X							**1**
Acrocephalus baeticatus	African Reed Warbler	O							X					X		**2**
Acrocephalus arundinaceus	Great Reed Warbler	N					X									**1**
Hippolais pallida	Olivaceous Warbler	O							X							**1**
Eremomela scotops	Green-capped Eremomela	O								X						**1**
Eremomela icteropygialis	Yellow-bellied Eremomela	O							X				X			**2**
Sylvietta whytii	Red-faced Crombec	O								X			X			**2**
Macrosphenus kretschmeri	Kretschmer's Longbill	F				X						X		X	X	**4**
Phylloscopus trochilus	Willow Warbler	O													X	**1**
Sylvia nisoria	Barred Warbler	O			X											**1**
Sylvia communis	Common Whitethroat	O			X											**1**
Cisticola juncidis	Zitting Cisticola	N			X											**1**
SYLVIIDAE - WARBLERS cont.																
Cisticola aridulus	Desert Cisticola	N			X											**1**
Cisticola natalensis	Croaking Cisticola	N							X							**1**
Cisticola chiniana	Rattling Cisticola	O					X		X					X		**3**
Cisticola brachypterus	Siffling Cisticola	O			X											**1**
Cisticola angusticaudus	Long-tailed Cisticola	N							X							**1**
Cisticola erythrops	Red-faced Cisticola	N					X		X							**2**
Cisticola cantans	Singing Cisticola	O					X			X						**2**
Cisticola galactotes	Winding Cisticola	N							X				X			**2**
Prinia subflava	Tawny-flanked Prinia	O					X		X	X	X			X		**5**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Heliolais erythroptera	Red-winged Warbler	O			X											**1**
Apalis flavida	Yellow-breasted Apalis	O					X		X		X			X	X	**5**
Camaroptera brevicauda	Green-backed Camaroptera	O												X	X	**2**
Camaroptera stierlingi	Barred Wren Warbler	O							X							**1**
MUSCICAPIDAE – FLYCATCHERS																
Bradornis microrhynchus	Grey Flycatcher	O			X											**1**
Bradornis pallidus	Pale Flycatcher	O			X											**1**
Melaenornis pammelaina	Southern Black Flycatcher	O							X				X			**2**
Muscicapa caerulescens	Ashy Flycatcher	F												X		**1**
Muscicapa striata	Spotted Flycatcher	O					X		X							**2**
Myioparus plumbeus	Lead-coloured Flycatcher	O			X											**1**
PLATYSTEIRDAE - WATTLE-EYES and BATIS																
Bias musicus	Vanga Flycatcher / Black & White Shrike Flycatcher	F										X	X			**2**
Batis mixta	Forest Batis	F				X					X					**2**
Batis minor	Black-headed Batis	O					X			X	X		X			**4**
Batis soror	Pale /East Coast Batis	O			X				X							**2**
Platysteira peltata	Black-throated Wattle-eye	O				X				X			X	X		**4**
MONARCHIDAE - MONARCH FLYCATCHERS																
Erythrocercus livingstonei	Livingstone's Flycatcher	O				X									X	**2**
Erythrocercus holochlorus	Little Yellow Flycatcher	F												X		**1**
MONARCHIDAE - MONARCH FLYCATCHERS cont.																
Terpsiphone viridis	African Paradise Flycatcher	O					X		X	X	X		X			**5**
Trochocercus cyanomelas	African Crested Flycatcher	F				X			X		X	X	X	X	X	**7**
TIMALIIDAE - BABBLERS, ILLADOPSIS, CHATTERERS																
Illadopsis rufipennis	Pale-breasted Illadopsis	F												X		**1**
Turdoides jardineii	Arrow-marked Babbler	O											X			**1**
PARIDAE - TITS																
Parus leucomelas	White-winged / Black Tit	O			X											**1**

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Parus pallidiventris	Cinnamon-breasted Tit	O			X											**1**
REMIZIDAE - PENDULINE TITS																
Anthoscopus caroli	African Penduline Tit	O			X											**1**
NECTARINIIDAE – SUNBIRDS																
Anthreptes neglectus	Uluguru Violet-backed Sunbird	O		X		X						X		X		**4**
Anthreptes collaris	Collared Sunbird	O				X	X			X	X	X	X	X	X	**8**
Nectarinia olivacea	Olive Sunbird	F				X	X		X		X	X		X	X	**7**
Nectarinia veroxii	Mouse-coloured Sunbird	O							X		X					**2**
Nectarinia amethystina	Amethyst Sunbird	O									X		X			**2**
Nectarinia senegalensis	Scarlet-chested Sunbird	O					X		X	X	X					**4**
Nectarinia bifasciata	Purple-banded Sunbird	O							X	X	X		X	X	X	**6**
ZOSTEROPIDAE - WHITE-EYES																
Zosterops senegalensis	Yellow White-eye	O											X		X	**2**
ORIOLIDAE - ORIOLES																
Oriolus oriolus	Eurasian Golden Oriole	O		X			X		X	X						**4**
Oriolus auratus	African Golden Oriole	O													X	**1**
Oriolus larvatus	Black-headed Oriole	O					X				X			X		**3**
LANIIDAE - SHRIKES																
Lanius collurio	Red-backed Shrike	O					X		X				X			**3**
Lanius isabellinus	Isabelline Shrike	O		X												**1**
Lanius minor	Lesser Shrike	O		X												**1**
Lanius cabanisi	Long-tailed Fiscal	O			X											**1**
LANIIDAE – SHRIKES cont.																
Lanius collaris	Common Fiscal	O			X											**1**
MALACONOTIDAE - PUFFBACKS, TCHAGRAS, BOUBOUS, BUSH SHRIKES																
Nilaus afer	Brubru	O							X	X			X			**3**
Dryoscopus cubla	Black-backed Puffback	O				X	X		X	X	X	X	X	X	X	**9**
Tchagra minuta	Marsh Tchagra	N					X									**1**
Tchagra australis	Brown-crowned Tchagra	O					X				X		X			**3**

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Tchagra senegala	Black-crowned Tchagra	O					X						X	X		**3**
Laniarius aethiopicus	Tropical Boubou	O					X		X	X	X	X	X	X	X	**8**
Malaconotus sulfureopectus	Sulphur-breasted Bush-Shrike	O								X						**1**
Malaconotus quadricolor	Four-coloured Bush-Shrike	O				X						X	X		X	**4**
Malaconotus blanchoti	Grey-headed Bush-Shrike	O					X				X				X	**3**
Nicator gularis	Eastern Nicator	O				X			X	X	X	X	X	X	X	**8**
PRIONOPIDAE -- HELMET SHRIKES																
Prionops retzii	Retz's Helmet-Shrike	O			X								X	X	X	**4**
Prionops scopifrons	Chestnut-fronted Helmet-Shrike	O				X			X		X	X	X	X	X	**7**
DICRURIDAE - DRONGOS																
Dicrurus ludwigii	Square-tailed Drongo	O				X					X	X		X	X	**5**
Dicrurus adsimilis	Common Drongo	O					X		X	X	X		X			**5**
CORVIDAE - CROWS																
Corvus splendens	House Crow	N							X							**1**
Corvus albus	Pied Crow	O					X		X	X			X			**4**
STURNIDAE - STARLINGS																
Lamprotornis chalybaeus	Blue-eared Starling	O			X											**1**
Cinnyricinclus leucogaster	Violet-backed Starling	O					X		X	X	X		X			**5**
Lamprotornis corruscus	Black-bellied Starling	O				X	X		X	X	X	X		X	X	**8**
Lamprotornis chloropterus	Lesser Blue-eared Starling	O					X									**1**
Creatophora cinerea	Wattled Starling	N			X											**1**
Buphagus africanus	Yellow-billed Oxpecker	O			X											**1**
Buphagus erythrorhynchus	Red-billed Oxpecker	O			X								X			**2**
PASSERIDAE -- SPARROWS and PETRONIAS																
Passer griseus	Grey-headed Sparrow	N			X		X		X	X			X			**5**
Passer domesticus	House Sparrow	N			X											**1**
Petronia superciliaris	White-browed Petronia/Yellow-throated Sparrow	O			X		X				X					**3**
PLOCEIDAE - WEAVERS, QUELEAS, BISHOPS																

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Plocepasser mahali	White-browed Sparrow-Weaver	O											X			**1**
Ploceus ocularis	Spectacled Weaver	O							X				X	X		**3**
Ploceus cucullatus	Black-headed / Village Weaver	O		X			X		X							**3**
Ploceus jacksoni	Golden-backed Weaver	O			X											**1**
Ploceus bicolor	Dark-backed Weaver	F				X			X			X	X	X	X	**6**
Ploceus subaureus	African Golden Weaver	O							X	X				X		**3**
Anaplectes rubriceps	Red-headed Weaver	O											X			**1**
Quelea cardinalis	Cardinal Quelea	N		X												**1**
Quelea erythrops	Red-headed Quelea	N			X											**1**
Quelea quelea	Red-billed Quelea	O					X									**1**
Euplectes hordeaceus	Black-winged Red Bishop	N			X											**1**
Euplectes nigroventris	Zanzibar Red Bishop	N					X	X	X	X			X			**5**
Euplectes capensis	Yellow Bishop	N								X						**1**
Euplectes axillaris	Fan-tailed Widowbird	N					X		X				X	X		**4**
Euplectes albonotatus	White-winged Widowbird	N							X							**1**
Euplectes ardens suahelica	Red-naped Widowbird	N			X											**1**
Amblyospiza albifrons	Grosbeak Weaver	O											X	X		**2**
ESTRILDIDAE - WAXBILLS, CORDON-BLEUS, MANNIKINS etc																
Pytilia melba	Green-winged Pytilia	O					X			X			X		X	**4**
Pytilia afra	Orange-winged Pytilia	O			X											**1**
Hypargos niveoguttatus	Peter's Twinspot	O				X			X		X	X	X	X	X	**7**
Mandingoa nitidula	Green-backed Twinspot	F				X			X		X	X		X	X	**6**
Lagonosticta senegala	Red-billed Firefinch	O					X		X				X			**3**
Lagonosticta rubricata	African Firefinch	O							X	X						**2**
Estrilda astrild	Common Waxbill	O					X		X	X	X		X	X	X	**7**
ESTRILDIDAE - WAXBILLS, CORDON-BLEUS, MANNIKINS cont.																
Uraeginthus angolensis	Southern Cordon-bleu	O			X				X	X			X			**4**
Lonchura cucullata	Bronze Mannikin	O							X	X	X		X	X		**5**
Lonchura nigriceps	Rufous-backed Mannikin	O													X	**1**

Family / Scientific name	Common name	Ecological Status[6]	Conservation Status[8]	Ham03	Bak03	Bur 00	Nas00	Ham00	Bak98	Hil98	Wat94	Bur91	Hal46	Bos 02	Mbi02	Freq
Lonchura fringilloides	Magpie Mannikin	O			X											**1**
VIDUIDAE – INDIGOBIRDS AND WHYDAHS																
Vidua chalybeata	Village Indigobird	O							X							**1**
Vidua funerea	Dusky Indigobird	O			X											**1**
Vidua macroura	Pin-tailed Whydah	O							X	X			X	X		**4**
Vidua paradisaea	Paradise Whydah	O							X				X		X	**3**
Vidua obtusa	Broad-tailed Whydah	O			X											**1**
FRINGILLIDAE - CANARYS and SEED-EATERS																
Serinus mozambicus	Yellow-fronted Canary	O							X		X		X			**3**
Serinus reichenowi	Yellow-rumped Seedeater	O					X									**1**
EMBERIZIDAE - BUNTINGS																
Emberiza cabanisi	Cabanis' Bunting	O			X											**1**
Emberiza flaviventris	Golden-breasted Bunting	O			X											**1**
Number of Records				**20**	**91**	**45**	**157**	**29**	**199**	**112**	**92**	**42**	**183**	**113**	**73**	

F – Forest Dependent, O - Other habitats (may use forest edge, woodlands and wooded grasslands), N - Non-forest
CR – Critical y Endangered, EN - Endangered, VU – Vulnerable, LR/cd – Lower Risk Conservation Dependent, LR/nt – Lower Risk Near Threatened, DD – Data Deficient

6 Mammals

A summary of Mammal species recorded in Rufiji District was compiled from various sources, detailed below:

- Howell *et al,* 2000. A Preliminary Biodiversity (Fauna) Assessment of the Rufiji Floodplain and Delta. REMP Technical Report No. 9 (Howell, 2000)
- Perkin, A. 2002 Galago and nocturnal mammal surveys within the Rufiji Environmental Management Project area.
- Pers comm. – Personal communications (observations by REMP staff)

In total 117 mammal species from 39 families and 16 orders have been recorded in Rufiji District. These are listed in Table 1 on page 57. 19 of the mammal species are bats, these are listed in Table 2 on page 63.

24 of the Rufiji mammal species have been listed by IUCN on the Red Data List (Hilton-Taylor, 2000). These are detailed below:

Critically Endangered

Browse (Black) Rhinoceros	*Diceros bicornis*

Endangered

Red and Black Elephant Shrew	*Rhynchocyon petersi*
Wild Dog	*Lycaon pictus*
Elephant	*Loxodonta africana*

Vulnerable

Red Bush Squirrel	*Paraxerus palliates*
Lesser Pouched Rat	*Beamys hindei*
Lion	*Panthera leo*
Eastern Tree Hyrax	*Dendrohyrax validus*
Dugong	*Dugong dugon*
Collared Fruit Bat	*Myonycteris relicta*
Spring Hare	*Pedetes capensis*

Lower Risk - Conservation Dependent

Spotted Hyaena	*Crocuta crocuta*
Buffalo	*Syncerus caffer*
Greater Kudu	*Tragelaphus strepsiceros*
Eland	*Taurotragus oryx*
Natal Duiker	*Cephalophus natalensis*
Harveys Duiker	*Cephalophus harveyi*
Suni	*Neotragus moschatus*
Impala	*Aepyceros melampus*
Wildebeest Brindled gnu	*Connochaetes taurinus*
Sable Antelope	*Hippotragus niger*

Lower Risk – Near Threatened

Zanzibar Galago	*Galagoides zanzibaricus*
Silky Blesmol	*Heliophobius argenteocinereus*
Crested Porcupine	*Hystrix cristata*
Slit-faced Bat	*Nycteris aurita*

At least 11 Rufiji mammal species are forest dependent and a further 34 species may use the forest edge and other habitats such as woodlands. Only nine species are listed as non-forest species.

It should be noted that the presence of a small population of a Red Colobus species, most likely the Iringa RC, was confirmed in the Mtanza Msona forest. It would seem this population is now extinct as there have been no sightings since 1999 (Butynski, T. pers.comm.). There are rumours that another population might exist around Mangwi, in or close to the Ngumburuni forest block.

