

COASTAL FOREST RESEARCH PROGRAMME

Site Description and Conservation Evaluation :
ZARANINGE (KIONO) FOREST,
Bagamoyo District, Tanzania.

Clare Ansell and Alex Dickinson

AUGUST 1994



THE SOCIETY FOR ENVIRONMENTAL EXPLORATION
AND

THE UNIVERSITY OF DAR ES SALAAM

in collaboration with

The Regional Development Director's Office, Coast Region



FRONTIER TANZANIA Technical Report No. 11

**Site Description and Conservation Evaluation :
ZARANINGE (KIONO) FOREST,
BAGAMOYO DISTRICT, TANZANIA.**

Clare Ansell and Alex Dickinson

AUGUST 1994

***Produced with the assistance of the Catchment Forestry Project of the
Ministry of Tourism, Natural Resources and Environment, Tanzania***

THE SOCIETY FOR ENVIRONMENTAL EXPLORATION

AND

THE UNIVERSITY OF DAR ES SALAAM

in collaboration with

The Regional Development Director's Office, Coast Region

The Society for Environmental Exploration

The Society is a non-profit making company limited by guarantee and was formed in 1989. The Society's objectives are to advance field research into environmental issues and implement practical projects contributing to the conservation of natural resources. Projects organised by The Society are joint initiatives developed in collaboration with national research agencies in cooperating countries. The Society also promotes cooperation between scientists and technical officers from collaborating institutions and counterparts in the UK and elsewhere.

The University of Dar es Salaam

The University of Dar es Salaam was established in July 1970 as a centre for learning and research in the arts and the physical, natural, earth, marine, medical and human sciences. The University is surveying and mapping the flora and fauna of Tanzania and is conducting research into the maintenance and improvement of the environment and the sustainable exploitation of Tanzania's natural resources.

The FRONTIER TANZANIA Project and Series of Reports

The Society and the University have been conducting collaborative research into environmental issues since July 1989, under the title of the Frontier Tanzania Project. The Project has to-date involved over 500 people from both Tanzania and overseas. Field research is being undertaken on a variety of habitats in Tanzania's coastal zone, chosen for their high biological interest and conservation value. Habitats under study include mangroves, coral reefs, coastal forests and savanna. The projects have been developed with the assistance and collaboration of Regional and District Authorities, the Ministry of Tourism, Natural Resources and Environment, Tanzania National Parks and Tanzania Fisheries Research Institute. The findings of the Project are summarised in a series of reports published by the University of Dar es Salaam. More formal scientific papers resulting from research are published in appropriate journals thus ensuring wide dissemination of the information.

The Coastal Forests Research Programme

The coastal forests of Tanzania comprise small and geographically isolated forest remnants supporting large numbers of endemic and near-endemic plants and animals. The forests were once extensive but have been largely removed to provide timber and farmland. Their status, distribution and biological character were extremely poorly known. The Frontier-Tanzania Coastal Forest Research Programme was formed in 1989 with the aim of surveying these forests and describing their conservation importance. To date over 70 sites have been identified of which 15 have been studied in depth. For each study site the project produces vegetation maps, species lists of the plants, vertebrates and invertebrates, and studies of the ecology of key species. It is intended this information be used in the production of management plans to secure the sustainable future development of Tanzania's coastal forests.

Series Editors:	Prof J.A. Kapuya	Dept. of Botany, University of Dar es Salaam, PO Box 35060, Dar es Salaam, Tanzania.
	Prof. K.M. Howell	Dept. of Zoology, University of Dar es Salaam, PO Box 35064, Dar es Salaam, Tanzania.
	Dr M.A.K. Ngoile	Director, Institute of Marine Sciences, University of Dar es Salaam, PO Box 668, Zanzibar, Tanzania.
	Prof A.K. Semesi	Dept of Botany, University of Dar es Salaam, PO Box 35060, Dar es Salaam, Tanzania.
	Dr N.D. Burgess	The Society for Environmental Exploration / The Royal Society for the Protection of Birds, 111 Mawson Road, Cambridge, U.K.

Published by: The Society for Environmental Exploration, UK.

Copyright: 1994 THE SOCIETY FOR ENVIRONMENTAL EXPLORATION and THE UNIVERSITY OF DAR ES SALAAM

Citation: Ansell, C.V. and Dickinson, A. (1994). Site Description and Conservation Evaluation: Zaraninge Forest, Bagamoyo District, Tanzania. Frontier Tanzania Report No. 11. The Society for Environmental Exploration, U.K./The University of Dar es Salaam, Tanzania. 60pp.

Pbk. ISSN: 0960 - 2437

Available from: THE SOCIETY FOR ENVIRONMENTAL EXPLORATION
77 Leonard Street
LONDON EC2A 4QS, U.K.

The views of the authors expressed in this publication do not necessarily reflect those of either The Society for Environmental Exploration, the University of Dar es Salaam, or the office of the Regional Development Director, Coast Region.

Foreword to the Frontier Tanzania series of reports.

Global concern over the conservation of the world's biological diversity reached a new peak in June 1992, when many of the world's Heads of State signed the Biodiversity Convention in Rio de Janeiro at the Earth Summit (UNCED).

However, an accurate knowledge of the earth's biological richness is lacking in many countries. Without detailed information on the flora and fauna of a region its importance for the conservation of biological diversity remain undefined.

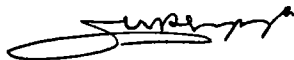
In Africa there are many areas of exceptional biological richness which have scarcely been studied. Even basic data on the status of resources may be lacking or outdated.

The Frontier-Tanzania project, a collaborative venture of the Society for Environmental Exploration and the Faculty of Science of the University of Dar es Salaam is tackling this problem head on.

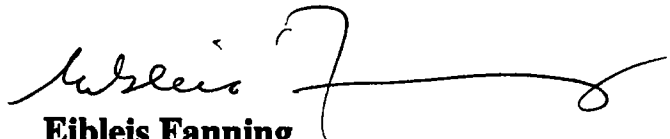
In 1989 Tanzanian scientists identified ecosystems in coastal Tanzania which were in particular need of study because of their biological richness and importance. Since that time, the Frontier-Tanzania project has provided the means and the man-power to investigate these sites, catalogue their importance and suggest management strategies for their conservation. Coastal monsoon forests, the coral reefs of Mafia Island, the mangroves and sediments of the Rufiji Delta, and the vegetation of the Mikumi National Park have been investigated over the past three years.

All of these projects have generated large quantities of new data on the biological importance of the sites and their place alongside similar systems elsewhere in Africa. This research has allowed biological-diversity priorities to be better determined and management actions to be suggested. Many of the recommendations are under consideration by the Tanzanian Government.

This report series forms a contribution to the Frontier-Tanzania project and to the knowledge of the biological diversity of Tanzania. We warmly endorse its publication and hope that many more reports and papers result from this collaborative project, and that they help to assure that the future of the biological heritage of these strategic sites is conserved.



Professor M. L. Luhanga
Vice Chancellor
The University of Dar es Salaam



Eibleis Fanning
Director
The Society for Environmental Exploration

SITE DESCRIPTION AND CONSERVATION EVALUATION

Summary

SITE:	Zaraninge Forest
MAP SHEET:	Ordnance Survey 1:50,000 Series Y742 Sheet 168/1 Boundary Map 1:25,000 JB2140 1987
GRID REF:	6°9'S, 38°36'E
LOCALITY:	Bagamoyo District, Coast Region, Tanzania
STATUS:	Proposed Forest Reserve (Under review)
MANAGED BY:	Bagamoyo District Council
AREA:	219.42 km ² (21km ² of forest)
TENURE:	Government land under District Authority control

SITE DESCRIPTION:

A plateau-top of internationally significant dry coastal monsoon forest surrounded by lowland wooded grassland. The forest supports several internationally important species and many of national importance.

RECOMMENDED MANAGEMENT OBJECTIVES:

- To preserve the site as one of the best remaining coastal forests in Tanzania.
- To maintain the important populations of vertebrates.
- To repair any human modifications to the site and control any further damaging activities.
- To carry out and foster research on the site.
- To encourage visitors and tourists to the site, to increase awareness of the importance of conserving such forests.

MAIN MANAGEMENT RECOMMENDATIONS:

- To clarify Reserve status.
- To relocate local inhabitants outside the Reserve boundaries.
- To clarify the Reserve boundary.
- To consider designation of management zones within the site.
- To establish on-site forest guards.
- To regenerate cleared and disturbed areas of forest.
- To liaise with other Government bodies and seek links with NGOs and business over the future development of the site.
- To investigate the feasibility of establishing a Study Centre on the site with educational, recreational and/or research facilities.

MAPS:

- 8.1.1 Location of Zaraninge Proposed Forest Reserve
- 8.1.2 Zaraninge Forest and Proposed Forest Reserve Boundaries
- 8.1.3 Physical Features of Zaraninge Proposed Forest Reserve
- 8.1.4 Vegetation Types of Zaraninge Proposed Forest Reserve
- 8.1.5 Zaraninge Forest - Location of Permanent Vegetation Transects
- 8.1.6 Suggested Management Zones for Zaraninge Proposed Forest Reserve

Contents

	Page
EXECUTIVE SUMMARY	i
1.0 INTRODUCTION	1
2.0 SITE FEATURES	
2.1 General Information	
2.1.1 Location and Access	3
2.1.2 Main Features	3
2.2 Establishment, Status, Administration and Management	
2.2.1 History of Establishment	3
2.2.2 Official Status	4
2.2.3 Land Tenure and Rights of Way	4
2.2.4 Management Authority and Current Management	4
2.2.5 Site Definition and Boundaries	4
2.3 Environmental Features	
2.3.1 Physical Aspects	5
2.3.1.1 Climate	5
2.3.1.2 Hydrology	5
2.3.1.3 Geology	5
2.3.1.4 Soils	5
2.3.1.5 Altitudinal Range	5
2.3.2 Biological Aspects	
2.3.2.1 Habitats	6
2.3.2.2 Flora	6
2.3.2.3 Fauna	7
2.4 Cultural, Land Use and Socio-Economic Features	
2.4.1 Historical Aspects	8
2.4.2 Past and Present Land Uses	
2.4.2.1 Forestry	9
2.4.2.2 Agriculture	9
2.4.2.3 Pharmaceutical	10
2.4.2.4 Tourism and Recreation	10
2.4.2.5 Water Supply and Management	10
2.4.2.6 Scientific Research	10
2.4.2.7 Unlicensed Occupancy	10
2.4.2.8 Hunting	11
2.4.2.9 Extraction of Other Forest Products	11
2.4.3 Surrounding Land Uses	11
2.4.4 Current Human Population In and Around the Proposed Reserve	11