Table 1: Mammal Species recorded in Rufiji District

Order	Family	Species	Common Name	Ecological Status	Conservation Status	Locality	Reference
PRIMATES							
	COLOBIDAE						
		Colobus angolensis	Black and White Colobus	F	DD	Mtanza Msona, Kikale, Ngumburuni	Perkin 2002, Pers.comm REMP
	CERCOPITHECIDAE						
		Papio cynocephalus	Baboon			Widespread	Howell et al 2000, Perkin 2002
		Cercopithecus mitis	Sykes or Blue Monkey	F		Weme, Kichi, Mtanza Msona, Nyamuete, Kiwengoma	Howell et al 2000, Perkin 2002
		Cercopithecus aethiops pygerythrus	Vervet Monkey	O		Widespread	Howell et al 2000, Perkin 2002
	GALAGONIDAE						
		Otolemur garnetti	Garnett's Galago	O		Weme, Kichi, Kiwengoma, Nyamuete	Howell et al 2000, Perkin 2002
		Otolemur crassicaudatus	Large Eared greater galago			Widespread	Howell et al 2000, Perkin 2002
		Galago moholi	Mohol galago			Kichi Woodland	Perkin 2002
		Galagoides granti	Grant's Galago		DD	Kichi, Nyamuete, Kiwengoma	Perkin 2002
		Galagoides zanzibaricus	Zanzibar Galago		LR/nt	Mtanza Msona	Perkin 2002
		Galago senegalensis	Lesser Galago	O			
INSECTIVORA							
	SORICIDAE						
		Crocidura sp.	White-toothed / Musk Shrews			Weme, Kichi	Howell et al 2000, Perkin 2002
MACROSCELIDEA							
	MACROSCELIDIDAE						
		Rhynchocyon petersi	Red and Black Elephant Shrew	F	EN	Mtanza Msona, Kichi, Nymuete, Kiwengoma	Howell et al 2000, Perkin 2002
		Petrodomus tetradactylus	Four toed elephant Shrew			Mtanza Msona, Kichi, Nymuete, Kiwengoma	Perkin 2002
LAGOMORPHA							
	LEPORIDAE						
		Lepus saxatilis	Scrub Hare			Utete airstrip	Howell et al 2000, Perkin 2002

Order	Family	Species	Common Name	Ecological Status	Conservation Status	Locality	Reference
RODENTIA							
	ANOMALURIDAE						
		Anomalurus derbianus	Lord Derby's Anomalure		CITES II	SGR	Howell et al 2000, Perkin 2002
	BATHYERGIDAE						
		Heliophobius argenteocinereus	Silky Blesmol		LR/nt	SGR	Howell et al 2000, Perkin 2002
	SCIURIDAE						
		Paraxerus sp.	Red Bush Squirrel			Weme, Kichi	Howell et al 2000, Perkin 2002
		Heliosciurus undulatus	Zanj sun squirrel			Mtanza Msona, Kichi, Nymuete, Kiwengoma	Howell et al 2000, Perkin 2002
						SGR	Howell et al 2000, Perkin 2002
				F	VU	SGR	Howell et al 2000, Perkin 2002
				O		SGR	Howell et al 2000, Perkin 2002
	PEDETIDAE						
		Pedetes capensis	Spring Hare		VU	widespread	Howell et al 2000, Perkin 2002
	MYOXIDAE						
		Graphiurus sp.				Probable	Howell et al 2000, Perkin 2002
	HYSTRICIDAE						
		Hystrix africaeaustralis				Mtanza Msona SGR	Howell et al 2000, Perkin 2002
		Hystrix cristata			LR/nt	Possible	Howell et al 2000, Perkin 2002
	THRYONOMYIDAE						
		Thryonomys gregorianus				widespread	Howell et al 2000, Perkin 2002
		Thryonomys swinderianus				SGR	Howell et al 2000, Perkin 2002
	MUROIDEA						
		Tatera sp.	Naked-soled Gerbil			Weme	Perkin 2002
						Probable	Howell et al 2000, Perkin 2002
						SGR	Howell et al 2000, Perkin 2002
		Beamys hindei	Lesser Pouched Rat	F	VU	Weme, Kichi	Howell et al 2000, Perkin 2002
		Cricetomys gambianus	Giant Pouched Rat			Kichi, Nymuete, Kiwengoma	Perkin 2002
						Probable	Howell et al 2000, Perkin 2002

Order	Family	Species	Common Name	Ecological Status	Conservation Status	Locality	Reference
RODENTIA cont.							
	MUROIDEA cont.						
		Saccastomus campestris				Widespread	Howell et al 2000, Perkin 2002
						Probable	Howell et al 2000, Perkin 2002
	MURIDAE						
		Acomys spinosissimus	Red Spiny Mouse			Weme, Kichi	Howell et al 2000, Perkin 2002
		Grammomys sp.	Narrow-footed Woodland Rat			Kichi	Howell et al 2000, Perkin 2002
		Lemniscomys rosalia	Striped Grass Mouse			Weme	Howell et al 2000, Perkin 2002
		Mus minutoides	Pigmy Mouse			Weme, Kichi	Howell et al 2000, Perkin 2002
						SGR	Howell et al 2000, Perkin 2002
						Remp	Howell et al 2000, Perkin 2002
						SGR, REMP	Howell et al 2000, Perkin 2002
							Howell et al 2000, Perkin 2002
							Howell et al 2000, Perkin 2002
						SGR	Howell et al 2000, Perkin 2002
					X		Howell et al 2000, Perkin 2002
						Possibly in forest	Howell et al 2000, Perkin 2002
						SGR	Howell et al 2000, Perkin 2002
						possible	Howell et al 2000, Perkin 2002
CARNIVORA							
	CANIDAE						
		Otocyon megalotis	Bat-eared Fox	O			Howell et al 2000, Perkin 2002
		Lycaon pictus	Wild Dog		EN	Widespread , SGR, Utete	Howell et al 2000, Perkin 2002
		Canis adustus	Side-striped Jackal	O		Widespread, SGR	Howell et al 2000, Perkin 2002
	MUSTELIDAE						
		Aonyx capensis	Cape clawless Otter	N		Widespread; SGR	Howell et al 2000, Perkin 2002
		Ictonyx striatus	Zorilla			Widespread; SGR	Howell et al 2000, Perkin 2002
		Mellivora capensis	Honey Badger	N		Widespread; SGR	Howell et al 2000, Perkin 2002
		Poecilogale albinucha	Striped Weasel			Widespread	Howell et al 2000, Perkin 2002

Order	Family	Species	Common Name	Ecological Status	Conservation Status	Locality	Reference
CARNIVORA cont.							
	HERPESTIDAE						
		Bdeogale crassicauda	Bushy-tailed Mongoose	O		Mtanza Msona, Kichi, Nymuete, Kiwengoma	Perkin 2002
		Herpestes sanguinea	Slender Mongoose	O			Perkin 2002
		Atilax paludinosus	Marsh Mongoose	N		Widespread; SGR	Howell et al 2000, Perkin 2002, Pers.comm REMP
		Helogale parvula	Dwarf Mongoose			Widespread; SGR	Howell et al 2000, Perkin 2002
		Herpestes ichneumon	Ichneumon (Egyptian) mongoose	O		Widespread; SGS	Howell et al 2000, Perkin 2002
		Ichneumia albicauda	White tailed mongoose	O		Widespread; probably in SGR	Howell et al 2000, Perkin 2002
		Mungos mungo	Banded mongoose			Widespread; SGR	Howell et al 2000, Perkin 2002, Pers.comm REMP
		Rhynchogale melleri	Mellers Mongoose			Probably in SGR	Howell et al Perkin 2002000
	VIVERRIDAE						
		Genneta sp.	Genet			Mtanza Msona, Kichi, Nymuete, Kiwengoma	Perkin 2002
		Civettictis civetta	African Civet	O		Widespread; SGR	Howell et al 2000, Perkin 2002
		Nandinia binotata	African palm Civet	F		Kiwengoma	Howell et al 2000, Perkin 2002
	HYAENIDAE						
		Crocuta crocuta	Spotted Hyaena	O	LR/cd	Present	Howell et al 2000, Perkin 2002
	FELIDAE						
		Felis serval	Serval Cat		CITES II	SGR	Howell et al 2000, Perkin 2002
		Felis silvestris	Wild cat	O	CITES II	SGR	Howell et al 2000, Perkin 2002
		Panthera leo	Lion	N	VU	Weme, Kichi	Howell et al 2000, Perkin 2002
		Panthera pardus	Leopard	O	CITES I	Weme, Kichi	Howell et al 2000, Perkin 2002
PHOLIDOTA							
	MANIDAE						
		Manis temminickii	Ground Pangolin	O		Mtanza Msona, SGR	Perkin 2002
TUBULIDENTATA							
	ORYCTEROPODIDAE						
		Orycteropus afer	Aardvark	N		Mtanza Msona, Kichi, SGR	Perkin 2002

Order	Family	Species	Common Name	Ecological Status	Conservation Status	Locality	Reference
HYRACOIDEA							
	PROCAVIDAE						
		Dendrohyrax validus	Eastern Tree Hyrax	O	VU		Howell et al 2000, Perkin 2002
		Heterohyrax brucei	Bush Hyrax				Howell et al 2000, Perkin 2002
PROBOSCIDEA							
	ELEPHANTIDAE						
		Loxodonta africana	Elephant	O	EN	Mtanza Msona, Kichi, Nymuete, Kiwengoma, Weme	Howell et al Perkin 2002000,Perkin 2002
PERISSODACTYLA							
	EQUIDAE						
		Equus burchellii				widespread	Howell et al 2000, Perkin 2002
		Equus quagga	Zebra				Perkin 2002
	RHINOCEROTIDAE						
		Diceros bicornis	Browse (Black) Rhinoceros	N	CR	SGR, formerly widespread	Howell et al 2000, Perkin 2002
ARTIODACTYLA							
	HIPPOPOTAMIDAE						
		Hippopotamus amphibious	Hippopotamus:	N	CITES II	Widespread	Howell et al 2000, Perkin 2002, Pers.comm REMP
	SUIDAE						
		Potamochoerus larvatus	Bushpig	O		Mtanza Msona, Kichi, Nymuete, Kiwengoma, Weme	Howell et al 2000, Perkin 2002
		Phacochoerus africanus	Warthog	N		Weme	Howell et al 2000, Perkin 2002, Pers.comm REMP
	BOVIDAE						
		Syncerus caffer	Buffalo	O	LR/cd	Weme, Kichi	Howell et al 2000, Perkin 2002
		Tragelaphus strepsiceros	Greater Kudu		LR/cd	Weme	Howell et al 2000, Perkin 2002
		Tragelaphus scriptus	Bushbuck	O		Mtanza Msona, Kichi, Nymuete, Kiwengoma	Perkin 2002
		Taurotragus oryx	Eland		LR/cd	SGR	Perkin 2002
		Sylvicapra grimmia	Bush Duiker			Weme, Kichi, Mtanza Msona	Howell et al Perkin 2002000,Perkin 2002

Order	Family	Species	Common Name	Ecological Status	Conservation Status	Locality	Reference
	BOVIDAE cont.						
		Cephalophus monticola	Blue Duiker	F		Mtanza Msona	Perkin 2002
		Cephalophus natalensis	Natal Duiker	F	LR/cd	Probably present	Howell et al 2000, Perkin 2002
		Cephalophus harveyi	Harveys Duiker	F	LR/cd	Mtanza Msona	Perkin 2002
		Kobus ellipsiprymnus syn. *defassa*	Waterbuck	O		Probably present	Howell et al 2000, Perkin 2002
		Neotragus moschatus	Suni	O	LR/cd	Mtanza Msona	Perkin 2002
		Aepyceros melampus	Impala		LR/cd	SGR	Perkin 2002
		Connochaetes taurinus	Wildebeest Brindled gnu		LR/cd	Woodland in Selous	
		Hippotragus niger	Sable Antelope	O	LR/cd	Seen west of Kichi Hills, Lake Lugongwe	Howell et al 2000, Perkin 2002, Pers. Comm REMP
CETACEA							
	STENIDAE						
		Humpback Dolphin	*Sousa chinensis*		DD	Simba Uranga river mouth	Pers.comm REMP
SIRENIA							
	DUGONGIDAE						
		Dugong	*Dugong dugon*		VU		Muir, 2003

CF End – Coastal Forest Endemic, TZ End – Tanzania Endemic, N End – Near Endemic, Tz/K End – Tanzania / Kenya Endemic
F – Forest Dependent, O - Other habitats (may use forest edge, woodlands and wooded grasslands), N - Non-forest
CR – Critical y Endangered, EN - Endangered, VU – Vulnerable, LR/cd – Lower Risk Conservation Dependent, LR/nt – Lower Risk Near Threatened, DD – Data Deficient

Table 2: Bat species recorded in Rufiji District

(NG=Ngumburuni, KG=Kiwengoma; MC=Mchungu; NK=Namakutwa, TO=Tong'omba; Ki = Kichi SGR=unpublished list for Selous Game Reserve).

Order	Family	Species	Common Name	Ecological Status	Conservation Status	NG	KG	MC	NK	TO	SGR	Ki
MEGACHIROPTERA												
	PTEROPIDAE: FRUITBATS											
		Epomophorus labiatus	Epauletted Fruit Bat	O							X	
		Epomophorus wahlbergi	Epauletted Fruit Bat	O		X	X	X	X		X	
		Rousettus aegyptiacus	Egyptian Fruit Bar	N			X					
		Myonycteris relicta	Collared Fruit Bat	F	VU		X			X		
MICROCHIROPTERA												
	NYCTERIDAE: SLIT-FACED BATS											
		Nycteris aurita	Slit-faced Bat	O	LR/nt							
		Nycteris grandis	Slit-faced Bat	O		X				X		
		Nycteris thebaica	Slit-faced Bat	O		X						
		Nycteris sp.	Slit-faced Bat									X
	MEGADERMATIDAE											
		Lavia frons	Yellow-winged Bat	O		X				-		
	RHINOLOPHIDAE: HORSESHOE BATS											
		Rhinolophus deckeni	Horseshoe Bat						X	X		
		Rhinolophus sp.										
		Hipposideros ruber	Leaf-nosed Bat	O		X	X		X	X		
	HIPPOSIDERIDAE: AFRICAN LEAF-NOSED BATS											
		Triaenops persicus	Persian leaf-nosed Bat	O						X		
	VESPERTILIONIDAE: VESPER BATS											
		Pipistrellus nanus	Pipistrelle Bat	O			X		X			
		Pipistrellus sp.	Pipistrelle Bat							X		
		Scotophilus viridis	House Bat	O			X		X			
		Kerivoula africana	Wooly Bat	F	DD	X				X		
		Chalinolobus variegata syn. Glaucoyncteris variegata	Butterfly Bat	O					X			

Order	Family	Species	Common Name	Ecological Status	Conservation Status	NG	KG	MC	NK	TO	SGR	Ki
	MOLOSSIDAE: FREE-TAILED BATS											
		Tadarida brachyptera	Guano Bat	O			X					

CF End – Coastal Forest Endemic, TZ End – Tanzania Endemic, N End – Near Endemic, Tz/K End – Tanzania / Kenya Endemic
F – Forest Dependent, O - Other habitats (may use forest edge, woodlands and wooded grasslands), N - Non-forest
CR – Critical y Endangered, EN - Endangered, VU – Vulnerable, LR/cd – Lower Risk Conservation Dependent, LR/nt – Lower Risk Near Threatened, DD – Data Deficient

7 Fish

Table 3 and Table 4 below list fish species known from Rufiji District. It must be noted that limited fish diversity research has been undetaken in Rufiji District, and research that has been carried out focuses on species of economic importance rather than biodiversity.

7.1 Freshwater Fish

Table 3 below lists 46 species from at least 15 families from Rufiji freshwater habitats including lakes. It should be noted that the species recorded by Cavalier require confirmation. The sources used to compile Table 3 are as follows :

- Cavalier, M., 2003. Fisheries assessment in the lower Rufiji River floodplain, Tanzania. REMP-report. 93 pp.
- Howell, K., Msuya, C. & Kihaule, P. 2000 A Preliminary Biodiversity (Fauna) Assessment of The Rufiji Floodplain and Delta. REMP Technical Report 9.
- Richmond, M. 2002. An Analysis of smallholder opportunities in fisheries, coastal and related enterprises in the floodplain and delta areas of the Rufiji River, Tanzania. REMP Technical Report 25.

Table 3: Freshwater Fish in Rufiji District

Classification	Common Name	Kiswahili Name	Rufiji River Eccles in Howell 2000	Cavalier (unconfirmed identification)
PROTOPTERIDAE	Lungfish			
Protopterus aethiopicus	African Lungfish	Kamongo		
MORMYRIDAE	Elephant-snouts			
Mormyrus longirostris			p	
Mormyrus hasselquisti				X
Petrocephalus steindachneri			p	
Petrocephalus catostoma catostoma				X
CYPRINIDAE				
Barbus macrolepis			p	X
Barbus radiatus			p	
Labeo ulangensis			p	
Labeo cylindricus				X
Opsaridium loveridgei			p	
DISTICHODONTIDAE				
Distichodus petersii		Tungu, Mbapale, Tungwi	p	
Distichodus rufigiensis			p	
Nannaethiops sp.			p	
CHARACIDAE	African Tetras			X
Alestes affinis				
Alestes imberi			p	
Alestes jacksoni			?	
Alestes stuhlmanni		Kasa, Ngacha	p	
Hemigrammopetersius barnardi			p	X
Hydrocynus vittatus	Tiger Fish		p	

Classification	Common Name	Kiswahili Name	Rufiji River Eccles in Howell 2000	Cavalier (unconfirmed identification)
Petersius conserialis		Kasa, Ngacha	p	X
BAGRIDAE	Bagrid Catfishes			X
Bagrus docmak				
Bagrus orientalis		Katoga, Kitoga	p	
Clarotes laticeps			?	
SCHILBEIDAE	Schilbeid Catfishes			
Eutropiellus longifilis			p	
Schilbe mystus			p	
Schilbe moebiusii				X
AMPHILIIDAE	Loach Catfishes			
Amphilius uranoscopus			p	
CLARIDAE	Air-breathing Catfishes			X
Clarias gariepinus			p	
MOCHOKIDAE	Squeakers			
Synodontis fuelleborni		Konge	p	
Synodontis maculipinna			p	
Synodontis matthesi			p	
Synodontis rufigiensis		Nyanyandu	p	
Synodontis rukwaensis				X
CYPRINODONTIDAE				
Aplocheilichthys kongoranensis			p	
Nothobranchius eggersi	Annual Fish		p	
Nothobranchius foerschi			?	
Nothobranchius kirkii			?	
Nothobranchius melanospilus			p	
MASTACEMBELIDAE	Swamp and Spiny Eels			
Afromastacembelus frenatus			p	
CICHLIDAE	Mouth Brooders			
Oreochromis urolepis			p	X
ELEOTRIDAE	Sleepers			
Eleotris fusca			p	
GOBIIDAE	Gobies			X
Glossogobius giuris			p	
Unknown Family				
Brycinus imberi				X
Favonigobius reichei				X
Megalops cyprinoides				X
Citharinus congicus	Pele			X

7.2 Marine Fish

Table 4 below lists marine fish species known from Rufijij District, this list is based on:

- Caras, T. 2001. Status of the marine habitat and resources adjacent to the Rufiji River outflow. REMP Technical Report 27.
- Richmond, M. 2002. An Analysis of smallholder opportunities in fisheries, coastal and related enterprises in the floodplain and delta areas of the Rufiji River, Tanzania. REMP Technical Report 25.

In many cases the exact species is not known, but the prescene of particular fish groups (families) are known, these are also listed. It is clear that this species list is far from complete, based mostly on species of economic value. 16 families are listed with 15 named species.

Table 4: Marine Fish Species

Family	Species	Common Name
Anguillidae	*Anguilla mossambica*	Eels
Belonidae	*Belonidae* sp.	Needlefish
Caesionidae		Fusiliers
Carangidae	*Caranx* sp.	Trevallies
Carcharhinidae	*Carcharhinus* sp.	Sharks
	Ginglymostoma brevicaudatom	Short Tail Nurse Shark
Hemiramphidae	*Hemiramphus* sp.	Halfbeaks
Lethrinidae		Emperors
Mullidae	*Upeneus* sp.	Goatfish
Muraenidae	*Echidna polyzona*	Brown Stripe Eel
Nasinae		Unicornfish
Rachycentridae	*Rachycentron canadum*	Cobia
Scaridae		Parrotfish
Scombridae	*Scomberoides* sp.	Queenfish
Serranidae	*Epinephalus* sp.	Groupers
Siganidae		Rabbitfish
Sphyraenidae	*Sphyraena* sp.	Barracuda
Unknown family		
	Hilsa kelee	Five spot Herring
	Chanos chanos	Milk fish
	Trichiurus lepturus	Hairtail

8 Invertebrates

8.1 Butterflies

The list compiled below is based on:

- Burgess, N. 2000. Coastal Forests of Eastern Africa
- Sheil, R. & Burgess, N. 1990. Preliminary results of biological surveys in Zaraninge and Kierengoma Coastal Forests, Tanzania.

With only 42 species from 8 families/subfamilies recorded for Rufiji District it is clear the list is far from complete. Data from butterfly surveys undertaken in Kichi Hills Forest in 2003 by C. Congdon et al. were unfortunately not available in time to be included in this list, though some 70 species were recorded (Congdon pers. comm.). Due to the 2003 drought relatively few species were recorded but some interesting results are expected, especially with regard to the Lycaenidae (Baliochila species). This list only presents data from forest habitats and thus has a relatively high number of forest-dependent species (18).

The list records 14 species endemic to Coastal Forests, 13 of these endemic species are also forest dependent, highlighting the importance of Rufiji Districts Coastal Forests for biodiversity conservation.

Table 5: Butterfly species recorded in Rufiji District

* = Coastal Forest Endemic

	Habitat	Kiwengoma Forest	Namakutwa Forest	Other Location
		Sheil 1990, Burgess 2000	Burgess 2000	REMP Pers Comm
Papilionidae				
Papilio ophidicephalos ophidicephalos		X		
Papilio dardanua tibullus		X		
Papilio nireus lyaeus		X		
Graphium leonidas leonidas		X		
Graphium philonoe philonoe	O	X		
Pieridae				
Appias l. lasti	O	X		
*Mylothriskilimensis rondonis**	**F**	X		
Nymphalidae				
Acraeinae				
*Acraea epaea epitellus**	**F**	X		
Acraea satis	**F**	X		
Danaidae				
Limenitinae				
*Bebearia chriemhilda**	**F**		X	
Bebearia o. orientalis	**O**	X	X	
Euphaedra orientalis	**F**	X	X	
*Euphaedra neophron**	**O**			Mtanza Msona, Kichi Hills, Ilu and Uba
*Euryphura achlys**	**O**			Kichi Hills
Neptis carcassoni	**F**	X	X	
Sallya natalensis	**O**		X	

	Habitat	Kiwengoma Forest	Namakutwa Forest	Other Location
Charaxinae				
Charaxes macclouni macclouni		X		
Charaxes cithaeron kennethi		X		
*Charaxes violetta maritimus**	F	X	X	
Charaxes protoclea azota		X		
Charaxes jahlusa kenyensis		X		
Charaxes etesipe tavetensis		X		
Charaxes brutus alcyone		X		
Charaxes castor flavifasciatus		X		
Charaxes zoolina zoolina		X		
Charaxes bohemani bohemani		X		
Charaxes varanes vologeses		X		
Charaxes candiope candiope		X		
*Charaxes pythodoris nesaea**	**F**		X	
Euxanthe wakefieldi wakefieldi	F	X		
*Euxanthe tiberius tiberius**	F	X		
Nymphalidae				
Hypolimnas deceptor	O	X	X	
*Hypolimnas usambara**	F	X		
Lycaenidae				
Baliochila amanica	F	X		
*Baliochila latimarginata**	F	X		
*Baliochila stygia**	F	X		
*Iolaus (Epamera) s. silanus**	F	X		
*Pentila r. parapetreia**	F	X		
*Teriomima micra**	F	X		
*Teriomima puella**	O	X		
*Teriomima subpunctata**	F	X		
Moth				
Chrisidia croesus				Kichi Hills, Kiwengoma

F – Forest Dependent, O - Other habitats (may use forest edge, woodlands and wooded grasslands), N - Non-forest

8.2 Dragonflies

The following list of Dragonflies (Odonata) in Rufiji District is taken from Clausnitzer (2003a), and is based on four field visits to various sites including: Mtanza-Msona, Ikwiriri, Lake Ilu, Kichi Hills, Kiwengoma, Nyamwete and Ngumburuni Forest. The full report is presented in Appendix 1.

69 dragonfly species were recorded, these are listed in Table 6 overleaf. Six of these species are habitat specialists confined to Coastal Forests of Eastern Africa, these are:

- *Coryphgagrion grandis*
- *Ceriagrion mourae*
- *Teinobasis alluaudi*
- *Gynacantha usambarica*
- *Hadrothemis scabrifrons*
- *Thermochoria jeannel*

Two species were recorded for the first time since their type descriptions from Mozambique in 1969 (Ceriagrion mourae), and from the Democratic Republic of Congo in 1959 (Gynacantha immaculifrons).

Eight species are of conservation concern (to be red listed) and are marked grey in the list.

'The majority of the species are common and widespread and inhabit the Rufiji River and its floodplains, while a smaller proportion are only found in permanent streams draining into the Rufiji or in forest habitats. The high overall species diversity is a result of the variety of habitats and their connectivity, combined with the dynamics of the floods. The habitat specialists found in Ngumburuni forest and in the forests of the Kichi and Kiwengoma Hills are globally endangered species and require special attention in regard of conservation efforts' Clausnitzer (2003).

Table 6: Dragonflies recorded from the Rufiji region

Forest types refer to the East African Coastal Forest definition by (Clarke 2000).

Family/Genus/Species	Dry Forest	Swamp Forest	*Brachystegia* Forest	Ruhoi River	Lakes	Rufiji River	Rufiji floodplain
LESTIDAE							
Lestes ictericus Gerstäcker, 1869			X				X
Lestes tridens McLachlan, 1895			X				X
Lestes uncifer Karsch, 1899			X				X
PSEUDOSTIGMATIDAE							
Coryphagrion grandis Morton, 1924	X	X					
PROTONEURIDAE							
Elattoneura glauca (Burmeister, 1839)				X		X	
COENAGRIONIDAE							
Aciagrion gracile (Sjöstedt, 1909)			X				X
Africallagma subtile (Ris, 1921)			X				X
Agriocnemis exilis Sélys, 1872			X				X
Agriocnemis gratiosa Gerstäcker, 1891					X	X	X
Azuragrion nigridorsum (Selys, 1876)							X
Ceriagrion glabrum (Burmeister, 1839)			X	X	X	X	X
Ceriagrion kordofanicum Ris, 1924					X	X	
Ceriagrion mourae Pinhey, 1969			X				
Ceriagrion suave Ris, 1921	X	X	X				

Ischnura senegalensis (Rambur, 1842)						X	X
Pseudagrion acaciae Förster, 1906				X		X	
Pseudagrion commoniae (Förster, 1902)				X			
Pseudagrion lindicum Grünberg, 1902					X		X
Pseudagrion massaicum Grünberg, 1902				X		X	
Pseudagrion sublacteum (Karsch, 1893)						X	
Teinobasis alluaudi (Martin, 1896)		X					
CALOPTERYGIDAE							
Phaon iridipennis (Burmeister, 1839)	X		X	X		X	
CHLOROCYPHIDAE							
Platycypha caligata (Sélys, 1853)				X			
GOMPHIDAE							
Ictinogomphus ferox (Rambur, 1842)				X		X	X
Paragomphus genei (Sélys, 1841)				X		X	
Paragomphus magnus Fraser, 1952				X			
Paragomphus sabicus Pinhey, 1950				X			
AESHNIDAE							
Anax imperator Rambur, 1842					X	X	X
Anax ephippiger (Burmeister, 1836)			X				X
Anax speratus Hagen, 1867				X			
Gynacantha immaculifrons Fraser, 1956	X						
Gynacantha manderica Grünberg, 1902					X		X
Gynacantha usambarica Sjöstedt, 1909	X	X					
Gynacantha villosa Gruenberg, 1902	X	X					
CORDULIIDAE							
Phyllomacromia spec	X						X
LIBELLULIDAE							
Acisoma panorpoides Martin, 1905					X	X	X
Brachythemis leucosticta (Burmeister, 1839)					X	X	X
Chalcostephia flavifrons Kirby, 1889					X	X	X
Crocothemis divisa Karsch, 1898	X				X		
Crocothemis erythraea (Brullé, 1832)						X	X
Crocothemis sanguinolenta (Burmeister, 1839)	X				X		
Diplacodes lefebvrii (Rambur, 1842)					X		X
Hadrothemis scabrifrons Ris, 1910	X						
Hemistigma albipunctata (Rambur, 1842)			X		X		
Nesciothemis farinosum (Förster, 1898)				X			
Olpogastra fuelleborni Grünberg, 1902						X	
Olpogastra lugubris Karsch, 1895				X		X	
Orthetrum abbotti Calvert, 1892			X				X
Orthetrum chrysostigma (Burmeister, 1839)	X		X	X			X
Orthetrum julia falsum Longfield, 1955							X
Orthetrum machadoi Longfield, 1955							
Orthetrum stemmale (Burmeister, 1839)	X		X		X		
Orthetrum trinacria (Selys, 1841)					X		X
Palpopleura deceptor (Calvert, 1899)					X		X
Palpopleura lucia (Drury, 1773)	X		X		X		
Palpopleura portia (Drury, 1773)	X		X	X			X

Pantala flavescens (Fabricius, 1798)	X		X	X	X		X
Philonomon luminans (Karsch, 1893)			X				
Rhyothemis semihyalina Sélys, 1849	X		X		X		X
Tetrathemis polleni (Selys, 1869)	X		X		X	X	X
Thermochoria jeanneli Martin, 1915	X	X					
Trapezostigma basilaris (Beauvois, 1805)	X		X		X		X
Trithemis arteriosa (Burmeister, 1939)			X			X	X
Trithemis aconita Lieftinck, 1969	X						
Trithemis annulata (Sélys, 1841)						X	X
Trithemis furva Karsch, 1899				X			
Trithemis kirbyi (Gerstäcker, 1891)						X	
Urothemis assignata (Sélys, 1872)	X				X		X
Urothemis edwardsii (Sélys, 1849)					X		X

8.3 Molluscs

Due to the limited knowledge and research effort regarding East African Molluscs the following list of mollusc species recorded in Rufiji District is likely to be far from complete.

The sources used to compile this list are:

- Howell, K., Msuya, C. & Kihaule, P. 2000 A Preliminary Biodiversity (Fauna) Assessment of The Rufiji Floodplain and Delta. REMP Technical Report 9.
- Caras, T. 2001. Status of the marine habitat and resources adjacent to the Rufiji River outflow. REMP Technical Report 27.

8.3.1 Marine Mollusc Species

A survey of Simaya Island revealed 25 species of Mollusc (listed below), it is likely there are many more species to be added to this list, particularly from mangrove areas.

Table 7: Marine Mollusc Species in Rufiji District

Based on: Caras, T. 2001. Status of the marine habitat and resources adjacent to the Rufiji River outflow. REMP Technical Report 27.