3.0	EVALUATION	
3.1	Evaluation of features	
3.1.1	Biological and Physical Features	
3.1.1.1	Size	13
3.1.1.2	Diversity	13
3.1.1.3	Naturalness	13
3.1.1.4	Rarity	13
3.1.1.5	Fragility	13
3.1.1.6	Typicalness	14
3.1.1.7	Position in an Ecological Unit	14
3.1.2	Economic Value	
3.1.2.1	Forestry	14
3.1.2.2	Agriculture	14
3.1.2.2	Pharamceutical	14
3.1.2.3	Water Supply	15
3.1.2.4	Intrinsic Appeal for Nature Tourism	15
3.1.3	Cultural Value	15
3.1.4	Activities Likely to Damage the Site and its features	15
3.2	Potential Value of the Proposed Forest Reserve	
3.2.1	Potential Conservation Value	15
3.2.2	Potential Economic Value	
3.2.2.1	Development of Nature Tourism	16
3.2.2.2	Potential Agricultural and Commercial Forestry Value	16
3.2.2.3	Potential Pharmaceutical Value	16
3.2.3	Potential Research, Recreational and Educational Value	16
3.2.4	Potential Land Acquisitions	17
3.2.5	Potential Roles of Other Government Bodies in Reserve Development	17
3.2.6	Potential Roles of NGOs and Business in Reserve Development	17
3.2.7	Rationale for the Establishment of Zaraninge Forest Reserve	17
4.0	RECOMMENDED MANAGEMENT OBJECTIVES	19
5.0	FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT	21
6.0	MANAGEMENT OPTIONS AND RECOMMENDATIONS	
6.1	Recommended Management Zoning System	23
6.2	Protection and Management of Biological and Physical Resources	
6.2.1	Reserve Status	23
6.2.2	Status of Local Villages	24
6.2.3	Reserve Boundary Location and Marking	24
6.2.4	Management Zones	25
6.2.5	Repair to Disturbed Areas	25
6.2.6	Road/track Development	25

6.3	Human Use	
6.3.1	Nature Tourism	26
6.3.2	Extraction of Forest Products	26
6.4	Administration and Reserve Management	
6.4.1	On-Site Forest Guards	26
6.4.2	Liaison Between Forestry Personnel	26
6.4.3	Links With NGOs and Business	27
6.4.4	Liaison With Other Government Bodies	27
6.4.5	Maintenance of Roads and Tracks	27
6.5	Research, Monitoring and Education	
6.5.1	Coastal Forest Study Centre	27
6.5.2	Local Conservation Education Programme	27
6.5.3	Suggested Areas for Further Research	27
7.0	BIBLIOGRAPHY	29

LIST OF FIGURES

2.1	Location and access to Zaraninge (Kiono) forest	4a
2.2	Boundaries of Zaraninge forest and the proposed Forest Reserve	4b
2.3	Physical features of Zaraninge proposed Forest Reserve	6a
2.4	Vegetation types within Zaraninge proposed Forest Reserve	6b
2.5	Location Of Permanent Vegetation Transects at Zaraninge (Kiono) forest left by the Frontier-Tanzania project	10a
6.1	Possible forest management zones for Zaraninge proposed Forest Reserve	26a

APPENDICES

APPENDIX A: Vertebrate species recorded from Zaraninge (Kiono) forest by Frontier-Tanzania (Aug. '89, Jan. '90 and Sep. '91).

APPENDIX B: Checklist of the vascular plants of Zaraninge (Kiono) forest.

1.0 Introduction

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

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

1.2 NATIONAL AND REGIONAL BACKGROUND

There are approximately 50 coastal forests in Tanzania (ie. forests of the Zanzibar-Inhambane Undifferentiated Type, classification according to White, 1983), of which around 50% lie wholly or largely within Forest Reserves (Burgess *et al.*, in prep.). Coast Region contains nine of these coastal forest areas of which five are contained within seven Forest Reserves (these statistics exclude Kiwengoma Forest Reserve lying on the Coast/Lindi regional border). The gazettment of Zaraninge would increase these regional figures to nine, six and eight respectively.

SITE DESCRIPTION AND CONSERVATION EVALUATION

2.0 Site Features

2.1 GENERAL INFORMATION

2.1.1 LOCATION AND ACCESS

Site Name:	Zaraninge Forest.
Region:	Coast
District:	Bagamoyo.
Nearest Town:	Miono
Forestry Office:	Bagamoyo (Forestry Officer In Miono)
Access:	Accessible by vehicle from the north and south (see Figures 2.1 & 2.2) and a few kms from both Mvavi (Saadani) and Wami (Matipwili) Railway Stations.
Grid Ref:	6°09'S, 30°36'E
Area:	219.42km ² (21km ² of forest)
Boundary Length:	Approx. 58km
Maps:	Ordnance Survey 1:50,000 Series Y742 Sheet 168/1 (1986/7) and Boundary Map 1:25,000 JB2140 (1987).
Aerial Photographic Coverage:	Geosurvey International Ltd June-Sept 1981, May-July 1982 and J A Story & Partners Dec 1982-Feb 1983

2.1.2 MAIN FEATURES

A Proposed Forest Reserve comprising an afforested plateau surrounded by thicket/woodland and wooded grassland. A small depression supporting wetland vegetation exists within the forest.

2.2 ESTABLISHMENT, STATUS, ADMINISTRATION AND MANAGEMENT

2.2.1 HISTORY OF ESTABLISHMENT

General public land until 1958 when the area was designated a Proposed Forest Reserve under the control of the Central Government Forestry and Beekeeping Division (FBD), Ministry of Tourism, Natural Resources and Environment. In 1985 the Local District Authorities (Bagamoyo) took control of the Proposed Reserve.

In July 1990 the intention to gazette Zaraninge as a Forest Reserve was published in a Government Notice, (number 426). However the Reserve has not since been declared in an official gazette due to land claims which have yet to be resolved. These claims are currently being addressed and it is expected that the site will shortly be gazetted as a Forest Reserve. Details of this gazettelement have not yet been determined; whether a protective or productive reserve, and whether under local or central government control.

Zaraninge has previously been referred to in maps and writing as "Kiono Forest", "Kiona Forest", "Mkange Forest" and "Miono Forest".

SITE DESCRIPTION AND CONSERVATION EVALUATION

2.2.2 OFFICIAL STATUS

Proposed Local Government Forest Reserve

2.2.3 LAND TENURE AND RIGHTS OF WAY

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

The Mbwebwe-Gongo-Wami road runs through the Reserve. This is currently a public right of way. It is little used by motor vehicles but is in frequent use by pedestrians and bicycles.

2.2.4 MANAGEMENT AUTHORITY AND CURRENT MANAGEMENT

Since 1985 all management decisions have been made at the Local Government level, by the various Bagamoyo District Authorities. The District Natural Resources Officer (DNRO) operates under the District Council, the District Development Committee and District Executive Director. The District Forestry Officer (DFO) advises the DNRO, and it is his responsibility to ensure implementation of all management directives by his personnel.

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

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

2.2.5 SITE DEFINITION AND BOUNDARIES

The Proposed Reserve boundaries were first surveyed in 1959. They were re-surveyed, altered, and demarcated in 1986/87 (Job Number 2140).

At present the northern perimeter of the Proposed Reserve follows a section of the Miono-Saadani road. A section of the Dar es Salaam to Tanga Railway represents the eastern boundary. The western boundary lies at the western edge of the plateau and excludes the Mbwebwe settlement. The southern boundary is located such that Gongo village lies within the Proposed Reserve. The western and southern boundaries are marked with small trenches (approximately 1.5m x 0.7m x 0.4m in size) at intervals of 5m or less.

Figure 2.2 shows both the forest boundary (mapped by Frontier-Tanzania in 1989-91) and the Proposed Reserve boundaries as drawn in 1986/87. (The Ordnance Survey map of 1986/7 shows incorrect Reserve boundaries.)

It is possible that the boundaries will change before gazettelement of the site. For example they may be redefined around settlements currently contained within the Proposed Reserve.

Figure 2.1: Location and access to Zaraninge (Kiono) forest.