Group	Class	Family	Scientific name	Common Name	Location
Mollusca	Polyplacophora: Chitons		*Acanthopleura gemmata*	Chiton	Simaya Island
Mollusca	Gastropoda	Architectonicidae	*Architectonica prespectiva*	Sundial Lined Spiral	Simaya Island
Mollusca	Gastropoda	Bursidae	*Bursa* sp.	Frog Shell	Simaya Island
Mollusca	Gastropoda	Cassidae	*Cypraecassis rufa*	Bull-mouthed / Red Helmet Shell	Simaya Island
Mollusca	Gastropoda	Conidae	*Conus* sp.	Cone Shell	Simaya Island
Mollusca	Gastropoda	Cypraeidae	*Cypraea annulus*	Annal Cowry	Simaya Island
Mollusca	Gastropoda	Cypraeidae	*Cypraea spp.*	Cowry	Simaya Island
Mollusca	Gastropoda	Cypraeidae	*Cypraea tigris*	Tiger Cowry	Simaya Island
Mollusca	Gastropoda	Fasciolaridae	*Pleuroploca* sp.	Tulip / Spindle Shell	Simaya Island
Mollusca	Gastropoda	Fasciolaridae	*Pleuroploca trapezium*	Tulip / Spindle Shell	Simaya Island
Mollusca	Gastropoda	Mitridae	*Mitra mitra*	Mitra	Simaya Island
Mollusca	Gastropoda	Mitridae	*Mitra spp.*	Mitra	Simaya Island
Mollusca	Gastropoda	Muricidae	*Chicoreus ramosus*	Rock Shell	Simaya Island
Mollusca	Gastropoda	Muricidae	*Haustellum haustellum*	Non Spiny Murex	Simaya Island
Mollusca	Gastropoda	Neritidae	*Nerita*	Snail Shell	Simaya Island
Mollusca	Gastropoda	Ovulidae	*Ovula ovum*	Common Egg Cowry	Simaya Island
Mollusca	Gastropoda	Strombidae	*Lambis chirgra*	Spider Conch	Simaya Island
Mollusca	Gastropoda	Strombidae	*Lambis lambis*	Common Spider Conch	Simaya Island
Mollusca	Gastropoda	Strombidae	*Strombus* sp.	Conch Shells	Simaya Island
Mollusca	Gastropoda	Tonnidae	*Tonna perdix*	Partridge Tun Shell	Simaya Island
Mollusca	Gastropoda	Vasidae	*Vasum* sp.	Vase Shells	Simaya Island
Mollusca	Bivalvia	Ostreidae	*Lopha*	Zigzag Oyster	Simaya Island
Mollusca	Bivalvia	Pinnidae	*Pinna*	Pen Shell	Simaya Island
Mollusca	Bivalvia	Tridacnidae	*Tridacna* sp.	Giant Clam	Simaya Island
Mollusca	Cephalopoda	Octopodidae	*Octopus* sp.	Octopus	Simaya Island

8.3.2 Terrestrial Mollusc Species

16 species of terrestrial Molluscs were recorded from Rufiji District in Howell, (2000). This list is likely to far from complete. A further 16 species known from Coastal Forests and the Eastern Arc may also be present in Rufiji District, these are also indicated in Table 8 below.

Table 8: Terrestrial Mollusc Species in Rufiji District

Based on: Howell, K., Msuya, C. & Kihaule, P. 2000 A Preliminary Biodiversity (Fauna) Assessment of The Rufiji Floodplain and Delta. REMP Technical Report 9.

Species	Locality	References
Gulella matumbiensis	Matumbi Hills	Verdcourt 1990
Maizania wahlbergi	Matumbi Hills	Verdcourt 1990
Tropidophora (*Otopoma*) *calcarea*	Matumbi Hills	Verdcourt 1990
Rhachistia picturata	Matumbi Hills	Verdcourt 1990
Rhachidina braunsi	Matumbi Hills	Verdcourt 1990
Ceras matumbianum	Matumbi Hills	Verdcourt 1990
Pseudoglessula obtuse	Matumbi Hills	Verdcourt 1990
P. sp. Nov? near *P. introversa*;	Matumbi Hills	Verdcourt 1990
P. sp. Nov;	Matumbi Hills	Verdcourt 1990
Opeas sp.	Matumbi Hills	Verdcourt 1990
Curvella sp. Nov.	Matumbi Hills	Verdcourt 1990
Curvella sp. Nov.	Matumbi Hills	Verdcourt 1990
Achatina fulica	Matumbi Hills	Verdcourt 1990
Achatina grandidieriana	Matumbi Hills	Verdcourt 1990
Trachycystis ariel	Matumbi Hills	Verdcourt 1990
Sitala jenynsi	Matumbi Hills	Verdcourt 1990
Achatina grandidieriana	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Cyathopoma azaniense	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Euonyma magilensis	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Gonaxis craveni	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Gulella gwendolinae	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Maizania cf volkensi	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Nesopupa cf bisulcata	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Opeas crenatum	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Curvella caloraphe	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Edentulina cf ovoidea	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Gonaxis cf denticulatus	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Nesopupa cf peilei	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Pupisoma cf orcula	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Subulina intermedia	Coastal Forests and Eastern Arc Forests	Tattersfield 1997
Subulona ordinarius	Coastal Forests and Eastern Arc Forests	Tattersfield 1997

8.4 Echinoderms

Table 9 below lists 11 species of sea cucumber found near Simaya Island, Rufiji District. This information is taken from:

- Caras, T. 2001. Status of the marine habitat and resources adjacent to the Rufiji River outflow. REMP Technical Report 27.

Table 9: Sea Cucumber Species In Rufiji District

Phylum	Class	Family	Scientific Name	Location
Echinodermata				
	Holothuroidea			
		Holothuriidae	*Actinophyga mauritiana*	Simaya
		Holothuriidae	*Actinophyga miliaris*	Simaya
		Holothuriidae	*Bohadschia vitiensis*	Simaya
		Holothuriidae	*Holotheria atra*	Simaya
		Holothuriidae	*Holotheria chloronotus*	Simaya
		Holothuriidae	*Holotheria leucospilota*	Simaya
		Holothuriidae	*Holotheria nobilis*	Simaya
		Holothuriidae	*Holotheria scarab*	Simaya
		Stichopodidae	*Stichopus hermanni*	Simaya
		Stichopodidae	*Thelenota ananas*	Simaya
		Stichopodidae	*Thelenota anax*	Simaya

9 References and Bibliography

This list of references and bibliography includes texts referred to in the data source documents and not necessarily used to compile this report.

Baker N.E. and Baker E.M. (2002), *The Important Bird Areas of Tanzania: a first inventory*. Wildlife Conservation Society of Tanzania, Dar-es-Salaam.

Baker N.E. and Baker E.M. (in prep.), The Tanzanian Bird Atlas. http://home.no.net/stenil1/TZbirdatlas/tzatlas.htm.

Baker, N.E. and Baker, E.M. (in prep) Birds of Tanzania: An Atlas of Distribution and Seasonality. http://home.no.net/stenil1/TZbirdatlas/tzatlas.htm

Baker, N.E. and Baker, E.M. 1992. Four Afrotropical migrants on the East African coast: evidence for a common origin. *Scopus* 15(2): 122-124.

Baker, N.E. and Baker, E.M. 2001. Tanzania. In Fishpool & Evans. Important Bird Areas of Africa.

Barnes, K.N. (ed.) 1998. The Important Bird Areas of southern Africa. BirdLife South Africa, Johannesburg.

Barnes, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

Bennun, L.A. 1987. Ringing and recapture of Spotted Ground Thrushes Turdus fischeri at Gede, Kenya coast: indications of site fidelity and population size stability. Scopus 11 (1). 1-5.

Bridges, C.A., 1994. Catalogue of the family-group, genus-group and species-group names of the Odonata of the World. Urbana, Bridges.

Britton, P.L. (ed.) 1980. Birds of East Africa. Nairobi: EANHS.

Burgess, N.D. and Clarke, G.P. (eds) 2000. The Coastal Forests of Eastern Africa, IUCN Conservation Programme, Gland, Switzerland and Cambridge, England.

Caras, T. 2001. Status of the marine habitat and resources adjacent to the Rufiji River outflow. REMP Technical Report 27.

Cavalier, M., 2003. Fisheries assessment in the lower Rufiji River floodplain, Tanzania. REMP-report.

Chen, H., and P. P. G. Dyke, 1998. Multivariate time-series model for suspended sediment concentration. Continental Shelf Research 18: 123-150. In Ochieng, 2002.

Clarke, G.P. and Dickinson, A. 1995. Status Reports for 11 Coastal Forests in Coast Region, Tanzania. FRONTIER-TANZANIA Technical Report No. 17. The Society for Environmental Exploration and University of Dar es Salaam.

Clarke, G.P., 2000. Climate and climatic history. Coastal Forests of Eastern Africa. Burgess, N.D.&G.P. Clarke. Gland, Switzerland & Cambridge, UK, IUCN: 47-67.

Clarke, G.P., 2000. Defining the eastern African Coastal Forests. Coastal Forests of Eastern Africa. Burgess, N.D.&G.P. Clarke. Gland, Switzerland & Cambridge, UK, IUCN: 9-26.

Clausnitzer, V. & K.-D. Dijkstra, in prep. The dragonflies of East Africa - An identification key. Annales du Musée royal de l'Afrique centrale (Zoologie).

Clausnitzer, V. & M. Lindeboom, 2002. Natural history and description of the dendrolimnetic larvae of *Coryphagrion grandis* (Odonata). International Journal of Odonatology 5(1): 29-44.

Clausnitzer, V. 2003a Dragonflies of the Rufiji Delta. REMP report.

Clausnitzer, V., 2002. Afrotropical Region: Eastern Africa. IUCN Odonata Specialists Group: Regional Report. Gland, Switzerland.

Clausnitzer, V., 2002. Reproductive behaviour and ecology in the dendrolimnetic *Hadrothemis scabrifrons* (Odonata: Libellulidae). International Journal of Odonatologogy 5(1): 15-28.

Clausnitzer, V., 2003b. Dragonfly communities in coastal habitats of Kenya: indication of biotope quality and the need of conservation measures. Biodiversity and Conservation 12: 333-356.

Clausnitzer, V., 2003c. Odonata of African forests. Cimbebasia in press.

Clausnitzer, V., 2003d. *Teinobasis alluaudi* Martin, 1896 from mainland Africa. Notes on ecology and biogeography. Odonatologica 3: in press.

Collar, N.J., Crosby, M.J. and Stattersfield, A.J. 1994. Birds to Watch 2: The world list of threatened birds. BirdLife Conservation Series No. 4. Cambridge: Birdlife International.

Durand, 2003. Implementation of the Rufiji Forest Action Plan. With Special Emphasis on Community Based Natural Resources Management and a Case Study of Ngumburuni Forest. REMP Technical Report 45.

Fishpool, L.D.C. 1997. Important Bird Areas in Africa, IBA Criteria, Categories, Species Lists and population Thresholds. Cambridge: Birdlife International

Fjeldsa, J. & J.C. Lovett, 1997. Geographical patterns of old and young species in African forest biota: the significance of specific montane areas as evolutionary centres. Biodiversity and Conservation 6: 325-346.

Fjeldsa, J., D. Ehrlich, E. Lambin & E. Prins, 1997. Are biodiversity "hotspots" correlated with current ecoclimatic stability? A pilot study using the NOAA-AVHRR remote sensing data. Biodiversity and Conservation 6: 401-422.

Fraser, F.C., 1956. *Pseudagrion superbum, Gynacantha flavipes* and *Gynacantha immaculifrons*, three new species of Odonata from the Belgian Congo. Revue de Zoologie et de Botanique Africaines LIV(3-4): 382-387.

Fry, C.H., Keith, S. & Urban, E.K. (Eds.) 2000. *The Birds of Africa* Vol. VI. Academic Press. London.

Germain, L. 1913 Contributions a la fauna malacologique de l"Afrique equatoriale: 39 An noveau genre d'Helicidae de l"Est Africain. **Bull. Mus. Natn. Hist. Nat., Paris** 19: 349-352.

Germain, L. 1918 Contributions a la faunae malacologique de l"Afrique Equatoriale, XLIV. Mollusques terrestres receullis dans les provinces de Kilwa et de Mahenge. **Bull. Mus. Hist. Nat. Paris** 22: 243-259.

Gentry, A.H., 1993. Diversity and floristic composition of lowland tropical forest in Africa and South America. Biological Relationships between Africa and South America. Goldblatt, P. Dexter, Michigan, Yale University: 500-547.

Goldblatt, P., Ed. 1993. Biological Relationships between Africa and South America. Dexter, Michigan, Yale University.

Groeneveld, L.F., 2003. Molecular approaches to systematics, speciation, and population genetics of four African damselfly species. Master Thesis, Biology Departement, University of Hannover: 76.

Hilton-Taylor, C. (compiler) 2000. *2000 IUCN Red List of Threatened Species.* IUCN, Gland, Switzerland and Cambridge, UK. xviii + 61pp.

Holsten, B., Braunlich, A. and Huxham, M. 1991. Rondo Forest Reserve, Tanzania: an ornithological note including new records of the East Coast Akalat *Sheppardia gunningi*, The Spotted Ground Thrush *Turdus fischeri*, and the Rondo green Barbet *Stactolaema olivacea woodwardi*. Scopus 14: 125-128

Howard, P.C., P. Viskanic, T.R.B. Davenport, F.W. Kigenyi, M. Baltzer, C.J. Dickinson, J.S. Lwanga, F.A. Matthews & A. Balmford, 1998. Complementarity and the use of indicator groups for reserve selection in Uganda. Nature 394: 472-475.

Howell, K., Msuya, C. & Kihaule, P. 2000 A Preliminary Biodiversity (Fauna) Assessment of The Rufiji Floodplain and Delta. REMP Technical Report 9.

Kasigwa, P.F. 1975 Studies on the ecological genetics of the land snail *Sitala jenynsi* (Pfr.). MSc thesis, University of Dar es Salaam.

Kasigwa, P.F. 1991 Diet and its ecological implications in the East African arboreal snail, *Sitala jenynsi* (Pfr.) (Gastropoda Pulmonata, Ariophantidae). **J. Afr. Zool.** 105: 81-95.

Kingdon, J. 1974. *East African Mammals. vol. II part A (Insectivores and Bats)*. Academic Press, London. New York.

Kingdon, J., 1989. Island Africa. Princetown, Princetown University Press: 287.

Lieftinck, M.A., 1962. Insects of Micronesia. Odonata. Insects of Micronesia 5(1): 1-95.

Mackworth-Praed, C.W. and Grant, C.H.B. 1957, 1960. African handbook of birds, Series 1, vols 1 & 2. Birds of eastern and north eastern Africa. 2nd Edition. London. Longmans, Green & Co.

Mbilinyi N., Mbilinyi F. and Mbilinyi M. Baker E.M, (2002), *A preliminary bird survey of the Kichi Hills forest*. REMP Report.

Mlingwa, C.O.F, Waiyaki, E.M., Bennun, L.A. & Burgess, N.D. 2000. Birds. In: Burgess, N.D. and Clarke, G.P. (eds.) (2000), The *Coastal Forests of Eastern Africa.* IUCN Forest Conservation Program. Gland, Switzerland and Cambridge, England. Pp. 149-171.

Muir, C. Sallema, A., Abdullah, O., DeLuca, D., Davenport, T. (2003) The Dugong (*Dugong dugon*) in Tanzania: A national assessment of status, distribution and threat. Wildlife Conversation Society. pp 31

Mwalyosi R.B.B., 1990. Resource potentials of the Rufiji River Basin, Tanzania. AMBIO Vol. 19 (1) pp 16-20. In Ochieng, 2002.

Mwasumbi, L,. Suleiman, H. & Lyaruu, V. 2000 A Preliminary Biodiversity (Flora) Assessment of selected Forest of the Rufiji Floodplain

Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B.D. Fonseca & J. Kent, 2000. Biodiversity hotspots for conservation priorities. Nature 403: 853-858.

Ochieng, C. 2002. Research Masterplan for Rufiji Floodplain and Delta. REMP Technical Report 28.

Perkin, A., 2002. Galago and nocturnal mammal surveys within the Rufiji Environmental Management Project area. Survey Report. (see Appendix 2)

Pijnappel, H., 2002. Lakes of the Lower Rufiji Floodplain, Tanzania. The water balance of Lake Lugongwe and the ecohydrological connectivity of the Rufiji lakes with the Rufiji River. University of Nijmegen – Department of Environmental Studies (unpubl.), 170 pp. (Pij 02)

Pinhey, E., 1969. Two new species of Zygoptera (Odonata). Novos Taxa Entomologicosd 66: 3-7.

Pinhey, E., 1981. Checklist of the Odonata of Mocambique. Occasional Papers. National Museum of Southern Rhodesia (B)6(8): 557-631.

Pomeroy, D., Ed. 1995. Using distributional data for conservation: How well will Uganda's protected areas conserve the country's wildlife? Conservation of biodiversity in Africa: Local initiatives and institutional

roles. Proceedings of a conference held at the National Museums of Kenya, 30 August-3 September 1992. Nairobi, National Museums of Kenya.

Pomeroy, D., H. Tushabe & M. Green, 1999. Using biodiversity data to review coverage of Uganda's forests. Journal of East African Natural History 88(1&2): 41-57.

Richmond, M. 2002. An Analysis of smallholder opportunities in fisheries, coastal and related enterprises in the floodplain and delta areas of the Rufiji River, Tanzania. REMP Technical Report 25.

Seddon, M.B., Tattersfield, P. & Ruparelia, B. 1996 Darwin Initiative Manual for Research on Molluscan Biodiversity Conservation: From Survey to Analysis. Prepared for a training course held at National Museum of Kenya 9-14 September 1996. Unpublished report.

Semesi, 1991. Management Plan for the Mangrove Ecosystem of Mainland Tanzania: Vol. 7 Mangrove Management Plan of Rufiji Delta. Forest and Beekeeping Division, MNRT Dar es Salaam. (Sem91)

Songas, 2002. Assessment of the Flora Biodiversity along the Songo Songo Gas to Electricity Pipeline Corridor. Songas Dar es Salaam.

Stattersfield, A.J., Crosby, M.J., Long, A.J. and Wege, D.C 1998. Endemic Bird Areas of the World. Cambridge: Birdlife International

Stuart, S.N. & Van der Willigen, T.A. 1979. *'Report of the Cambridge Ecological Expedition to Tanzania, 1978'*. photocopy 77 pp.

Stuart, S.N., R.J. Adams & M.S. Jenkins, 1990. Biodiversity in sub-saharan Africa and its islands - conservation, management and sustainable use. Gland & Cambridge, IUCN: 242.

Tattersfield, P. 1997 Biodiversity and Conservation of Land Molluscs (Snails and Slugs) of Forests of Tanzania. Contribution no. 2-Studies in Eastern Arc Forests. Unpublished report to COSTECH.

Verdcourt, B. 1983 Checklist of the non-marine molluscs of East Africa. **Achatina** 22: 200-239.

Verdcourt, B. 1993 A new species of *Gulella* Pfeiffer from southern Tanzania. **Arch. Moll**. 121: 87-90. (Kiwengoma Forest)

Verdcourt, B. in press.2000. Slugs and snails of the coastal forests. In Biodiversity and Conservation of coastal Forests of East Africa. Burgess, N.D. & Clarke, P. (eds).

10 Appendices

10.1 Appendix 1: Rufiji Odonates

DRAGONFLIES OF RUFIJI DISTRICT

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SUMMARY

The dragonfly fauna of the Rufiji District was studied during several field trips (13-15 September 2001, 16-21 October 2001, 04-13 May 2002, 02-08 February 2003). Various habitats were visited (Mtanza-Msona, Ikwiriri, Lake Ilu, Kichi Hills, Kiwengoma, Nyamwete, Ngumburuni Forest) during the rainy and dry season.

A total of 69 species were recorded, of which 6 are habitat specialists confined to coastal forests of Eastern Africa (Coryphgagrion grandis, Ceriagrion mourae, Teinobasis alluaudi, Gynacantha usambarica, Hadrothemis scabrifrons, Thermochoria jeannel). Two species were recorded for the first time since their type descriptions from Mozambique in 1969 (Ceriagrion mourae), and from the Democratic Republic of Congo in 1959 (Gynacantha immaculifrons).

The majority of the species are common and widespread and inhabit the Rufiji River and its floodplains, while a smaller proportion are only found in permanent streams draining into the Rufiji or in forest habitats. The high overall species diversity is a result of the variety of habitats and their connectivity, combined with the dynamics of the floods. The habitat specialists found in Ngumburuni forest and in the forests of the Kichi and Kiwengoma Hills are globally endangered species and require special attention in regard of conservation efforts.

1 General Introduction

In order to meet the objectives of "The Convention on Biological Diversity" (CBD, 2000; http://www.biodiv.org /convention/articles.asp) the assessment of signatory country's biodiversity and its conservation are important. There are several shortcomings realising this, especially if focusing on invertebrates in tropical countries, as the following citations show: "To meet the needs of conserving biodiversity, a country's Protected Area system should support as many as possible of the species occurring in that country. However, as yet no country [of Africa] has comprehensive information about these species." (Pomeroy 1995, p. 362); a "major obstacle to conserving tropical biodiversity is the lack of information as to where efforts should be concentrated" (Howard et al. 1998, p. 472). Nevertheless the knowledge and database for African Odonates are comparatively good and enable attention to be focused on critical species and critical habitats.

1.1 Dragonflies as tools for wetland assessment, monitoring and conservation planning

With their amphibious habits dragonflies are indicators of both, aquatic and terrestrial habitat quality of wetlands, which are seriously under-represented in conservation planning in East Africa (Pomeroy et al. 1999). Dragonflies spend their larval life in aquatic habitats and as imagoes use a wide range of terrestrial habitats. Their sensitivity to physical habitat quality makes dragonflies useful indicators of habitat quality above and below the water surface. Water quality, aquatic habitat morphology, such as bottom substrate and vegetation structure are critical to dragonfly larvae. Adult habitat selection is strongly dependent on vegetation structure, including degrees of shading. As a consequence dragonflies are greatly affected by habitat change, such as thinning of forest and increased erosion. Ubiquitous species prevail in disturbed or temporary waters, while pristine streams, seepage and swamp forests harbour a wealth of more vulnerable, often localised species.

Different ecological requirements are linked to different dispersal capacities. Species with narrow niches disperse poorly, while pioneers of temporal habitats (often created by disturbance) are excellent colonisers. For this reason Odonata have a potential use to evaluate habitat connectivity. The success of proposed linkages of protected areas through the creation of forest corridors may thus be assessed. Dragonflies are an easy-to-study group to monitor the overall biodiversity of aquatic habitats.

Ecological advantages of dragonflies as environmental monitors are:

- Their amphibious habits make them indicators of both aquatic and terrestrial habitat quality.
- Larvae site selection is closely correlated with erosion-related factors like streambed morphology, substrate and turbidity.
- Adult site selection is closely correlated to deforestation-related factors such as vegetation structure and forest cover.
- A full array of ecological types, from pioneers to specialists, occurs within the Odonata.

Practical advantages of Odonata as environmental monitors are:

- Aquatic habitats are the focal point of dragonfly life histories, making them easily found.
- Their diurnal activity and high densities make dragonflies easy to study.
- Extensive experience with monitoring Odonata has been obtained in Europe and elsewhere.
- The number of dragonfly species occurring in East Africa is manageable.
- Identification is straightforward as Odonate taxonomy is clear-cut.
- Due to their attractiveness, dragonflies can serve as flagship of invertebrates and watershed conservation.

1.2 Coastal forests

Once the Eastern African Coastal Forests covered most of the East African coastal plains from north Mozambique to south Somalia. The width of this "Coastal Forest Belt" was very variable, from 30 km at the Kenya/Tanzania border to 300 km in Mozambique, reaching well into Malawi. Now this belt is reduced to over 250 small to very small separated forest patches, often of less than 500 ha in size (Burgess & Clarke, 2000). These remaining small and highly fragmented forest patches have an exceptionally high degree of localised endemism, they differ in structure and species composition due to physical conditions, they are extremely vulnerable and rapidly being degraded. The remaining coastal forests in East Africa are listed as ‘critical sites’ by IUCN and are not adequately represented in the present day protected area system (Stuart et al., 1990).

2 Methods

The area surveyed for dragonflies in Rufiji District is roughly between Kibiti, Kiwengoma, Kichi and Msona (Table 1). The classification of the forests follows Clarke (2000). Dragonflies were caught by sweep-netting in different habitats and identified with Clausnitzer & Dijkstra (in prep.); photographs of most species were taken. For some crepuscular species special efforts were made to establish presence or absence by searching for adults and larvae.

Table 1: Localities visited in Rufiji District.

Localities	Dates
Kichi Hills	16-18 Oct '01, 06-13 May '02
Nyamwete Forest	18-20 Oct '01
Kiwengoma	20-21 Oct '01, 02-03 Feb '03
Ngumburuni Forest	08 Feb '03
Lake Ilu	04 Feb '03
Lake Lugogwe	07 Feb '03
Ruhoi River	08 Feb '03
Lake south-east of Kichi Hills	11 May '02
Rufiji River	13-15 Sept '01, 04-05 May '02, 04 Feb '03
Floodplain of Rufiji	04-05 May '02
Lake Mtanza	14-15 Sept '01
Msona Forest	13 & 15 Sept '01
Msangazi Gallery Forest	14 Sept '01

3 Results and discussion

3.1 Habitats surveyed

Most important for dragonflies is the habitat variety and connectivity found in Rufiji District. Most dragonflies depend on more than one of these habitat types during their adult life. Many species use the floodplains of the Rufiji for reproduction and the forest areas as feeding grounds. Though the majority of the dragonflies are common and widespread species, the area harbours a comparatively high number of coastal forest specialists with a very restricted distribution range and/or a high level of data deficiency. Some of the most threatened species depend entirely on the indigenous forests of the Rufiji and are discussed in detail below.

3.1.1 Rufiji River

The Rufiji River itself is a typical African river with no aquatic vegetation, a high substrate dynamic and high fluctuation in water levels. Dragonflies found along the Rufiji River are common species, which are often widespread in Africa and inhabit rivers in savannah, bush and woodland. Most of these species depend on the surrounding habitats (forests and woodlands) for their maiden flight and as feeding grounds.

3.1.2 The Floodplain

The floodplain itself attracts large numbers of migratory species, which follow the rains (e.g. *Anax ephippiger, Pantala flavescens*, *Tramea basilaris*, *Rhyothemis semihyalina*). Some species are confined to the floodplain areas for their entire lifespan (e.g. *Pseudagrion lindicum*) and appear in vast numbers during the floods. Many species spend the dry season along the river and around the permanent lakes and then spread during the floods into the whole area.

Although most of these species are very common and widespread in large parts of sub-Saharan tropical Africa, they play an important role in the ecosystem of the Rufiji River and its floodplains. Dragonflies are predators largely to other insects in both life stages (adult and larvae), at the same time they are prey for fish and birds. The seasonality and enormous fluctuations of the water levels in the Rufiji floodplain lead to high productivity of many organisms. Humans profit from this high productivity largely in terms of fish and fertilization of their fields. Disturbances such as reduction of flood amplitude, destruction of forests, over-fishing etc would make this ecosystem collapse. Knowledge about the whole ecosystem is insufficient to understand the reasons for such changes. A drastic decrease in fish might be the result of forest destruction in the adjacent hills of the floodplain.

3.1.3 Eastern African Coastal Riverine/Groundwater/Swamp Forest

These forests have a high groundwater table and/or a poor drainage. In Rufiji District they are found in the floodplain itself. Since the underlying soil is often clay, these forests have often been cleared for agriculture, usually into rice fields, as in most parts of Eastern Africa. In Rufiji District some good patches of this forest remain e.g. the Ngumburuni Forest and the forests around Lake Ilu. Species confined to this forest habitat are threatened as they have a very limited and disjunct distribution (e.g. *Teinobasis alluaudi*, *Thermochoria jeanneli*).

3.1.4 Eastern African Coastal Dry Forest

These forests are semi-evergreen or evergreen forests with a high to medium (down to 7m) forest canopy. Soils are usually poor and well-drained, which allow shifting cultivation at best. Rainfall can be very unpredictable and might be very low in some years, making permanent substantial agriculture difficult. Most of the forests visited belong to this type (Kichi, Kiwengoma, Nyamwete). In depressions and valleys seasonal pools and swamps are found, which are an important breeding habitat for the dragonflies found in this forests. The dominating dragonflies belong to the large and crepuscular genus *Gynacantha* (Dusk-Hawkers). Two other species worth mentioning are *Coryphagrion grandis* and *Hadrothemis scabrifrons*, which reproduce in phytotelmata and spend the dry season as adults. Species found in these forests have a limited distribution, are often confined to the East African Coastal forests and of regional and global importance.

3.1.5 Seasonal streams in the Eastern African Coastal Dry Forest

Situated in the otherwise dry forest matrix in the Kichi and Kiwengoma Hills, these streams are interesting in terms of ecology and adaptation to high seasonality of otherwise widespread and non-seasonal dragonflies. Despite several attempts, the author failed to survey the streams in the rainy season, so species composition information is incomplete. Nevertheless some interesting dry season observations were made and resulting conclusions are outlined below.

The streams in Kiwengoma and Nyamwete Forest and in the Kichi Hills are dry for most of the year, usually for 8 months or more (Elibariki, pers. com.). The sandy bottom and the structure of surrounding substrate and vegetation show that the streams must be very fast and clear in the rainy season. Unfortunately I never managed to visit these streams when filled with water. Males and females of the widespread river species *Phaon iridipennis* were found in high number along the dry stream beds. Their behaviour was exactly the same as the behaviour of specimen along streams with permanent water (e.g. Ruhoi River), where this species is not seasonal. The observations allow speculations about an adult life span of one year or more and a very rapid development from egg to adult in a few weeks time only. These are all new aspects with regard to longevity and larval development. It would be interesting to find out, which other species are adapted to this highly seasonal habitat with fluctuating amount and length of surface water. One *Trithemis aconita* was observed in the Kiwengoma Forest during the dry season in October. It must have emerged from one of the streams in May or earlier. More species, e.g. Gomphids, are expected to be adapted to the seasonality of the streams, spending the dry season in the East African Coastal Forest areas and returning to the streams during the rains.

3.1.6 Permanent streams

Apart from the Rufiji River, there are not many permanent streams in the study area. The Ruhoi River, which is a clear, fast flowing stream with sandy substrate, was the only permanent stream surveyed in this study. A number of Gomphid species were recorded only from this locality. It is expected that these species spread into the seasonal streams in the Eastern African Coastal Dry Forests in the rainy season.

3.1.7 Eastern African Coastal *Brachystegia* Forest *(Miombo)*

This forest type is mainly found south of the Rufiji River. Most dragonflies recorded here are ubiquitous and widespread species, which take advantage of pools, swamps and puddles in the rainy season. The finding of *Ceriagrion mourae*, which was the second specimen recorded of this species allows speculations that it is adapted to the otherwise not very suitable habitats of dry Miombo forest (some information about the species is given below).