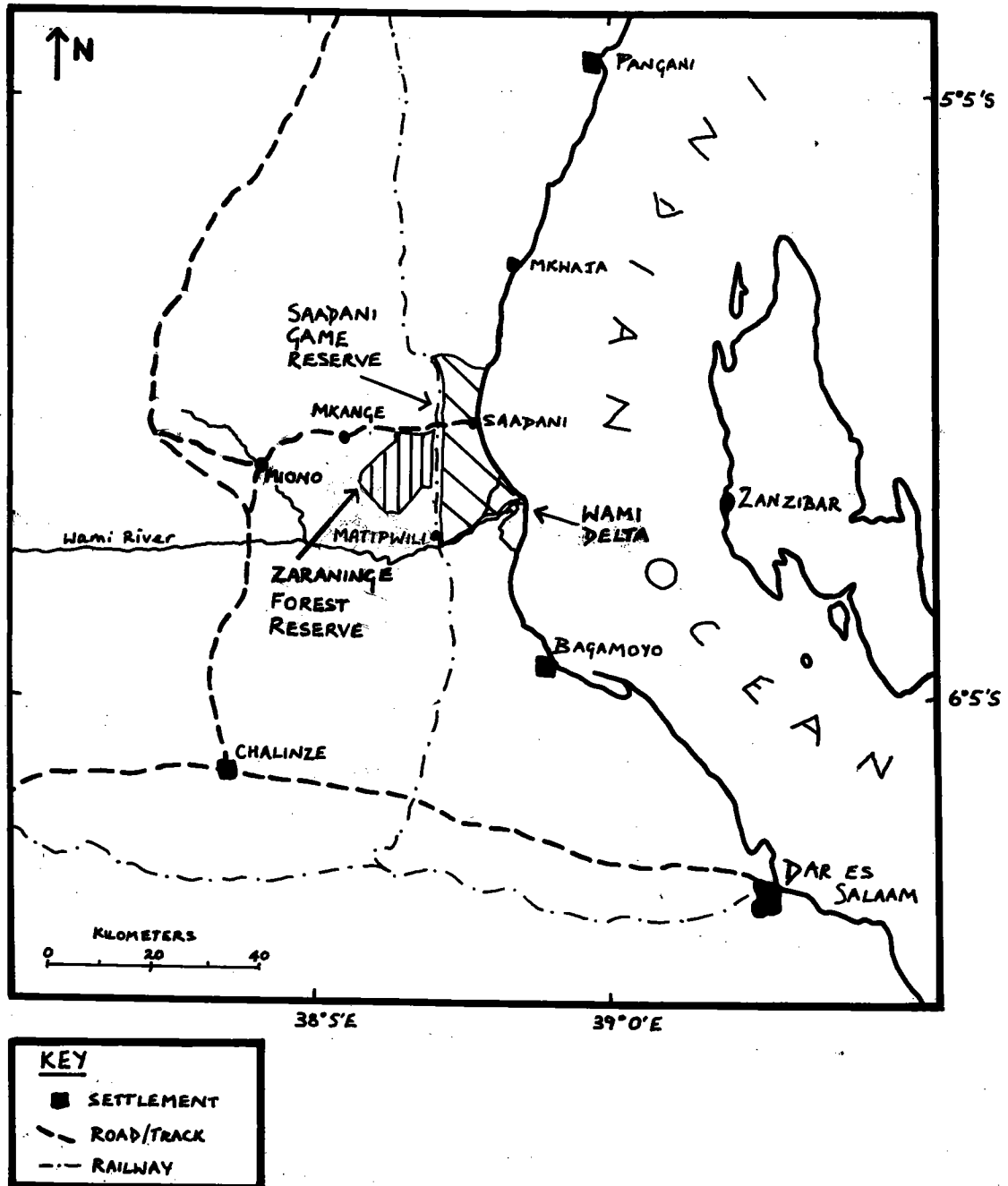
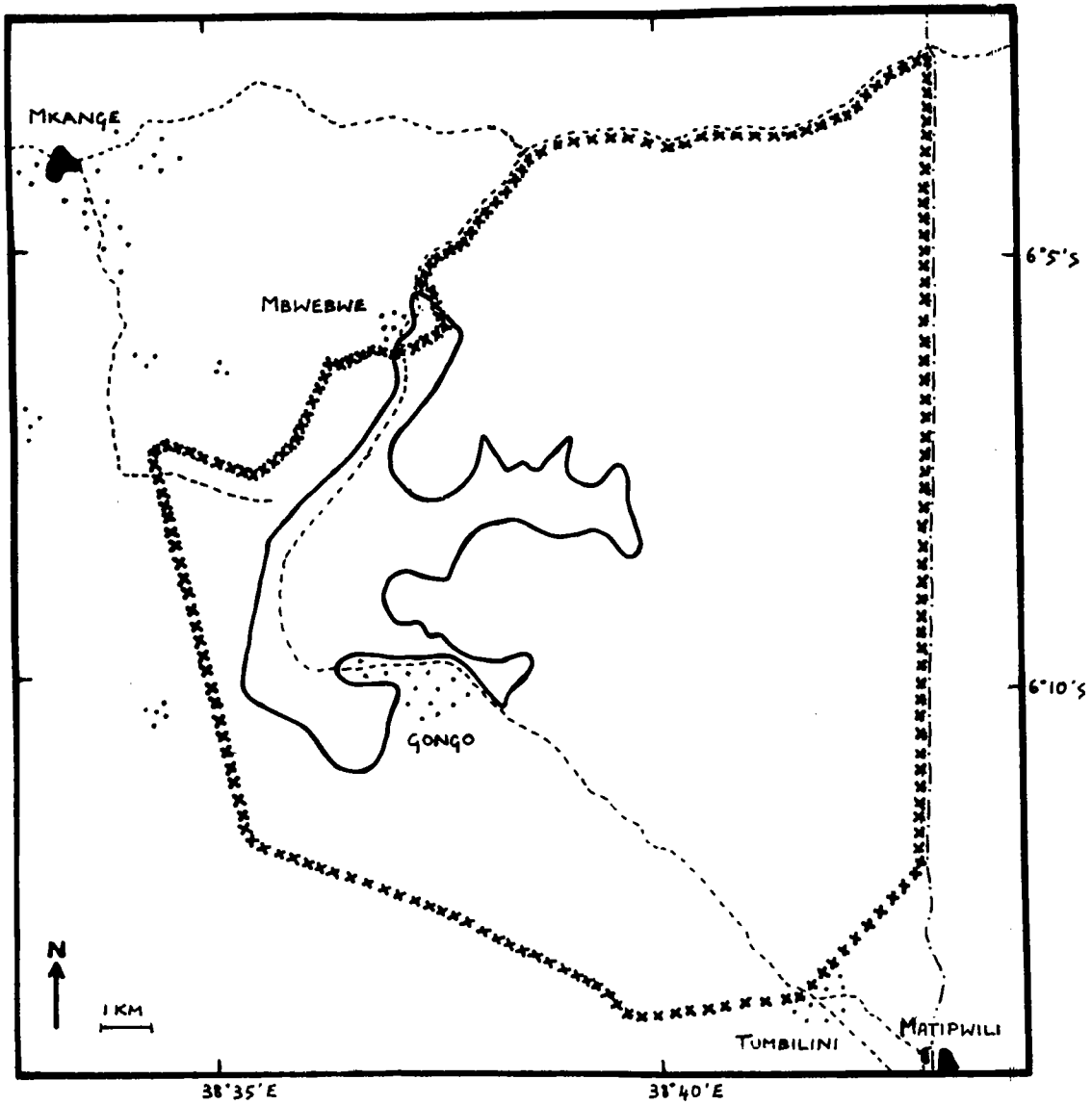


Figure 2.2: Boundaries of Zaraninge forest and the proposed Forest Reserve .



KEY	
—	FOREST BOUNDARY
xx	FOREST RESERVE BOUNDARY
---	MINOR ROAD/TRACK
- - -	RAILWAY
■	VILLAGE
· · ·	POPULATED AREA

2.3 ENVIRONMENTAL FEATURES

2.3.1 PHYSICAL ASPECTS

2.3.1.1 Climate

Generally oceanic, with oceanic temperatures. Subject to orographic rain from westward moving moist sea air. Appendix C gives temperature and rainfall data from Mkwaja Ranch situated 30 km north of the Reserve, these show the area to experience a four month dry season (June to September) and two wet seasons (March to July and October to December), February and March are the warmest months and August the coolest. No average yearly figures are known for Zaraninge, however, only 29.5mm of rain were recorded between 28 July and 18 August 1991 (Cockle and Dickinson, in prep.). Mean maximum temperature was 26.5°C during the same period with an average minimum temperature of 20.8°C. Cumulative temperature and rainfall data for 1959-1979 for Mkwaja Ranch just 30km north of the Reserve are given in temperature and humidity readings for different layers within the forest canopy were also recorded, see Appendix C.

2.3.1.2 Hydrology

The site lies within the catchment of the Wami River (see Figure 2.1). No permanent running water courses present, although many seasonal water channels exist. Figure 2.3 shows the site to be an important seasonal watershed.

There are several permanent ponds in the wetland depression located in the north western part of the forest. The water table in the depression appears to lie beneath an impermeable layer of clay, with pools forming on top of this. The seasonal nature of these wetlands results in periods when the water table drops markedly and much of the water trapped on the surface evaporates.

A permanent water-hole exists outside the forest in the Gongo area.

2.3.1.3 Geology

The forest grows on a plateau of limestone and calcareous sandstone (possibly Jurassic age). Sandstone is exposed at the margins of the plateau.

2.3.1.4 Soils

Fairly homogenous (to a depth of 2m) sandy soil present in all areas with a dark but thin humus layer. The wetland soil is similar, although underlying peaty clay is exposed in areas where pools have formed. The lower slopes of the plateau have sandy soil with numerous small quartz pebbles and frequent carbon fragments from past fires.

2.3.1.5 Altitudinal Range

The site has an altitudinal range of 60-320m. (See Figure 2.3).

2.3.2 BIOLOGICAL ASPECTS

2.3.2.1 Habitats

Semi-deciduous Coastal Monsoon Forest	21.0km ² (approx.)
Wetlands	0.5km ² "
Thicket/Woodland	38.0km ² "
Doum Palm Savanna	160.0km ² "

Figure 2.4 shows the distribution of these habitats.

2.3.2.2 Flora

i) Vascular Plants: Approximately 500 distinct specimens were collected from the forest area by Frontier-Tanzania in 1989-91. This has resulted in the discovery of two possible new species and one new record for Tanzania (Kai Vollesen, pers. comm.):

Pancovia sp. nov? (Sapindaceae) - small forest shrub found near the wetlands

Cyperus sp. nov? (Cyperaceae) - sedge found in and around the wetlands

Diospyros shimbaensis (Ebenaceae) - new to Tanzania

In addition, two new species (*kalanchoe sp. nov.* and *Uvaria sp. nov.*) and one new genus (Rhizophoraceae) have been identified by the Herbarium at the University of Dar es Salaam (L. Mwasumbi, pers. comm.).

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

ii) Non-vascular Plants: No data available.

iii) Vegetation Communities: A basic vegetation survey was carried out by Frontier-Tanzania in 1990. Homogeneous semi-deciduous forest occupies the plateau-top, with intermediate vegetation comprising forest edge and woodland species at the plateau sides. The remainder of the Reserve supports thicket/woodland and doum palm savanna.

The plateau forest is rich in legume species. Dominant trees include *Hymenaea verrucosa* (Caesalpinaceae), *Baphia kirkii* (Papilionaceae), *Haplocoelum* spp. (Sterculiaceae) and less commonly *Bombax schumannianum* (Bombaceae). *Euphorbia* sp. and *Dioscorea* sp. are abundant on the plateau edge. A more detailed vegetation description is given by Sheil and Burgess (1990).

There is an area of woodland linked to the eastern edge of the forest which appears to be undergoing succession to forest with a preponderance of forest species, including tree seedlings, in the undergrowth.

Areas of abandoned cultivation around Gongo and Mbwebwe display a dense thicket cover of predominantly woodland species.

The plateau wetlands and surrounding area displays an ecotone from open sedge wetland vegetation through woodland to forest (Sheil and Burgess, 1990).

Recent statistical analysis has revealed the majority of the rarest species to be members of a single vegetation association: understory shrubs of the most shaded, humid parts of the forest (Mwasumbi and Burgess, in prep.). It is this association which would be most at risk from selective logging (thinning of canopy cover) or encroachment (reduction in forest size); both lead to reduced humidity within the forest, and the former also reduces shade.

Figure 2.3: Physical features of Zaraninge proposed Forest Reserve .

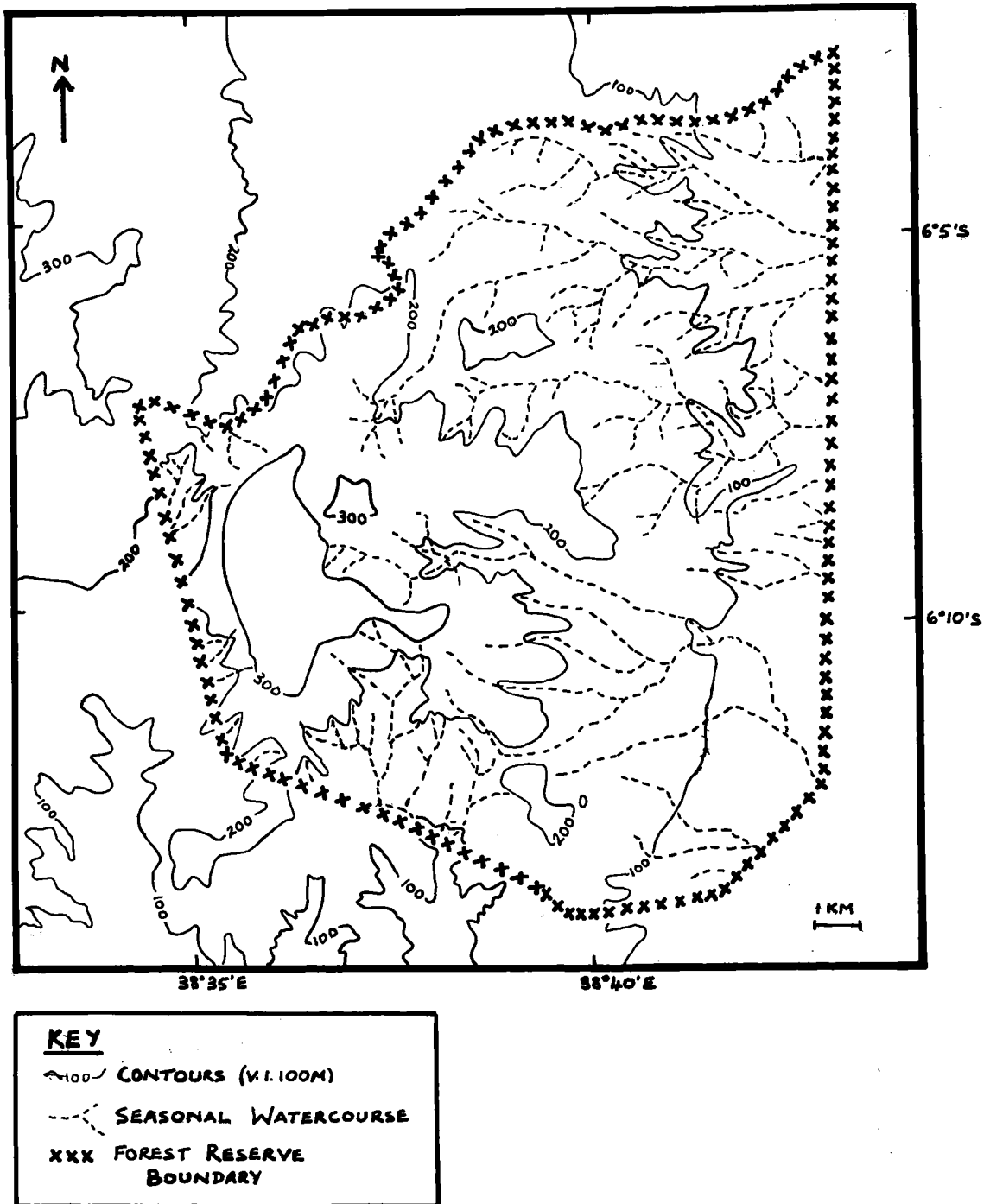
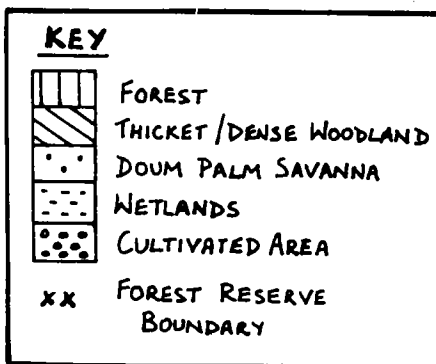
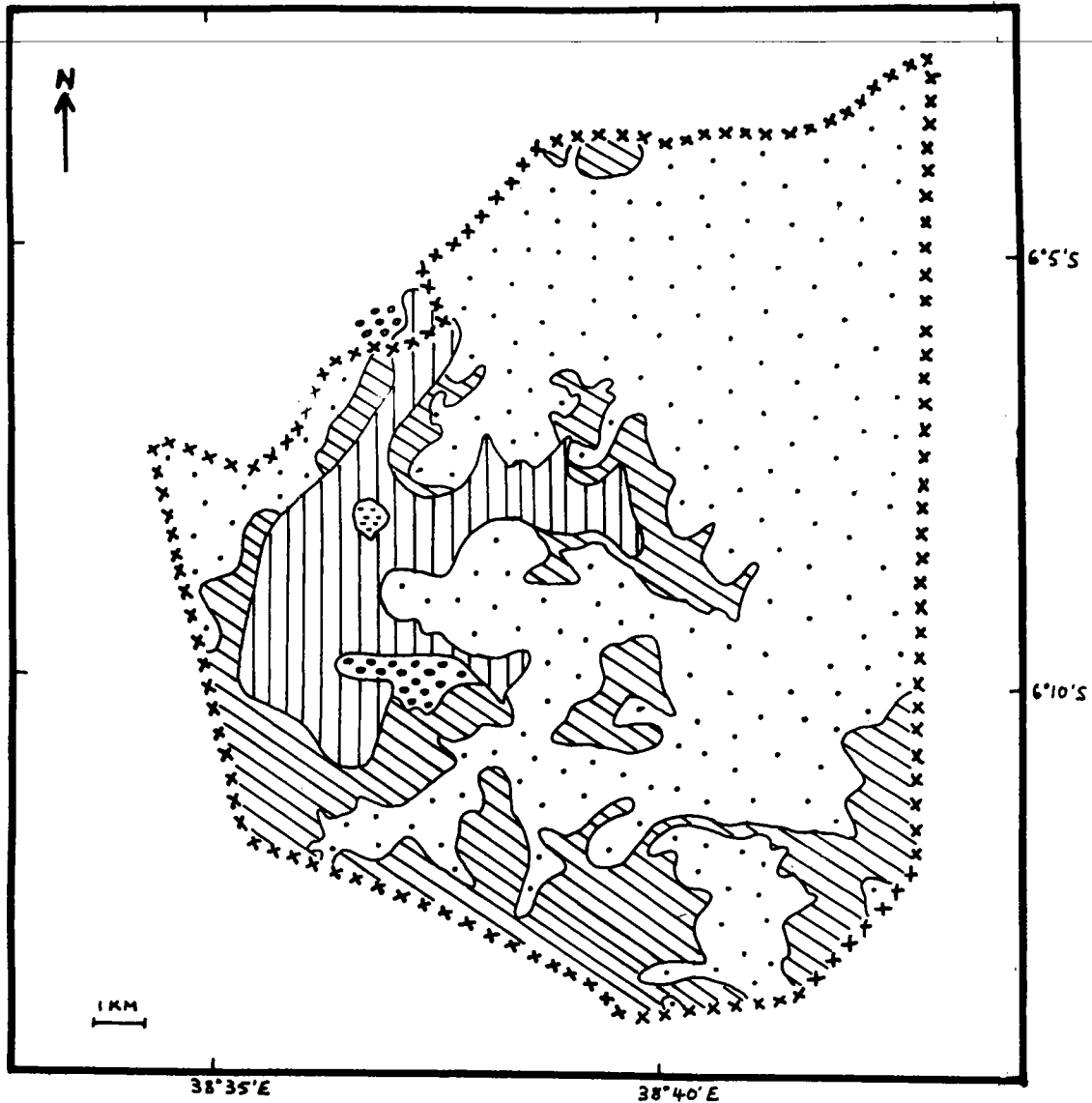


Figure 2.4: Vegetation types within Zaraninge proposed Forest Reserve .



NOTE: FOREST EXTENT AS SURVEYED BY FRONTIER-TANZANIA IN 1990-91. DISTRIBUTION OF SURROUNDING VEGETATION TAKEN FROM ORDNANCE SURVEY MAP (SERIES Y742 SHEET 168/1).

iv) **Vegetation Structure:**

Canopy Type	Semi deciduous
Canopy Height	20m
Canopy Cover	80%
Lower Strata Height	10-15m
Shrub Layer Height	3m
Shrub Cover	40%
Herb Cover	15%
Amount of Dead Wood	15% approx.

v) **Vegetation Components of Importance to Other Biotic Groups:** The forest canopy and understorey are essential microclimate modifiers for the vast majority of the birds and invertebrates found within the forest, most of which are unable to survive in the surrounding woodland - forest vegetation provides a cool and moist environment while that of woodland is hot and dry.

Many of the trees are important food sources for various forest vertebrate species, including colobus and Syke's monkeys which feed on leaves and fruits respectively.

The wetland area is used as a food and water source by warthog and buffalo, and provides water to forest-resident bush pig and game animals from the surrounding area (lion and baboon) in the dry season (Saadani Game Wardens, pers. comm.) - absolute importance unquantified.

vi) **Natural Disturbance to Vegetation:** An area of high tree-fall and dense standing dead timber is found in the eastern area of the plateau forest. This is thought to be the result of a prolonged drought period in the 1970s which weakened certain species (generally the locally common "Msandalusi" and "Mtengwe" - in Kisigua). Many of these were later brought down by a storm (Sheil and Burgess, 1990). Water stress (wilting) was also evident in shrubs and tree saplings surrounding the wetlands in August 1991.

Substantial buffalo, warthog and bush pig disturbance is evident in the wetlands.