3.1.8 Permanent lakes (e.g. Lakes Ilu, Mtanza, Uba and Lugongwe)

The lakes, though an important habitat within the floodplain, have not been surveyed systematically for dragonflies. Due to their permanency, a high number of often common and widespread dragonflies are found here, which spread into the entire floodplain during the rainy season. The lakes act therefore, as a kind of reservoir of non-seasonal species.

The results from the lakes are grouped together in Table 2 because the lakes were not surveyed intensively during the survey, instead the main focus was on the various forest habitats (see also Table 1). Nevertheless from the occasional visits to the lakes it became obvious, that a comparative study of the lakes would result in differences in the species composition. This would be mainly related to the very different shoreline structures and aquatic vegetation. The shoreline vegetation ranged from forest, dense thicket, reeds and grasses to hardly any vegetation cover. A similar variety was found in the aquatic vegetation, which ranged from reeds, swamps, herbs and floating plants to none. A very common species in thickets around the lake was *Gynacantha manderica*, which breeds in the flood-zone of the lakes during the wet season.

3.2 Critical species

Seven species will be red listed in the global IUCN Red List in due course (highlighted in Table 2). Most of them occur exclusively in East African Coastal Forests and will disappear with increasing forest destruction. All these species are of regional and global importance because they are endemic

to coastal forests of Eastern Africa with a very restricted distribution and/or hardly any records of these species exists. First studies on population genetics could show, that the remaining, often isolated populations of the once continuous coastal forest belt are already genetically isolated.

3.2.1 *Teinobasis alluaudi*

The very recent discovery of this species in the Ngumburuni Forest is exciting, as it is only the second record of *Teinobasis alluaudi* for the African mainland, the other being from the Buda Forest in south-east Kenya. All other records are from Indian Ocean Islands, though the single Malawi record of *Teinobasis malawiensis* Pinhey, 1966 might turn out to be the same species (Clausnitzer 2003c). *Teinobasis alluaudi* need shady forest with seasonal swampy areas and dense understory between 1 and 2 m in height. It is usually associated with palm trees, e.g. *Raphia farinifera* and *Elaeis guineensis*.

The discovery of this species is of biogeographical interest as well. The genus *Teinobasis* has its centre of diversity in Eastern Australasia (especially New Guinea, as well as Indonesia and the Philippines). Some insular endemics occur across the Pacific, but the genus is absent from the Indian Subcontinent. Lieftinck (1962) assumed the Philippine Islands and New Guinea to be the principal centres of dispersal. Currently about 65 species are recognized (Bridges 1994), of which only 2 occur in Africa.

3.2.2 *Gynacantha*

All *Gynacantha* species breed in seasonal pools and swampy places in the forest areas. The females oviposit into the still dry soil of seasonal swamps, pools and puddles when the rains approach. The larvae have an unusually fast development, which is necessary for emergence before the pool dries out again. The whole genus is confined to forest or dense bush with a radiation centre in the vast rain forest areas in Central Africa.

In the Kichi Hills large numbers of *Gynacantha* were observed hunting in the evening ("Dusk-Hawker"). Three different species were caught there and it would be interesting to know if they use the same breeding habitats and to elucidate how interspecific competition of the very large and very greedy larvae works.

3.2.3 *Gynacantha usambarica*

Gynacantha usambarica was thought to be endemic to coastal forests of Eastern Africa (Tanzania and Kenya), but recent studies revealed, that the South African *Gynacantha zuluensis* (Balinsky, 1961) is a synonym to *G. usambarica* (Clausnitzer & Dijkstra in prep.). Therefore *Gynacantha usambarica* inhabits the entire Coastal Forest Belt from South Africa to Kenya, including Malawi. It depends on seasonal swampy forest areas and, though not yet threatened, a continuing destruction of these forests will result in a decline of this species and further isolation of more populations.

3.2.4 *Gynacantha immaculifrons*

The record of *Gynacantha immaculifrons* in the Kichi Hills is a big surprise and some time was taken to confirm the identification (specimens were compared with the types in the Musée Royal du Congo Belge, Tervuren). The species was described by Fraser (1956) from a male and a female caught near Lubumbashi, Democratic Republic of Congo. No further specimens of this species have been caught except the three males and one female obtained during the surveys in the forests of the Kichi Hills. These specimens were only found in the least disturbed forest areas around the top of the Hills, which have recently been penetrated and largely opened up by a new road towards southern hunting sectors in the Selous Game Reserve. Nothing is known about the ecology of this species, e.g. where it breeds, but I assume, that it depends on seasonal swampy areas in depressions of the Kichi Hills. In respect of the paucity of records of this species, the new locality is very exiting. This species will be red listed in due course.

3.2.5 *Thermochoria jeanneli*

Another typical inhabitant and endemic of East African coastal swamp forest is *Thermochoria jeannelli*. Not much is known about the biology of this species, but it seems to have developed some unusual reproductive behaviour when compared to the general Libellulidae pattern. In a

coastal swamp forest in South Kenya (Buda Forest) I observed a territorial male in a still dry *Raphia* swamp at the beginning of the rainy season. At the same time *Teinobasis* and *Gynacantha* were already busy ovipositing in the dry mud. After two weeks, when the swamp was filled with water, none of the species was observed to be reproductively active. It might be, that *Thermochoria* oviposits into or onto dry mud like *Gynacantha* and *Teinobasis*, which would be the first observation of this oviposition pattern in the Libellulidae.

3.2.6 *Coryphagrion grandis*

This is one of the most interesting species of the East African coastal forests, which is the largest damselfly of Africa. It was placed for convenience into the Megopodagriidae, but recent morphological and genetic studies revealed, that it belongs into the otherwise strictly neotropical family Pseudostigmatidae (Clausnitzer & Lindeboom 2002, Groeneveld 2003). *Coryphagrion grandis* shares with its neotropical relatives the giant size, the reproduction in phytotelmata, a slow flight and the feeding behaviour (gleaning prey out of spider webs) and belongs genetically in the pseudostigmatid clade. This is of high biogeographic significance, since *C. grandis* is then an afrotropical relict of Gondwana (Goldblatt 1993), which was separated from the neotropical Pseudostigmatidae about 120 million years ago and remained surprisingly similar to the latter in terms of ecology, morphology, genetics and behaviour. The exclusive occurrence of *Coryphagrion grandis* in East Africa and not in West Africa, as one would expect, can be explained with climatic stability in Eastern Africa and the changes of forest cover in Africa. The coastal forests of Eastern Africa are considered to be partial relicts of the former pan-African tropical forest (Fjeldsa et al. 1997, Fjeldsa & Lovett 1997). These forests are believed to have been climatically stable during Ice Age periods unlike the forests in West Africa, based on estimates of the water temperature of the Indian and the Atlantic Ocean. West African *Coryphagrion* populations may have become extinct during colder periods, which resulted in a decline of rain and therefore a decrease of forest cover in West and Central Africa (Clarke 2000). Additionally, during colder periods at the equator much of tropical Africa may have cooled to below the tolerance levels of tropical stenothermic species, and this may have led to random extinctions in the African rain forests (Colinvaux, 1993). Similarly Gentry suggests "… that Madagascar is floristically more similar to the Neotropics than tropical Africa is" (Gentry 1993), in detail a certain plot in Madagascar shares 40% of plant genera with the Neotropics, but only 31% with tropical Africa.
Now, due to massive destruction of the once continuous coastal forest belt, the remaining populations of *Coryphagrion grandis* are highly isolated. A recent study on the population genetics of this species revealed two interesting results:

- Climatically instable areas like the Arabuke Sokoke Forest must have been re-colonized more recently from more southern populations, where higher elevations guaranteed survival even during serious droughts;
- Rufiji populations show a higher genetic distance to all other populations (Udzungwa and Usambara Mts, Buda and Gongoni Forest, Shimba Hills, Arabuke Sokoke Forest), with low intraspecific divergence.

Surprisingly the Udzungwa Mts population groups with the populations from the Usambara Mts and the Kenyan coastal forests, whereas the Rufiji population is highly isolated from more northern coastal and the Eastern Arc populations. Though the Udzungwa Mts are further south than Rufiji District, the chain of the Eastern Arc Mts must have been an easier stepping stone for *Coryphagrion grandis* towards the north Kenyan populations, then along the coast. The connection from the Rufiji populations to the more northern populations has been disrupted longer ago. Unfortunately the populations from Kiwengoma and Kichi Hills and from the Udzungwa Mts are the most southerly populations known so far, although the author expects population in suitable habitats all the way down to at least mid Mozambique. It would be interesting to see, if the cryptic speciation observed splits the south coastal populations from the Eastern Arc and north coastal populations.

From all forests visited by the author along the East African coast, the ones in Rufiji District, namely Kichi Hills had the largest population of *Coryphagrion grandis*. It might be, that the forests in the Rufiji District hold the world's largest population of these species.

3.2.7 *Hadrothemis scabrifrons*

Hadrothemis scabrifrons reproduces like *Coryphagrion grandis* in phytotelmata (Clausnitzer 2002a). This behaviour, which is common in neotropical dragonflies, is only known to occur in three African species, *Hadrothemis scabrifrons, Coryphagrion grandis* and *Hadrothemis camarensis.* The latter being a central and west African rain forest species. Records of *Hadrothemis scabrifrons* from Gabon and Cameroon are unreliable and have not yet been confirmed. At the moment this species is only known for sure from the East African Coastal Forest Belt. Though *Hadrothemis scabrifrons* is a forest dependent species, individuals are more likely to cross larger open areas than *Coryphagrion grandis* and *Teinobasis alluaudi*, and are likely to be less affected by habitat isolation than all previous species.

3.2.8 *Ceriagrion mourae*

This species was only known from the single type specimen from Mamunge (Mozambique, S19°52'/E34°04') (Pinhey 1969, 1981). In this study it was caught in a seasonal puddle in Miombo woodlands (*Brachystegia* Forest) on the southern slopes of the Kichi Hills, which is quite some distance from the type locality. It is assumed that *Ceriagrion mourae* lives in small seasonal puddles in the East African Coastal *Brachystegia* Forest. More records and data are definitely needed.

4 Conclusions

Dragonfly diversity in Rufiji District is largely a result of the connectivity between different unique habitats and the hydrological dynamics. Most species utilise more than one of the different habitats during their lifecycle. Three large groups in respect to their ecological requirements can be differentiated roughly:

- Stream species (found exclusively along the Ruhoi River)
- Forest species (found exclusively in one or several of the East African Coastal Forest types)
- Ubiquitous open land species (found all over the floodplain in the rainy season and along the Rufiji, around the lakes or in the surrounding forest, bush and woodland in the dry season).

4.1 Threatened species

The species highlighted in Table 2 are of regional and of global importance and require special conservation attention. All these species are confined to coastal forests and will be red listed in the global Red List by the IUCN in due course. The situation for some of these species is given in some more detail in Clausnitzer (2002a, b; 2003a, b, c; & Lindeboom 2002). The high fragmentation of coastal forests has resulted in small isolated populations of these forest dragonflies, especially in species, which do not cross any open areas, e.g. *Teinobasis alluaudi* or *Coryphagrion grandis*. This fragmentation of primary habitats and isolation of populations is already reflected in the population genetics, as outlined for *Coryphagrion grandis*.

4.2 Conservation measures

The most important step concerning the remaining coastal forest patches is to at least guarantee protection for the officially gazetted forest reserves, which is not the case at the moment. The coastal forests all along the East African coast, which once formed a belt all along the coast from southern Somalia to northern South Africa have faced massive destruction of the last 100 years. The forests in Rufiji District are still comparatively large and intact, if compared to other regions, but nibbled away at an alarming rate. Daily dozens of charcoal lorries and several timber lorries loaded in the Rufiji District pass Kibiti on their way towards Dar es Salaam. The opening of the first bridge across the Rufiji River at Ikwiriri at the end of 2002 will put an enormous pressure on the forests south of the Rufiji, namely in the Kichi Hills and Kiwengoma.

The protection of the last remaining forests, especially in the hills adjacent to the floodplain of the Rufiji, are also important to provide sufficient water during the dry season for people living in this area and to protect the floodplain from catastrophic floods. These forests function as important water reservoirs, holding water in the rainy season and releasing water slowly in the dry season.

4.3 Conservation of East African Coastal Forests in general

“By conserving Coastal Forests a great part of Africa’s biodiversity will be protected“ (Burgess & Clarke 2000, p. 7). Coastal forests are listed as important areas in terms of conservation for East Africa (Stuart et al. 1990) and are a major centre of endemism in Africa (Kingdon 1989, Fjeldsa & Lovett, 1997). One reason for the very high level of endemism, including neodendemics as well as biogeographical relicts in coastal forests and forests of the Eastern Arc Mountains, with which they often merge, is their relative climatic and habitat stability (Fjeldsa et al., 1997). Generally, coastal forest areas contain many unique species and their protection deserves attention. Because of their high biodiversity and high levels of ‘taxa’ endemism they should receive high priority in conservation efforts. Once, these coastal forests covered most of the East African coast from north Mozambique to south Somalia. Now this belt is reduced to over 250 small to very small separated forest patches, often of less than 500 ha in size (Burgess & Clarke, 2000). These small and highly fragmented remaining forest patches have an exceptionally high degree of localised endemism, differ in structure and species composition due to physical conditions and are extremely vulnerable and rapidly being degraded. For example the Eastern Arc and Coastal Forests of Tanzania and Kenya cover an area of 2,000 km² today, which is only 6.7 % of their original extent (Myers et al. 2000).

Coastal forests of Kenya, Tanzania and Mozambique are centres of endemism, hardly protected and in urgent need of a priority status in conservation measures. Further destruction of the remaining coastal forests will threaten a high number of species, including dragonflies, with extinction.

5 References

Bridges, C.A., 1994. Catalogue of the family-group, genus-group and species-group names of the Odonata of the World. Urbana, Bridges.

Burgess, N.D. & G.P. Clarke, Eds. 2000. Coastal Forests of Eastern Africa. Gland, Switzerland & Cambridge, UK, IUCN.

Clarke, G.P., 2000. Climate and climatic history. Coastal Forests of Eastern Africa. Burgess, N.D.&G.P. Clarke. Gland, Switzerland & Cambridge, UK, IUCN: 47-67.

Clarke, G.P., 2000. Defining the eastern African Coastal Forests. Coastal Forests of Eastern Africa. Burgess, N.D.&G.P. Clarke. Gland, Switzerland & Cambridge, UK, IUCN: 9-26.

Clausnitzer, V., 2002a. Afrotropical Region: Eastern Africa. IUCN Odonata Specialists Group: Regional Report. Gland, Switzerland.

Clausnitzer, V., 2002b. Reproductive behaviour and ecology in the dendrolimnetic *Hadrothemis scabrifrons* (Odonata: Libellulidae). International Journal of Odonatologogy 5(1): 15-28.

Clausnitzer, V., 2003a. Dragonfly communities in coastal habitats of Kenya: indication of biotope quality and the need of conservation measures. Biodiversity and Conservation 12: 333-356.

Clausnitzer, V., 2003b. Odonata of African forests. Cimbebasia in press.

Clausnitzer, V., 2003c. *Teinobasis alluaudi* Martin, 1896 from mainland Africa. Notes on ecology and biogeography. Odonatologica 3: in press.

Clausnitzer, V. & K.-D. Dijkstra, in prep. The dragonflies of East Africa - An identification key. Annales du Musée royal de l'Afrique centrale (Zoologie).