2.3.2.3 Fauna

i) **Mammals:** At least 40 species have been recorded (Sheil and Burgess, 1990; Cockle and Dickinson, in prep; Faldborg *et al.*, 1991). Zaraninge forest is the only suitable habitat in the area for many of these mammals. Some species of interest are listed below.

Vulnerable species (according to IUCN Red Data Book):

Galago zanzibaricus (Zanzibar bushbaby)

Rare species (IUCN Red Data Book):

Rhynchocyon petersi (Black and rufous elephant shrew)

Treatened species (IUCN Red Data Book):

Panthera pardus (Leopard)

Internationally scarce species:

Colobus angolensis palliatus (Black and white colobus)

Cercopithecus albogularis (Syke's monkey)

Beamys hindei (Lesser pouched rat)

Paraxerus palliatus (Red-bellied bush squirrel)

Triaenops persicus (Persian leaf-nosed bat)

Second known location in Tanzania:

Suncus varilla (Musk shrew)

SITE DESCRIPTION AND CONSERVATION EVALUATION

ii) Birds: 71 species have been recorded in the forest (Burgess *et al.*, 1991; Faldborg *et al.*, 1991). Ten of these are classified as globally scarce (Collar and Stuart, 1985) rendering the site of international importance.

Vulnerable Species (according to IUCN Red Data Book):

Anthus sokokensis (Sokoke pipit) * only known from four other sites in the world

Near-Threatened Species (IUCN Red Data Book):

Ciraetus fasciolatus (Southern banded snake eagle)

Anthreptes neglectus (Uluguru violet-backed sunbird)

Anthreptes reichenowi (Plain-backed sunbird)

Candidate Red Data Book Species:

Phyllastrephus debilis (Tiny greenbul)

Macrosphenos kretschmeri (Kretschmer's longbill)

Prionops scopifrons (Chestnut-fronted helmet shrike)

Erythrocerus holochlorus (Little yellow flycatcher)

Pogoniulus simplex (Green tinkerbird)

iii) Reptiles: 27 species have been recorded (Sheil and Burgess, 1990; Cockle and Dickinson, in prep.). Those of interest are noted below.

Possible new species:

Lygodactylus sp. near *conradti* (Dwarf gecko)

Internationally scarce:

Cordylus t. tropidosternum (Tropical girdled lizard)

Rhampholeon spp. (Leaf chameleon)

Gastropholis prasina (Green keel-bellied lizard) * only known from S.E. Kenya and two other forests in Tanzania

Holaspis guentheri laevis (Eastern serrate-toed tree lizard)

Second most northern location in Tanzania:

Bitis gabonica (Gaboon viper)

iv) Amphibians: 20 species have been recorded (Sheil and Burgess, 1990; Cockle and Dickinson, in prep.). One of particular interest is the internationally scarce *Hyperolius parkeri*. 18 amphibian species were found in the wetlands alone indicating the high level of diversity in this small area.

v) Fish: Sheil and Burgess (1990) record kilifish for the site. Species not yet determined, but is potentially endemic.

vi) Invertebrates: Extensive collections of most groups have been carried out (Sheil and Burgess, 1990; Cockle and Dickinson, in prep.). Most identifications are pending, though one endemic snail species is known. Some-site endemics are expected. Many species will be coastal forest endemics.

2.4 CULTURAL, LAND USE AND SOCIO-ECONOMIC FEATURES

2.4.1 HISTORICAL ASPECTS

The forest edges are known to have been cultivated in the Gongo and Mbwebwe areas since the early twentieth century. There was a move to relocate all inhabitants from these areas during the Government-backed "Ujamaa" villagisation programme (1972-80), however some families resisted. Those who refused to move from Gongo incurred a six month prison sentence. On their release they requested transport to assist them in their move. However, for various reasons this was never provided thus they remained in Gongo (G. Mramboa, District Forestry Officer, pers. comm.). Since 1980 some of those who moved have returned to

"shambas" in the Gongo and Mbwebwe areas and other younger families from Matipwili and Mkange have moved in.

There is little contact between Mbwebwe and Gongo for tribal reasons. Those at Gongo are primarily from the coastal Wadoe tribe and many have origins in Matipwili while those at Mbwebwe are from the up-country Wazigua tribe having immediate origins in Mkange and Sadaani.

The Dar es Salaam-Tanga railway was built between 1945-47 and has a major station at Matipwili (Wami). A road from Matipwili through Gongo to Mkange was constructed shortly after the railway. Parts of this road were abandoned in 1984 when a licensee logger cleared the existing route through Mbwebwe to Matipwili.

2.4.2 PAST AND PRESENT LAND USES

2.4.2.1 Forestry

In 1985 the District authorities suspended the legal exploitation of any forest product in the Reserve. Before this date external enterprises were responsible for the majority of the commercial timber extraction, obtaining licences from the District Forestry Officer and using local labour to help cut and load the wood which was then transported unprocessed to Wami Railway Station. Such logging practices started in the 1950's after the Mkange- Matipwili road had been constructed.

These selective logging activities have concentrated along the forest road where most of the larger timber trees have been felled (primarily *Newtonia pacijuga*). This area of the forest is criss-crossed with extraction paths and truck roads, however forest species are regenerating strongly (Sheil and Burgess, 1990). Only the north-eastern part of the forest and steeper plateau sides have remained untouched due to inaccessibility. A survey carried out by Frontier-Tanzania concluded that an average of 470 trees (with a trunk diameter at breast height greater than 10cm) have been cut per square kilometre. However, this was considerably lower than natural tree falls at 7600 per square kilometre (Cockle and Dickinson, in prep.).

Some of the trees felled in the early 1980s have never been removed since haulage plans coincided with the 1986 boundary survey and Local Government permission was refused. However once the survey team had withdrawn it was agreed that the licensee could remove the cut logs under the supervision of Forestry personnel (G. Mramboa, pers. comm.). Activities of this nature are reported to have taken place in 1990 (Sheil and Burgess, 1990).

2.4.2.2 Agriculture

Approximately 100 hectares are under cultivation within former forest. A further 1km² (approx.) is under dense scrub arising from former cultivation. Most of the clearance is focused on Gongo village, while Mbwebwe to the north only accounts for a few hectares, however the present boundary location will allow further forest clearance in the Mbwebwe area (see Figure 2.2). The clearance at Gongo has concentrated along the forest road and is in danger of eventually dissecting the forest area. "Shambas" have already isolated small patches of forest to the south and cleared natural vegetation from parts of the southern plateau-slopes. Comparison of recent surveys with the Ordnance Survey map of 1986/7 indicates that approximately 40 hectares of the cultivated area around Gongo has been cleared since an aerial survey in 1982 (Cockle and Dickinson, in prep.). Each "shamba" clears on average one hectare of forest every 2-3 years (Sheil and Burgess, 1990).

SITE DESCRIPTION AND CONSERVATION EVALUATION

Cash crops being grown in Mbwebwe and Gongo include coconuts, bananas, pineapples, mangoes, oranges, lemons and cashew nuts. In addition, maize, millet, sugar cane, cassava, peanuts and okra are grown for home consumption.

Small areas of woodland have recently been cleared for agriculture in the south-east of the Reserve near Tumbilini village.

2.4.2.3 Pharmaceutical

There is some use of forest plants by the local people for traditional healing purposes. Details were collected by Frontier-Tanzania (Jan.'91, March'91, July-Aug.'92)

2.4.2.4 Tourism and Recreation

None

2.4.2.5 Water Supply and Management

Although there are no permanent running water courses within the Reserve the plateau is an important feature of the Wami catchment and provides water to the surrounding local area. A permanent water-hole just outside the forest provides water for the inhabitants of Gongo.

There is no past or present water management on the site.

2.4.2.6 Scientific Research

Frontier-Tanzania expeditions have visited the site on four occasions (August 1989, January 1990, March 1990, July-August 1991) giving a total of twelve weeks study in the forest area. Work carried out includes compilation of floral and faunal inventories, basic survey of the forest boundaries and vegetation structure, assessment of forest disturbance (natural and unnatural), socio-economic surveys in Gongo and Mbwebwe villages, gathering of general information about the forest (status, local usage etc.) as well as some more specialised ecological studies. Two permanently marked and measured transects were set up in 1990 (Sheil and Burgess, 1990). Figure 2.5 shows the transect locations.

The Danish-Tanzanian ICBP Expedition visited the forest for 6 days in August 1990. Birds were netted and ringed and a general assessment of the forest was made.

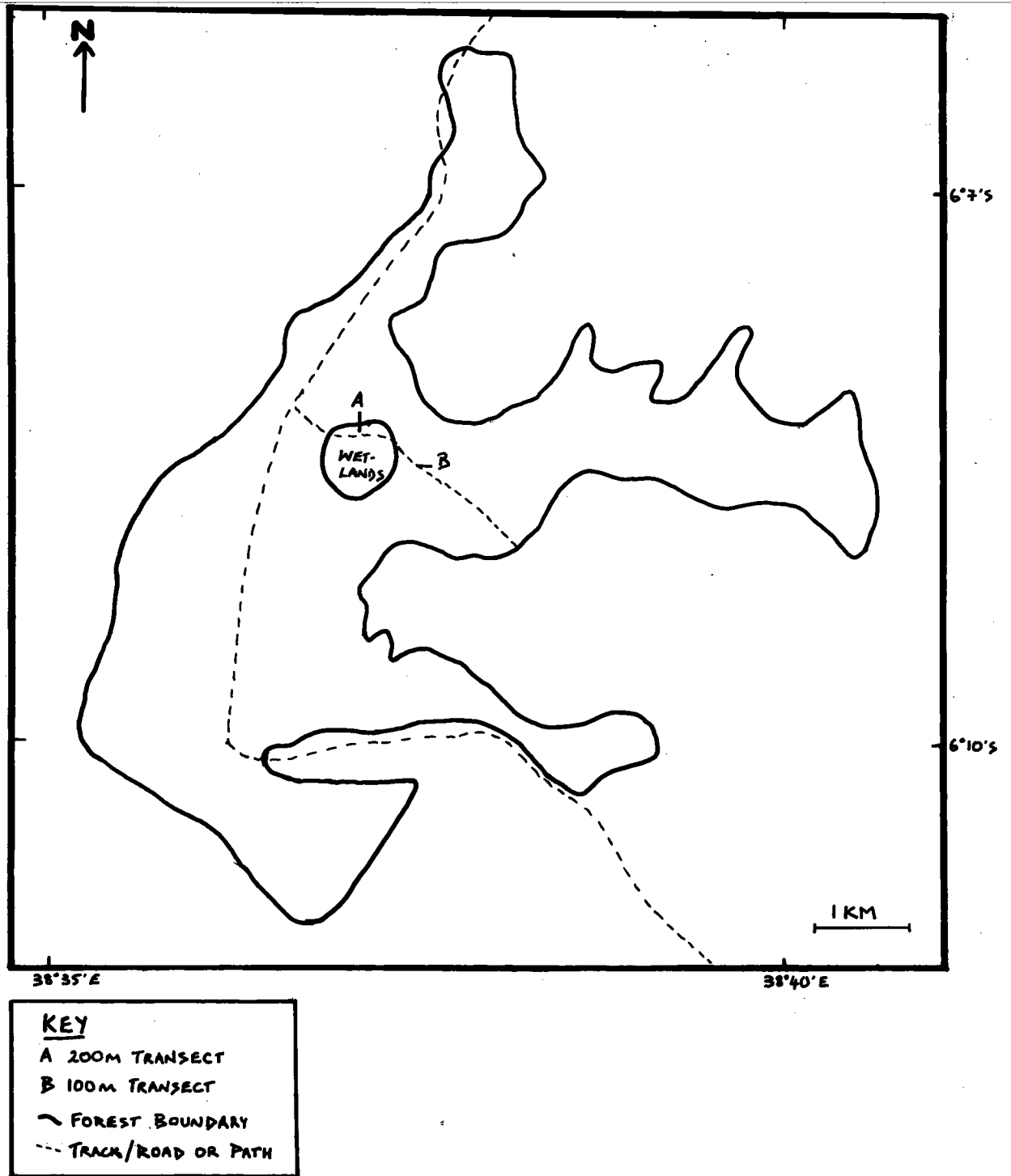
Two independent botanical collections of the forest have also been carried out by Procter and Mgaza (Polhill, 1988).

2.4.2.7 Unlicensed Occupancy

Gongo settlement and some isolated "shambas" lie within the Proposed Reserve (see Figure 2.2). There is presently a debate over the rights of these people to remain here should the proposed forest reserve become gazetted. A substantial sum of money would be required for compensation should it be decided to relocate the people

There may also be some "squatters" by the village of Tumbilini. This village was bisected when the Proposed Reserve boundaries were re-drawn in 1986/7 and people living within the new boundaries were asked to move; however it is not known whether all have done so.

Figure 2.5: Location of permanent vegetation transects at Zaraninge (Kiono) forest left by the Frontier-Tanzania project.



2.4.2.8 Hunting

At present, the hunting pressure in the forest appears low although game poachers are said to be based in the forest on occasions (O. Matola, pers. comm.). However, agricultural pests, namely baboons and monkeys are controlled by shooting with unlicensed rifles. Possession of these weapons puts other forest animals at risk. It is probable that hunting is more frequent in the woodland areas.

2.4.2.9 Extraction of Other Forest Products

i) Building Materials: Building materials (poles, and lianas for ropes) are collected for local use. The affected areas are principally concentrated around Mbwebwe village and, less so, around Gongo and along the forest road. A survey by Frontier-Tanzania found an average of 1080 poles removed per square kilometre (Cockle and Dickinson, in prep.). Commercial pole removal was reported in March 1990 by Sheil and Burgess (1990) but not found in November 1991 by Cockle and Dickinson (in prep.).

ii) Other: The local villagers collect fuelwood, traditional medicines, and "Sandarusi" gum from the forest, all for home consumption. Sheil and Burgess (1990) reported export of the gum but no supporting evidence was found by Cockle and Dickinson (in prep.).

2.4.3 SURROUNDING LAND USE

Saadani Game Reserve lies immediately east of the Reserve (See Figure 2.1). Some scattered cultivation occurs to the south-east, west and north-west. The remaining terrain is unsettled woodland and savanna.

2.4.4 CURRENT HUMAN POPULATION IN AND AROUND THE PROPOSED RESERVE

Figure 2.2 shows all settlement in, and within 5km of, the Proposed Reserve boundaries (settlement to the north-west is taken from OS map series Y742 sheet 168/1, 1986-7). The settlements of Gongo and Mbwebwe lie on the forest edge (although Mbwebwe is outside the Reserve boundaries) while Tumbilini village is located on the south-eastern boundary. There are possibly also several isolated "shambas" in the south-west of the Reserve. There is little settlement in the area immediately surrounding the Reserve. Exact population sizes of settlements are unknown.

3.0 Evaluation

3.1 EVALUATION OF FEATURES

3.1.1 BIOLOGICAL AND PHYSICAL FEATURES

3.1.1.1 Size

The forest is one of the larger coastal forests currently known in Tanzania, containing approximately 7% of the total known area. The site is large enough to support healthy populations of many of the species mentioned in section 2.3.2.

3.1.1.2 Diversity

Only two coastal forest vegetation types are present, but there is a very high species diversity (biodiversity) within each of these. The forest/woodland/wetland ecotone adds both habitat and species diversity and use by game animals from Saadani increases the species diversity of the site.

3.1.1.3 Naturalness

The majority of the forest appears natural although logging has occurred in some areas. Other disturbance is present but is not yet extensive enough to change the community remaining. The site is probably the best example of its vegetation type in Tanzania.

3.1.1.4 Rarity

East African coastal forests are globally threatened, thus Zaraninge Forest itself is of international significance as an example of its habitat type. In addition, the forest supports at least 24 internationally scarce species, many further species of national interest and many more of local importance. Five species are site-endemic or near-endemic.

3.1.1.5 Fragility

Although not fragmented, the forest is dwindling due to human disturbance, and is liable to permanent conversion to woodland: Once a forest canopy is removed or disturbed enough to dry out the interior, regular fires from the surrounding woodland penetrate the forest and convert disturbed areas to woodland. Many forest species are extremely environment-sensitive; a lack of forest will cause their extinction. The wetland area appears more robust, being severely disturbed by buffalo and warthog activities on a regular basis. (Such regular and specific disturbance is responsible for the maintenance of this wetland species community. Local removal of warthog, buffalo and bush pig would allow succession to a new, less diverse wetland type.)

3.1.1.6 Typicalness

Given that little is known about coastal monsoon forests, Zaraninge appears a classic example of this forest type and its fauna. It is possibly the best example of dry coastal forest in Tanzania.

3.1.1.7 Position in an Ecological Unit

The forest may be an isolated remnant of a formerly more widespread vegetation type. The nearest forests of a similar composition to Zaraninge are found 30km to the north on Mkwaja Ranch, Pangani District (Cockle and Dickinson, in prep). Further forested areas may exist to the south (unconfirmed), however due to a lower altitude these would be much drier and less diverse than Zaraninge (as are those to the north at Mkwaja).

Two different but ecologically important sites adjoin the Reserve: Saadani Game Reserve to the east and the Wami Delta to the south-east (See Figure 2.1). Saadani Game Reserve, approximately 300km² in size, is an area of mainly Doum Palm savanna on black cotton soils notable for its significant diversity of game animals (though diversity and population densities are greater in Mkwaja Ranch to the immediate north). The Wami Delta is a mangrove delta system of significant size (approximately 150km²) on which almost no data are available but it is known to support at least one rare species of vertebrate (Caecilian: *Schisotometopum gregoranum*). Half the delta lies within Saadani Game Reserve, the rest is (or will be soon) a Mangrove Forest Reserve. These three reserves form one continuous protected area encompassing mangrove, coastal forest, swamp and savanna - a rare and valuable occurrence.

3.1.2 ECONOMIC VALUE

3.1.2.1 Forestry

Due to selective logging activity in the past few large trees of economic value remain in the forest (Sheil and Burgess, 1990). Thus the present commercial forestry value of the site is not high.

3.1.2.2 Agriculture

"Shambas" located within this former forest area are reported to experience faster crop growth and better harvests than those in the surrounding woodland areas. However, this reported fertility probably reflects the short-term benefits of clearance (soils temporarily enriched with nutrients resulting from recent tree burning and decomposition), and is not expected to be long-lived.

3.1.2.2 Pharmaceutical

The forest contains one endemic and one or two other species of *Uvaria*, a plant currently undergoing tests for anti-malarial properties (Nkunya *et al.*, 1990). This genus is characteristic of coastal forests (Leonard Mwasumbi, pers. comm.).

3.1.2.3 Water Supply

Zaraninge is an afforested plateau attracting orographic rainfall and therefore is an important feature of the Wami catchment and is vital in the provision of water to the surrounding local area.

The forest is used as a water source by Saadani game animals during the dry season.

3.1.2.4 Intrinsic Appeal for Nature Tourism

Zaraninge plateau affords fine views of the surrounding countryside and the forest is one of the most aesthetically pleasing of coastal forests. It harbours a variety of colourful invertebrates, and several large vertebrates which are frequently seen, including monkeys and warthog. Bush pig, duiker and buffalo are sometimes seen. Ornithologists find the bird life of great interest.

The wetland depression is beautiful and provides a pleasant contrast to the closed forest vegetation.

The proximity of the site to the sea and to Saadani Game Reserve increases its overall appeal.

3.1.3 CULTURAL VALUE

The forest is an important source of building materials, fuelwood and traditional medicines for the inhabitants of Gongo and Mbwebwe villages.

3.1.4 ACTIVITIES LIKELY TO DAMAGE THE SITE AND ITS FEATURES

- a) Further selective logging would affect the naturalness of the site and possibly alter the vegetation community, hence altering the typicalness of the forest and causing the loss of specialist species, thus lowering the rarity and biodiversity values of the site.
- b) Pole removal practices affect forest regeneration and hence the site's naturalness.
- c) Pest control could potentially affect the Syke's monkey population.
- d) Hunting in the area could endanger duiker, bush pig and colobus populations.
- e) Clearance for cultivation will reduce forest extent and alter the micro-climate of the forest interior, possibly causing species-loss and reduction of population sizes to non-viable numbers.
- f) Activities of future visitors to the area could potentially damage the site.

3.2 POTENTIAL VALUE OF THE PROPOSED FOREST RESERVE

3.2.1 POTENTIAL CONSERVATION VALUE

The site has a high conservation value. In the international context East African coastal forests are recognised to be a very important but threatened natural resource. Many of Tanzania's coastal forests have been cleared or badly disturbed with only a few remaining intact. Zaraninge could be the country's best surviving example of dry coastal forest.