Clausnitzer, V. & M. Lindeboom, 2002. Natural history and description of the dendrolimnetic larvae of *Coryphagrion grandis* (Odonata). International Journal of Odonatology 5(1): 29-44.

Fjeldsa, J., D. Ehrlich, E. Lambin & E. Prins, 1997. Are biodiversity "hotspots" correlated with current ecoclimatic stability? A pilot study using the NOAA-AVHRR remote sensing data. Biodiversity and Conservation 6: 401-422.

Fjeldsa, J. & J.C. Lovett, 1997. Geographical patterns of old and young species in African forest biota: the significance of specific montane areas as evolutionary centres. Biodiversity and Conservation 6: 325-346.

Fraser, F.C., 1956. *Pseudagrion superbum, Gynacantha flavipes* and *Gynacantha immaculifrons*, three new species of Odonata from the Belgian Congo. Revue de Zoologie et de Botanique Africaines LIV(3-4): 382-387.

Gentry, A.H., 1993. Diversity and floristic composition of lowland tropical forest in Africa and South America. Biological Relationships between Africa and South America. Goldblatt, P. Dexter, Michigan, Yale University: 500-547.

Goldblatt, P., Ed. 1993. Biological Relationships between Africa and South America. Dexter, Michigan, Yale University.

Groeneveld, L.F., 2003. Molecular approaches to systematics, speciation, and population genetics of four African damselfly species. Master Thesis, Biology Departement, University of Hannover: 76.

Howard, P.C., P. Viskanic, T.R.B. Davenport, F.W. Kigenyi, M. Baltzer, C.J. Dickinson, J.S. Lwanga, F.A. Matthews & A. Balmford, 1998. Complementarity and the use of indicator groups for reserve selection in Uganda. Nature 394: 472-475.

Kingdon, J., 1989. Island Africa. Princetown, Princetown University Press: 287.

Lieftinck, M.A., 1962. Insects of Micronesia. Odonata. Insects of Micronesia 5(1): 1-95.

Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B.D. Fonseca & J. Kent, 2000. Biodiversity hotspots for conservation priorities. Nature 403: 853-858.

Pinhey, E., 1969. Two new species of Zygoptera (Odonata). Novos Taxa Entomologicosd 66: 3-7.

Pinhey, E., 1981. Checklist of the Odonata of Mocambique. Occasional Papers. National Museum of Southern Rhodesia (B)6(8): 557-631.

Pomeroy, D., Ed. 1995. Using distributional data for conservation: How well will Uganda's protected areas conserve the country's wildlife? Conservation of biodiversity in Africa: Local initiatives and institutional roles. Proceedings of a conference held at the National Museums of Kenya, 30 August-3 September 1992. Nairobi, National Museums of Kenya.

Pomeroy, D., H. Tushabe & M. Green, 1999. Using biodiversity data to review coverage of Uganda's forests. Journal of East African Natural History 88(1&2): 41-57.

Stuart, S.N., R.J. Adams & M.S. Jenkins, 1990. Biodiversity in sub-saharan Africa and its islands - conservation, management and sustainable use. Gland & Cambridge, IUCN: 242.

10.2 Appendix 2: Galago and nocturnal mammal surveys within the Rufiji Environmental Management Project area.

Survey Report

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SUMMARY

Surveys for galagos and other nocturnal mammals were conducted in the forests of the Kichi Hills proposed district forest reserve, Mtanza/Msona proposed village forest reserve, Nyamuete forest reserve and Kiwengoma forest reserve. These reserves fall in the project area of the Rufiji Environment Management Project (REMP). At least six species of galago were recorded in these areas, which reflect the variety of habitats and the biodiversity values of the area. Two of the galago species are coastal forest endemics. Records of other mammal, reptile and birds species are also presented. General observations and discussions with local people highlighted the main threats to the Kichi Hills which are; forest clearance for unsustainable agriculture, fire, and logging. The new road built from Utete to the Selous Game Reserve was seen as a problem due the full clearance of a significant area of forest. It will also lead to increased pressure on the forests by attracting more cultivators and by facilitating access to the area for loggers. It is recommended that the road be used positively to promote the conservation of the Kichi Hills forests, for example by the establishment of a nature trails or the posting of sign boards with environmental messages on them.

Aim

To conduct surveys for nocturnal mammals particularly galagos in Mtanza/Msona, Kichi Hills, Nyamuete and Kiwengoma Forest Reserves and in the bordering woodlands, all being within the Rufiji Environmental Management Project (REMP) area.

Background

Galago research and taxonomy

Galagos or bushbabies (super family: Lorisiformes; Sub-family: Galagonidae,), exhibit crypsis (lack of visual distinctiveness) and as a result their taxonomy has long been contentious. Additionally, they exhibit an extremely wide, continuous distribution across sub–Saharan Africa and utilise a multitude of different habitats (including woodlands, forests and wooded savannahs). Their inherent crypsis and ecological variation makes the galagos an ideal study

group for the investigation of levels of variability. This study investigates how galagos vary according to their vocalizations, habitat requirements, body size and colour, and distribution within the forests of East Africa. Samples are also taken to analyse genetic variability.

The main contentions with galago classification over the years have arisen through miss-classification of specimens that possess extremely similar gross anatomical features and body sizes. Problems of miss-identification relate to shortfalls in certain classical taxonomic approaches, such as the use of skeletal measurements and pelage coloration. Such methodologies, although utilised in other groups to great effect over the years, yield less than satisfactory results within the galagos. For example, pelage coloration can show greater differences within species than between them (e.g. the pelage of the thick tailed greater galago, *O. crassicaudatus*, can be grey, black, or brown). Several other disciplines are helping to untangle the taxonomic confusion within this group.

Recent research indicates that the number of galago 'species' therefore, may be underestimated when the differences in vocalizations, reproductive anatomy and genetics are considered (Bearder, Honess and Ambrose, 1995; Kingdon, 1997; Bearder, 1999). A survey conducted in South and South West Tanzania (Honess & Bearder, 1996; Honess, 2000) resulted in the description of two new species: the Matundu galago, *Galagoides udzungwensis* and the Rondo galago *G. rondoensis.* It also resulted in the elevation of *G. zanzibaricus granti* and *G. demidoff orinus* to full species level: *G. granti* (Grant's galago), and *G. orinus* (the mountain galago) respectively. The taxonomic validity of *G. udzungwensis* is currently under review and it is now being treated as a synonym of *G. zanzibaricus* Grubb et al, 2002).

Galagos in the Rufiji river area

The forests of Rufiji are part of the East African coastal forests mosaic that are globally recognized for their biodiversity importance (Burgess & Clarke, 2000; Myers, 2000) and this is being reflected in their galago diversity.

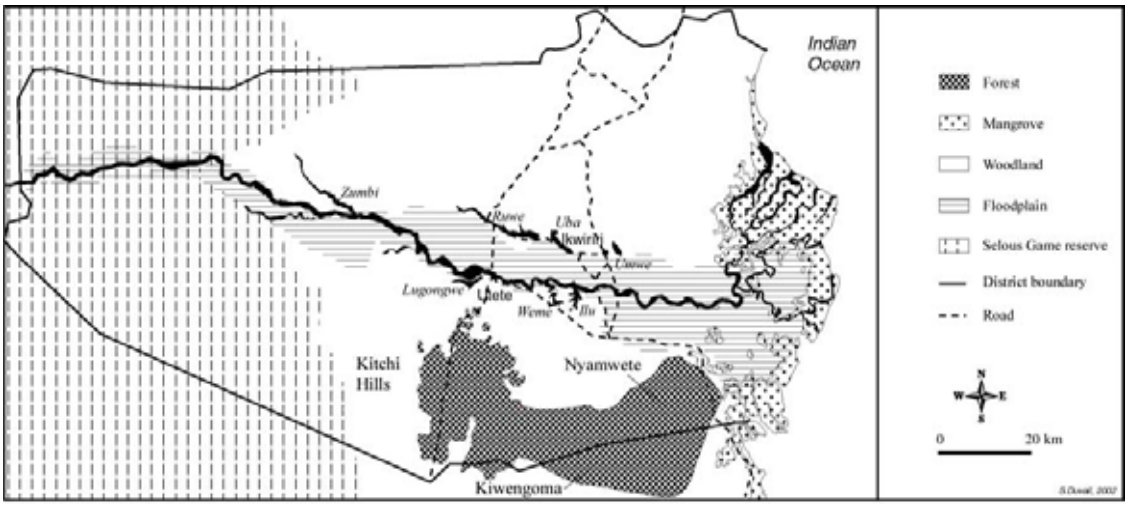

Figure 1. The Rufiji Environmental Management Project area, showing the main vegetation types. The principle study areas south of the R. River were in the Kichi Hills Proposed Forest Reserve, Kiwengoma and Nyamwete Forest Reserves and Mtanza/Msona Forest Reserve (just west of to Lake Zumbi).

Recent mammal surveys conducted (Howell *et al*, 2000) in the Kichi Hills indicated the presence of *Otolemur garnetti, G. zanzibaricus* and possibly the Mwera galago sp. nov (Kingdon, 1997). By using specialised trapping, audio recording and vocalization recognition techniques it is anticipated that further galago identifications can be confirmed.

The areas of forested or wooded habitats immediately either side of the Rufiji river are important localities in terms of galago biogeography, since it has been suggested that the Rufiji and Kilombero Rivers mark the species boundary for the Zanzibar galago *G. zanzibaricus* (to the north of the Rufiji River) and Grant's galago *G. granti* (to the south of the Rufiji River) (Honess & Bearder, 1996; Kingdon, 1997). Therefore, obtaining data from both sides of the Rufiji River and, as close to the river as possible is important as far as these two species are concerned. No research into the common biogeographical boundaries of *G. zanzibaricus* and *G. granti* in the Rufiji area has been conducted to date.

It was also considered that another galago species, the Rondo galago *Galagoides rondoensis,* may be found in the forests of the Matumbi and/or the Kichi hills, and which is of great conservation importance. This species was originally thought be endemic to the Rondo plateau forests in SW Tanzania but has recently been discovered in Pugu/Kazimzumbwe forest reserves (just W of Dar es Salaam) and Zaraninge forest reserve (Bagamoyo district, on the western edge of Sadaani Game Reserve) (Perkin, 2000). It is believed to be a relictual conservative species left over from previous 'species invasions' when, during wetter periods in history, Congolean forests stretched across tropical Africa. The Rondo galago therefore seems to have a discrete fragmented distribution within the coastal forests, being confined to certain evergreen escarpment forests within the Tanzanian coastal forest belt. It was thought that the Matumbi and Kichi Hills forests may provide similar biophysical habitat as required by this species.

O. garnetti is known to occur in a wide variety of moist forest types in East Africa including the coastal forests, and agricultural areas where suitable trees occur (Kingdon, 1997). It is anticipated that *O. garnetti* will be found in the forests of the Kichi and Matumbi Hills and the riverine forests of the R. Rufiji. In the drier miombo and acacia woodland habitats *O. garnetti* is replaced by *O. crassicaudatus.* Whilst the taxonomic validity is in question, it is also possible that the 'Mwera dwarf greater galago sp. nov. may occur in the forests of the Matumbi and Kichi hills (Kingdon, 1997, Grubb *et al*. 2002). It was also considered that *G. moholi* would occur in the woodlands to the south of the R. Rufiji and *G. senegalensis* to the north.

Methods

1. Tape recordings

Galagos can most easily be identified in the field from their vocalizations. The various types of calls made (up to 6 loud calls) depend on the behavioural status of the animal. Calls that signify the presence of one animal to another are known as advertising calls. Other calls mainly signify various states of alarm and possibly curiosity. For the purposes of species identification, the advertising calls are of most interest as they are species specific whereas the alarm calls can show some degrees of similarity in structure across several species. Tape recordings are made with a Sony WM-C6C tape recorder and Senheiser K6-ME66 directional microphone. All galago calls are recorded as are calls of owls, hyrax and other mammals recorded. Vocalisation data is analysed by a computerised digital sound analyser and compared with a library of calls held at the Nocturnal Primate Research Group, Oxford Brookes University, UK, and the British Library of Wildlife sounds, the British Library, London.

2. *Observations*
Observations are made with the aid of a Petzel head torch with a halogen bulb. This torch picks out eye shine that is reflected by nocturnal mammals. Once eye shine is spotted, a four cell Maglite torch is used with binoculars (Zeiss DDR 10x50W), to obtain observations of the animal(s). Notes are made of the height of the animals in the canopy, support use, general behaviour and animal interactions.

3. *Trap data*
Chardonneret traps baited with fruit are used to capture galagos alive and sometimes bat nets are used to catch trap shy species. Traps are checked every 4-6 hours, and animals are extracted by hand without the need for anaesthesia. Biometric measurements are taken and tissue samples (from the ear, using a biopsy punch) are collected for genetic analysis and stored in ethanol.

4. *Population and ecological data*
Night walks are conducted along pre-existing paths where possible to reduce noise and disturbance. Galago sightings and/or calls are noted. From this, relative densities are estimated by counting the number of galagos encountered over a measured distance. Given a known distance from the path within which animals can be counted reliably and the distance sampled, it is possible to estimate the number animals within that particular area. This estimate is usually very approximate and is biased by such factors as; detection ability, variability in habitat and moon phase. Only by intensively trapping and marking (preferably radio tracking) of animals from a given known area can density estimates be properly made (Harcourt and Nash, 1986; Bearder and Martin, 1979). Encounter rates per hour can also give an indication of relative animals densities as well as activity rates under variable weather conditions and moon phases.

5. *Any other data.*
Other data collected opportunistically include; galago hairs, faeces and locating tree holes or nests where the animals may live during the daytime.

Results

Galagos
Five species of galago were recorded from the study sites visited (see Table 1). A sixth species, suspected to be the Senegal galago was recorded in the Selous game reserve near Sand Rivers Safari camp. This observation requires confirmation.

Table 1. Galago records for the field sites visited south of the Rufiji River.

Species/Site	**Kichi Hills FR**	**Nyamuete FR**	**Kiwengoma FR**
Garnett's Galago *Otolemur garnetti*	Present in forest	Present in forest	Present in forest
Large Eared greater galago *Otolemur crassicaudatus*	Not recorded	Not recorded	Present in Miombo woodland/ forest edge
Senegal galago *Galago senegalensis*	Not recorded	Not recorded	Not recorded
Mohol galago *Galago moholi*	Present in miombo woodland	Not recorded	Not recorded
Grant's Galago *Galagoides granti*	Present in forest	Present in forest	Present in forest
Zanzibar Galago *Galagoides zanzibaricus*	Not recorded	Not recorded	Not recorded

Table 2. Galago records for the field sites visited north of the Rufiji River.

Species/Site	**Mtanza/ Msona Forest Reserve**	**Rufiji Riverine forest**
Garnett's Galago *Otolemur garnetti*	Present in forest	Present in forest
Large Eared greater galago *Otolemur crassicaudatus*	Heard in surrounding woodland	Heard in surrounding woodland
Senegal Galago *Galago senegalensis*	Not recorded	Not recorded
Mohol galago *Galago moholi*	Not recorded	Not recorded
Grant's galago *Galagoides granti*	Not recorded	Not recorded
Zanzibar Galago *Galagoides zanzibaricus*	Present in forest	Not recorded

Vocalization data

The following calls were recorded or heard (Table 3). Calls shown in brackets are the known calls of this species from other localities in Africa but were not heard during this study.

Table 3 The call types heard of each species detected during this survey.