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

3.2.2 POTENTIAL ECONOMIC VALUE

3.2.2.1 Development of Nature Tourism

If developed appropriately the site holds great potential for nature tourism. This would possibly be best exploited in conjunction with Saadani Game Reserve where Gogo Hotels Ltd. are updating the current Game Lodge and an airstrip has been constructed. Tourists from the Game Lodge could enjoy day trips to the forest at a small entry fee collected by the management authority of the Reserve. Transport to the site would have to be provided by the Reserve and/or hotel administration.

3.2.2.2 Potential Agriculture and Commercial Forestry Value

Recently cleared soils of the plateau render the site valuable for agriculture, but the long-term agricultural potential of these areas is unlikely to be significantly high; with the initial fertility decreasing shortly after clearance. However, any development of this resource must involve clearance of natural forest vegetation.

Economically viable (industrial scale) logging would involve permanent alteration or removal of the coastal forest ecosystem and its species, resulting in a reduction of the biodiversity and amenity values of the Reserve. There would, furthermore, be a danger of reducing soil quality and the catchment value of the plateau. Sustainable logging of the natural forest community is not economically viable except as a minor source of income to local people; however effective policing/management of this would be difficult.

3.2.2.3 Potential Pharmaceutical Value

The present ongoing research into the medicinal properties of forest plants may identify Zaraninge forest as an important source of future medicines, since it has both characteristic and very diverse vegetation communities.

3.2.3 POTENTIAL RESEARCH, RECREATIONAL, AND EDUCATIONAL VALUE

As an excellent example of its habitat type the forest offers great potential for research and educational activities. A Coastal Forest Study Centre could be developed on the site, incorporating facilities for nature tourism along with those for educational purposes, as well as offering a base for one-off, and ongoing, research. Further investigation of this idea is necessary. Basic facilities would be required, such as a Kiswahili and English-speaking guide/forest guard; a simple building housing information on the forest and its wildlife (leaflets and displays) as well as more general information on the issues of forest conservation (in English and Kiswahili); and simple accommodation with toilet, washing and cooking facilities for on-site staff, researchers and more adventurous tourists.

The educational role of the Centre could be extended to local areas with organised talks to local villages/towns and schools.

Tourists and Tanzanian visitors could be charged a small entry fee and an accommodation fee where applicable. Preferably, educational visits by schools and universities would be externally sponsored as would any research work undertaken.

Public transport and possibly also access routes to the site may have to be improved. Although there are bus services to Miono and train services to Saadani (Mvavi Station) and Matipwili (Wami Station) there are no public transport links to the forest. Unless conditions are very dry, the present nature of the roads limit access to the site to 4 wheel drive vehicles only.

3.2.4 POTENTIAL LAND ACQUISITIONS

The three adjoining protected areas (Saadani G. R., Zaraninge F. R., Wami Delta Mangrove F. R.) are presently under different management authorities. Combining them into a one area would improve efficiency, economy and efficacy of management. A great diversity of important habitats would then be represented within a single site (mangrove, wetland swamp, coastal forest and savanna), which would increase the potential appeal to visitors plus expanding the scope for a Study Centre. However, such an amalgamation would not be possible without the formation of a new class of protected area (such as a "Nature Reserve").

3.2.5 POTENTIAL ROLES OF OTHER GOVERNMENT BODIES IN RESERVE DEVELOPMENT

The activities of a Study Centre with facilities for tourists and local education programmes could be enhanced through joint developments with other Government Bodies, namely Game Division, Tanzanian Tourist Board (Tourism Division), Environment Division and the Ministry of Education, thus incorporating the interests of all relevant parties in one project.

3.2.6 POTENTIAL ROLES OF NGOS AND BUSINESS IN RESERVE DEVELOPMENT

Outside expertise, advice and financial assistance provided by NGOs and/or business would be of great benefit to the development of the Reserve in general and would be particularly necessary for any development of a Study Centre. Parties with a possible interest include the Society for Environmental Exploration (Frontier-Tanzania), World Wildlife Fund (Tanzania), the Wildlife Conservation Society of Tanzania, the Rotary Clubs, Malihai Clubs and "Roots and Shoots".

Assistance in the provision of funds for compensation for relocated families could be sought from NGOs.

A collaborative venture with Gogo Hotels Ltd. concerning nature tourism in the Reserve could be beneficial for both parties, providing an added attraction for visitors to the Game Lodge and an accessible source of tourists for the Forest Reserve.

3.2.7 RATIONALE FOR THE ESTABLISHMENT OF ZARANINGE FOREST RESERVE

Zaraninge is a pleasant and ecologically important forest under pressure from "slash and burn" clearance for cultivation which, although on a small scale at present, is a long-term threat to the survival of the site.

SITE DESCRIPTION AND CONSERVATION EVALUATION

Conservation and sustainable management of the site would reflect international and national concern over the dwindling nature of Tanzania's coastal forest habitats. This would also contribute towards conserving Tanzania's biological and genetic diversity and preserving catchment forests.

The development of research, educational and recreational facilities at the site would further scientific knowledge of a poorly understood and important ecosystem, and increase public awareness (national and international) of the importance of conserving forest habitats.

4.0 Recommended Management Objectives

1. To preserve the site as one of the best known coastal monsoon forests remaining in Tanzania, with the broad aims of conserving and improving the habitat for all fauna living in the area.
2. To maintain the various important populations of vertebrates.
3. To repair any human modifications of the site and prevent any further modifications in the future.
4. To encourage visitors (both Tanzanian nationals and tourists) to the site thus furthering awareness of coastal forests and forest conservation issues in general, whilst limiting any consequent damage.
5. To increase local knowledge about the site and its significance.
6. To carry out and foster research on the site.

5.0 Main factors influencing management and development

1. Status: Presently under review (Productive or Protective).
2. Management authority: Likewise under review; linked to "a" (Central or local government).
3. Resources available: The feasibility of implementing any management prescriptions depends on the resources available (both within, and external to, the Local District Authorities).
4. Population settlements within the Reserve: Outcome of present dispute over their rights. If not relocated, their activities in relation to the forest will have to be controlled.
5. Visitors: Any future developments involving an increase of visitors to the site must consider both the impact they may have on the site, and the need to provide basic amenities.
6. Access: If visitors are to be attracted to the site public transport, and perhaps also access roads, must be improved.

6.0 Management options and recommendations

6.1 RECOMMENDED MANAGEMENT ZONING SYSTEM

The following recommendations are a modified version of the zoning system used by the Catchment Forestry Project, FBD. Under this system Akitanda (1991) has identified four management zones; a catchment zone, a biodiversity zone, an amenity zone and a productive zone. Four similar zones are identified for coastal forest management.

The catchment zone aims to protect the natural catchment values of the forest and prevent erosion. Within this zone there is to be no disturbance of vegetation except in managed regeneration areas. Akitanda's (1991) defining criteria for such a zone, based on hydrology and slope, are found to have shortfalls since there is no room for plateaux such as Zaraninge. However, the definition has been extended here to include the whole of the plateau area while the hydrology criteria have been relaxed somewhat.

The biodiversity zone exists to protect areas of high biodiversity or wildlife migration routes and is to be left undisturbed other than for non-destructive research and educational programmes.

The amenity zone exists to exploit interesting natural features for the purposes of education, recreation and research. The zone is to experience no forest product exploitation except that linked to educational or research programmes. It is within this zone that visitor facilities should be developed (nature trails, cabins, etc.).

The utility/productive zone exists to produce forest products on a small scale, primarily for local use - building materials, fuelwood and traditional medicines etc. The area is to be managed on a sustainable level. Mechanical logging is not permitted within the zone and exploited areas must be regenerated.

6.2 PROTECTION AND MANAGEMENT OF BIOLOGICAL AND PHYSICAL RESOURCES

6.2.1 RESERVE STATUS

Options:

- a) A Productive Forest Reserve under standard management practices. This would allow the exploitation of forest products under sustainable management with re-planting and regeneration schemes. This status is unsuitable for Zaraninge since the site has a considerably higher biodiversity/amenity value than commercial forestry value.
- b) A Protective Forest Reserve under standard management practices. Management of the site would aim to conserve and improve the forest. No harvesting or disturbance of natural vegetation or wildlife would be permitted. However, there would be no explicit consideration of research, tourism or education issues.
- c) A Protective Forest Reserve under tailored management practices. The standard management practices for Protective Forest Reserves could be modified to the site's specific requirements. For example, this could incorporate a management zoning system (see 7.2.4).

SITE DESCRIPTION AND CONSERVATION EVALUATION

Recommendation: A Protective Forest Reserve under tailored management practices whereby management details can be developed according to the level of external involvement (NGOs, business and other Government bodies) and the nature of the projects to be implemented. Possible inputs required include; legislative and administrative procedures, and funds for any necessary site boundary surveys.

6.2.2 STATUS OF LOCAL VILLAGES

Options:

- a) Relocate the inhabitants of all settlements within the Proposed Reserve outside the current proposed boundaries.
- b) Allow the existing settlements to remain in their current locations within the proposed Reserve boundaries and re-survey the boundaries accordingly. This would involve excluding areas of former forest on the plateau top around Gongo and would necessitate a substantial reduction in the Reserve area. In addition the close proximity of Gongo to the new Reserve boundaries would hinder successful maintenance of the boundaries and greatly increase the likelihood of further forest encroachment.

Recommendation: Relocation of the villages outside the current proposed Reserve boundaries. Possible inputs required include; legislative and administrative procedures, and compensation for relocated families.

6.2.3 RESERVE BOUNDARY LOCATION AND MARKING

Options:

a) Boundary location -

- i) Enforce the present Proposed Reserve boundaries. Note - this allows Mbwebwe to clear further areas of forest (see Map 8.1.2).
- ii) Re-survey the Reserve boundaries (in whole or in part). This will be necessary if there is to be a change in Reserve size, eg. to exclude Gongo and/or to reduce the area of unreserved forest around Mbwebwe.

b) Boundary marking -

Note: demarcation of the eastern and northern boundaries may be considered unnecessary since they follow major landmarks (railway and road) and there are currently no population settlements in close proximity to these boundaries.

- i) Leave the Reserve boundaries as marked at present, ie. with small but frequent (no more than 5m apart) trenches along the western and southern boundaries. Such trenches require infrequent maintenance and are obvious once pointed out.
- ii) Demarcate the Reserve boundary by clearing. This requires regular maintenance in order to remain obvious and would necessitate a degree of forest clearance around Mbwebwe.
- iii) Demarcate the Reserve boundary by clearing and planting with tree saplings (preferably of an indigenous species). This requires a larger initial financial outlay than (b) but needs less maintenance once the trees are established. However regular clearance of the areas of boundary passing through forest or woodland would be necessary for these stretches to remain obvious.