Species/Site	**Advertising call**	**Alarm call 1**	**Alarm call 2**
Garnett's Galago *Otolemur garnetti*	Trailing call	Cackle	Squawks
Large Eared greater galago *Otolemur crassicaudatus*	Cry		
Senegal Galago *Galago senegalensis*	(Honk)		
Mohol galago *Galago moholi*	(Barks)		
Grant's galago *Galagoides granti*	Incremental call	Sweep screeches	Slow screeches
Zanzibar Galago *Galagoides zanzibaricus*	Single unit rolling call	Yaps and descending screeches	Buzzes and yaps

Records of other Mammals

Other small-medium sized mammals were recorded in the forested and coastal thicket habitat areas (Table 4). More widespread/non-forest dependent large mammal species were recorded in the bushland and woodland areas. These were; eland, greater kudu, warthog, buffalo, impala, zebra, lion (reported to have been heard from the river banks near the Msona campsite), hippo, brown hyena, side-striped jackal and slender mongoose.

Table 4. The mammals recorded in the forested areas surveyed
SH - seen and/or heard by research team and including evidence from footprints and dung. **R** - reported to occur by local people. **NF** - species occurring on the forest edge or in surrounding wood or bushland. **A** - apparently absent, neither seen nor heard or reported to occur by local people.

Species/ Survey site	**Mtanza/Msona FR and Rufiji riverine forest**	**Kichi Hills FR**	**Nyamuete FR**	**Kiwengoma FR**
Black and White Colobus *Colobus Angolensis*	SH	SH	A	A
Blue Monkey *Cercopithecus mitis*	SH	SH	SH	SH
Four toed elephant Shrew *Petrodomus tetradactylus*	SH	SH	SH	SH
Black and Rufous elephant shrew *Rhynchocyon petersi*	SH	SH*	SH*	SH*
Zanj sun squirrel *Heliosciurus undulatus*	SH	SH	SH	SH
Brush-tailed porcupine *Athrerus africanus*	SH	SH	SH	SH
Giant-pouched rat *Cricetomys gambianus*	A	R	R	R
Dog mongoose *Bdeogale crassicauda*	SH	R	SH	R
Gennet *Genneta* sp.	SH	SH	SH	SH
Leopard *Panthera pardus*	R	R	R	R
Ground pangolin *Manis temmenikii*	SH	R	R	R
Aardvark *Orycteropus afer*	R	R	A	A
Elephant *Loxodonta africana*	SH	SH	SH	SH
Bush pig *Potamochoerus larvatus*	SH	SH	SH	SH
Bushbuck *Tragelaphus scriptus*	SH	R	R	R
Bush duiker *Sylvicarpa grimmia*	SH	A	A	A
Blue duiker *Cephalophus monticolor*	SH	R	R	R
Red duiker** *Cephalophus harveyi*	SH	R	R	R
Suni *Neotragus moschatus*	SH	R	R	R

The Black and Rufous elephant shrews observed differed in colour and patterning between sites north and south of the Rufiji River. At Mtanza and Msona Forest Reserve (north of the Rufiji river), the Black and Rufous elephant shrews were clearly very rich red in colour on the head and shoulder areas and black on the rest of the back as described in Kingdon (1997). In the Kichi hills, Nyamuete and Kiwengoma forests this species is much more variable in coloration, with some that are generally much darker and others with slight dark chequering patterns on the back. The Red Duikers recorded at all sites may not all be Harvey's red duiker *Cephalophus harveyi*

with those south of the river probably being the Natal red duiker *C. natalensis.* Lack of visual sittings prevented confirmation of this.

Other faunal records

A flapped necked chameleon *Chamaeleo dilepis* was recorded in the Kichi hills. This is a widespread forest species of chameleon. A Werner's giant chameleon *Chamaeleo werneri* was brought to us by local school children at Nyamuete FR to try and sell it to us. A vine snake which was run over, was found on the road between Kibiti and Msona. Several amphispinean blind snakes *Ionides sp.* were also collected in the Kichi Hills and Nyamuete FR which are the first to be collected in the region.

Bird records

Some bird observations were made opportunistically and are included here only to augment the existing bird lists.

Species/ Survey site	**Mtanza/Msona FR and Rufiji riverine forest and camp site**	**Kichi Hills FR**	**Nyamuete FR**	**Kiwengoma FR**
African skimmer	x			
Open billed stork	x			
Yellow billed stork	x			
Hamerkop				
Egyptian goose	x			
Southern banded snake eagle	x	x		x
African fish eagle	x			
Crowned eagle *Stephanoaetus coronatus*	x	x	x	x
African hobby	x			
White headed vulture	x			
African harrier hawk		x		
Bateleur	x	x		x
Little African sparrowhawk		x		
Wood sandpiper	x			
Greenshank	x			
White headed lapwing *Vallenus albiceps*	x			
Emerald spotted wood dove	x	x	x	x
African green pigeon	x	x		
Dusky pigeon				
Crested guinea fowl *Guttera pucherani*	x	x	x	x
Brown necked parrot	x	X		
Lovebirds sp	x	x		
Blue crested turaco	x			
Livingstones turaco *Tauraco livingstonii*		x	x	x
White-browed coucal	x			

Species/ Survey site	Mtanza/Msona FR and Rufiji riverine forest and camp site	Kichi Hills FR	Nyamuete FR	Kiwengoma FR
Burchell's coucal	x	?	?	x
African Emerald cuckoo			x	x
Barred long tailed cuckoo		x		
African wood owl *Strix woodfordii*	x	x	x	x
African scops owl		x(miombo only)		
Montane nightjar *Caprimulgus poliocephalus*				x
Boehm's spinetail		x		
Palm swift	x			
Giant kingfisher	x			
Pied kingfisher	x			
Malachite kingfisher				
Narina's trogon	x	x	x	x
Little bee-eater				
Swallow-tailed bee-eater	x			
White-fronted bee-eater	x			
Lilac breasted roller	x	x		
Broad billed roller		x		
Green wood-hoopoe	x	x	x	x
Hoopoe	x			
Trumpeter hornbill *Tockus alboterminatus*	x	x	x	x
Crowned hornbill *Tockus alboterminatus*	x	x	x	x
Ground hornbill	x			
Moustached green tinkerbird *Pogoniulus leucomystax*	x	x		
Golden-tailed woodpecker		x	x	
Buff spotted woodpecker	X?			
African broadbill		x		x
Lesser striped swallow	x	x		
Black saw-wing		X?		
Black cuckoo-shrike		x	x	
African pied wagtail	x			
Common bulbul *Pycnonotus barbatus*	x	x	x	x
Placid greenbul				
Yellow bellied greenbul	x	x	x	x
Fisher's greenbul	x			
Nicator	x	x		x

Species/ Survey site	Mtanza/Msona FR and Rufiji riverine forest and camp site	Kichi Hills FR	Nyamuete FR	Kiwengoma FR
White starred forest robin *Pogonocichla stellata*		x		
Red-capped robin chat	x	x	x	x
Yellow throated apalis	x	x		
Common camaroptera	x	x	x	x
White-eyed slatey flycatcher	x			
Forest batis		x		
East coast batis	x	x	x	x
Paradise monarch	x	x	x	x
Blue mantled crested monarch	x			
Livingstone's monarch		x		
Yellow white-eye	x			x
Collared sunbird *Hedydipna collaris*	x	x	x	x
Olive sunbird *Cyanomitra olivacea*	x	x	x	x
Little purpled banded sunbird	x			
Tropical boubou	x	x	x	x
Sulphur breasted bushshrike	x	x		
Retz's Helmetshrike	x	x	x	x
Black bellied glossy starling			x	
Fork tailed drongo	x	x	x	x
Square tailed drongo		x	x	x
Dark backed weaver (race *kersteni*)	x	x	x	x
Green-winged ptilia	x		x	
Common waxbill	x			

Discussion

Galagos: Species distribution/biogeography and taxonomic implications

Greater galagos *Otolemur* spp.

Consistent with other coastal forest areas of Tanzania and Kenya *O. garnetti* was found in the forested and forest margin habitats. *O. crassicaudatus* was found in the drier woodland habitats indicating that these two species are parapatrically distributed according to their ecological niches. Some areas of overlap probably occur along forest margins during nightly foraging, but their different behavioural ecologies e.g. distinctive calls, indicate that although the chance for cross breeding exists and may even occur occasionally the species remain distinct.

Small galagos *Galago* spp.

The galagos *Galago senegalensis* and possibly *G. moholi* were observed in the miombo woodlands. Perhaps the R. Rufiji splits these two widespread species with *G. senegalensis* to the north and *G. moholi* confined to the south. In other parts of western Tanzania around the Tanzania – Malawi border the two species are thought to occur parapatrically (Nash *et al,* 1986) but with no obvious biogeographical barrier present (like the R. Rufiji) it is not known exactly where *G. moholi* and *G. senegalensis* meet and/or overlap in Africa.

Dwarf galagos *Galagoides* spp.

It was considered that the R. Rufiji would is the species boundary for *G. zanzibaricus* and *G. granti* (Honess, 1996). This has been proved to be the case and has implications for galago taxonomy. *G. granti* is considered by some authors to be a sub species of *G. zanzibaricus* but their sympatric distribution and differences in call and morphology would seem support their status as full species. The penis morphology of *G. granti* is different from *G. zanzibaricus* (Honess, 1996; Kingdon, 1997). Also the penis morphology of the animal captured during this study is different from the published illustrations (Honess, 1996; Kingdon, 1997), which was probably taken from an immature specimen of unconfirmed identity (Bearder per com). In Tanzania *G. granti* has previously been located in the Rondo forests near Mtwara (Honess, 1996) and Nambiga forest reserve, Ifakara district on the south side of the Kilombero river. *G. granti* has a wide distribution as it is known to occur southwards into the forests of Mozambique. Its ability to occupy a variety of different habitats from coastal transitional woodland, thicket and evergreen coastal forests probably accounts for its wide distribution. However it was not found in Miombo woodlands. *G. rondoensis* was not recorded.

Biodiversity values and conservation

The coastal forests of Tanzania rank amongst the world's top biodiversity hotspots (Burgess & Clarke 2000). South of Utete, the Kichi Hills culminate around 500 m to 600 m asl and still contain a few patches of good quality forest. This survey and others (Howell *et al,* 2000) indicate the high biodiversity values of the Kichi Hills forests consistent with those of other remaining coastal forest patches. The Kichi Hills forests are more or less connected through dense bushland with the more easterly forests reserves of Kiwengoma (500 to 600m asl) and Namakutwa (350 to 400 m asl), which have already been surveyed and recognized as an important area for biodiversity and an important bird area (Burgess and Clarke, 2000). Some of these forests extend over the border into Kilwa district but little information on their status is available. Several specific issues, which are interrelated, are having an impact on the conservation of the Kichi Hills forests.

1. The recent all weather road built (Figure 1) by the management of the Selous Game Reserve (SGR), connecting Utete and the Kingupira entrance point and ranger post of the SGR, has been cut directly through the middle of one of the best preserved and least disturbed patches of the Kichi hills proposed forest reserve. This road will provide easier access for loggers and will attract more cultivators to the area. A freshly cut Mvule, *Milicia exelsa*, was found near the road, this species, like Mninga, *Pterocarpus angolensis* has become so rare in Rufiji District that its exploitation has been banned. The road, having already been built, should be used positively to bring forest conservation activities to the area and the adjacent communities.

2. Local communities have traditionally adopted slash and burn shifting agriculture to the area. A relatively new development has been the growing of rain fed variety of hill rice. Usually one or two hectares of forested land are cleared and then farmed for two to four growing seasons until the plot is abandoned when the soil fertility is exhausted. One crop per year is harvested at low yields. The new road through the Kichi hills is and will attract more people to the area to farm. *Addressing this issue is an immediate priority.*

Figure 1. The road from Utete to Kingupira which cuts through the Kichi Hills is having a negative impact on the forest

Conclusions

Biological:

1. The galagos *Galagoides granti, G. zanzibaricus* and *Otolemur garnetti* are forest dependent species and are thus directly affected by forest degradation and clearance. The findings of this survey support the taxonomic status of *G. zanzibaricus* and *G. granti* as distinct species. The coastal forest endemic species *G. rondoensis* was not found. The galago species *Galago senegalensis, G. moholi* and *Otolemur crassicaudatus* occur in the miombo woodlands and so are widespread and non threatened species.
2. The Kichi hills are an important area for biodiversity, and should be considered as biologically linked together with the SGR, and the Rufiji river catchment area.

Conservation:

1. The Kichi hills proposed forest reserve is threatened by clearance from unsustainable rice cultivation and logging, further exacerbated by the new Utete to Kingupira road. Socio economic surveys are required to assess the potential impacts the road through the Kichi hills.
2. Further biodiversity surveys are required to comprehensively cover the area particularly bird surveys.
3. Proposed conservation activities in the Kichi Hills by WWF must be implemented and/or linked with other projects in the area such as REMP. The status of the Kichi Hills proposed district forest reserve should be elevated to national level forest reserve status. Nature trails could be established but it is unlikely that there would be high user demand. Notices posted in the area to broadcast informative environmental messages to road users and local people may also be useful.

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References

Bearder., S.K., (1999) Physical and Social Diversity Among Nocturnal Primates: A New View Based on Long Term Research. *Primates*. 40(1): 267-282

Bearder, S.K., Martin R.D. (1979) The social organisation of a nocturnal primate revealed by radio tracking. In: *Handbook on biotelemetry and radio tracking.* Amlaner, C.J., Macdonald, D.W. (Eds.). Pergamon Press: Oxford

Bearder, S.K., Honess, P.E. and Ambrose, L., (1995) Species diversity among galagos, with special reference to mate recognition: In Alterman, L., Izaard, M.K., Doyle, G.A., (eds): *Creatures of the Dark: The Nocturnal Prosimians.* New York, Plenum Press.

Burgess, N.D. and Clarke. G.P. (eds.) (2000) *Coastal Forests of Eastern Africa*. Xiii + 443p IUCN, UK

Grubb P., Butynski T. M., Oates J. F., Bearder, S. K., Disotell T. R. , Groves C. & Struhsaker, T. In prep. An Assessment of the diversity of African primates.

Harcourt, C.S. & Nash, L.T. 1986b Social organisation of galagos in Kenyan coastal forests: I. *Galago zanzibaricus*. *American Journal of Primatology* 10: 339-355.

Honess, P.E. (2000) In Burgess, N.D. and Clarke. G.P. (eds.) (2000) *Coastal Forests of Eastern Africa*. Xiii + 443p IUCN, UK

Honess, P.E., Bearder, S.K., (1996) Descriptions of the Dwarf Galago species of Tanzania. *African Primates* 2(2): 75-79

Howell, K.M., Msuya, C.A. & Kihaule, P.M. (2000) A preliminary biodiversity (fauna) assessment of the Rufiji floodplain and delta. Rufiji Environment Management Project Technical Report N° 9, Utete, 65 pp.

Jenkins, P.D. (1987) *A Catalogue of Primates in the British Museum (Natural History), Part IV*. British Museum of Natural History, London.

Kingdon, J. A. (1997) *The Kingdon Field Guide to African Mammals*. Academic Press, London

Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Foseca, G. A. B., Kent, J., (2000) Biodiversity hotspots for conservation priorities. *Nature* 403, 853-858

Perkin, A. W. (2000) A Field Study on the Conservation Status and Species Diversity of Galagos in Zareninge Forest, Coast Region, Tanzania. Unpublished report to the World Wildlife Fund, Tanzania office.