Recommendation: Re-survey of the Reserve boundary around Mbwebwe and, if necessary, other settlements. Demarcation using the current trench system, ensuring all living near the

boundary are aware of its existence and location. Possible inputs required include; the permission/cooperation of the relevant authorities, funds for any survey work necessary and wages for labourers.

6.2.4 MANAGEMENT ZONES

Options:

- a) Manage the Reserve as a single unit under standard management practices.
- b) Designate specific management zones within the Reserve. The following recommendations are based on the management zoning system outlined in section 6.1.

Figure 6.1 shows a possible zoning option with a core biodiversity/catchment zone comprising the plateau top and slopes, including the woodland area regenerating to forest. Contained within this there is an amenity zone which can be developed for nature tourism and educational purposes. The remaining Reserve area may be managed as a utility zone if the demand for such an amenity is found to exist amongst the local populace. However, if available resources are insufficient to ensure effectively controlled use of the zone it is recommended that either:

- i) The catchment/biodiversity zone be extended to encompass the whole of the Reserve.
- or ii) That the core area be extended to include a corridor allowing movement of wildlife between the plateau and Saadani Game Reserve as shown on Figure 6.1.

Note - If the Gongo settlement is to remain they should have easy access to a utility zone and their use of this, and all other zones, should be carefully controlled.

Recommendation: Implementation of a zone system appropriate to the management resources available and the development plans for the Reserve. Possible inputs required include; legislative and administrative procedures, and a feasibility study of a proposed utility zone.

6.2.5 REPAIR TO DISTURBED AREAS

Recommendation: Logging tracks and the cleared areas of former forest around Gongo be regenerated, either by re-planting or by encouraging re-growth (possibly through weeding). If the cleared areas are re-planted a section could be left to regenerate naturally giving valuable research information. Possible inputs required include; wages for labourers, provision/purchase and transportation of seedlings, and the establishment and maintenance of an on-site nursery.

6.2.6 ROAD/TRACK DEVELOPMENT

Recommendation: Any future development of roads or tracks in the Reserve is limited, and any associated damage to the site is minimized. No tarmac roads or breakage of canopy should be allowed in order to preserve the naturalness of the site.

6.3 HUMAN USE

6.3.1 NATURE TOURISM

Recommendation: If the necessary financial resources are available, simple tourist facilities be developed within the amenity zone. These would include:

- marked nature trails
- provision of at least one Kiswahili and English-speaking guide with a basic knowledge of the forest, its wildlife, and the background to its conservation
- toilet facilities

These basic amenities could be developed further with educational information hand-outs about the Reserve and forest conservation in general, and possibly basic accommodation facilities. Possible inputs required include; the involvement of NGOs and/or business.

The scope of nature tourism developments would be greatly enhanced if a Study Centre is established within the Reserve.

6.3.2 EXTRACTION OF FOREST PRODUCTS

Recommendation: If a utility zone is identified, extraction of forest products (fuelwood, traditional medicines and possibly building materials) is limited and carefully monitored through regular and thorough patrols of the zone by on-site forest guards.

6.4 ADMINISTRATION AND RESERVE MANAGEMENT

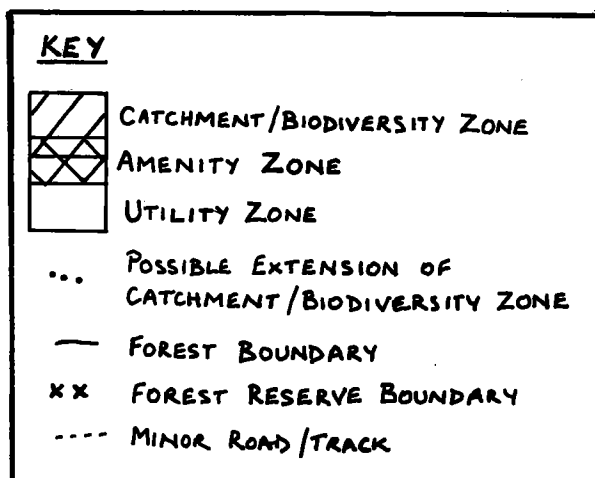
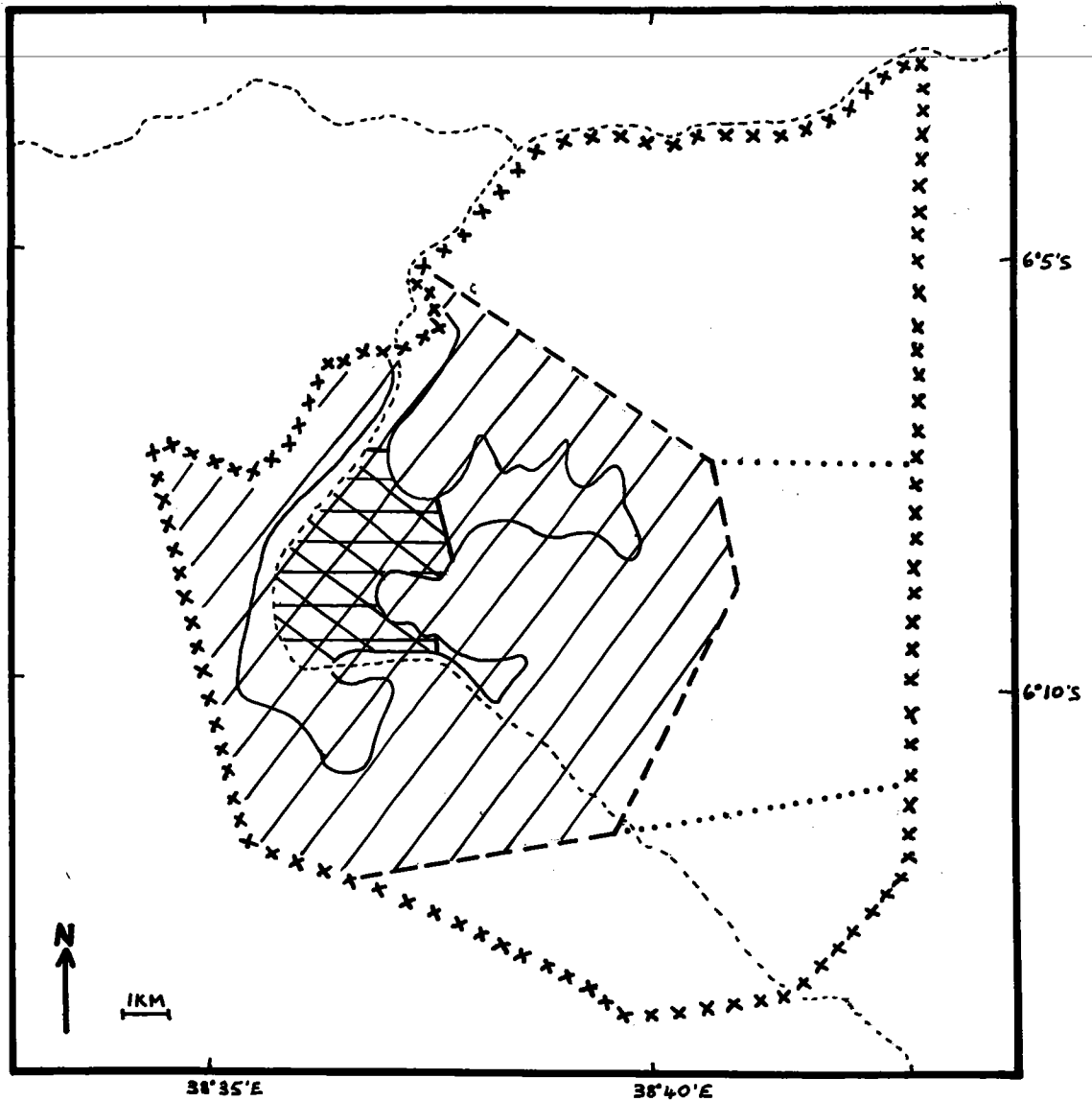
6.4.1 ON-SITE FOREST GUARDS

Recommendation: At least two forest guards are employed to monitor and control activities within the Reserve. They should carry out regular patrols of the Reserve to ensure no illegal activities are taking place within the respective management zone boundaries. To facilitate their duties they should be accommodated on-site and provided with bicycles. A guarantee of regular wages would encourage these guards to carry out their job properly and a bonus system could be implemented to encourage the fulfilment of their responsibilities.

6.4.2 LIAISON BETWEEN FORESTRY PERSONNEL

Recommendation: Close communication between the District, Regional and Ministerial personnel involved in the management of the site is maintained at all times. Preferably on-site forest guards must report to the District Forestry Officer (DFO) responsible for the Reserve every 2-4 weeks. (Buses from Miono to Bagamoyo are regular.) The DFO in turn should make regular visits to the site and keep the Regional Forestry Officer (RFO) informed on a frequent basis, possibly through annual progress reports. Similarly regular communication between the RFO and the management section of FBD is recommended.

Figure 6.1: Possible forest management zones for Zaraninge proposed Forest Reserve.



6.4.3 LINKS WITH NGOs AND BUSINESS

Recommendation: Links be sought with NGOs and business over the possible joint development of the Reserve. (Parties with a possible interest are listed in section 3.2.6.) Potential issues involved are:

1. Funds for compensation for relocated families.
2. Funds for boundary surveys.
3. Funds/provision of trees for re-planting and/or boundary marking.
4. Funds for forest guards and provision of bicycles.
5. Development of tourist and education facilities.

6.4.4 LIAISON WITH OTHER GOVERNMENT BODIES

Recommendation: FBD liaise closely with the management authorities of the other two neighbouring protected areas to ensure operations are maximally mutually beneficial. Topics to be considered include: natural resource management practices, publicity, promotion, and visitor amenities, and perhaps total amalgamation of the sites.

Similarly liaison with Tanzanian Tourist Board (Tourism Division), Environment Division and the Ministry of Education is recommended so that the aims of all relevant parties may be incorporated into the development of the site.

6.4.5 MAINTENANCE OF ROADS AND TRACKS

Recommendation: repairs necessary to maintain the condition of the present and any future roads and tracks in frequent use in the Reserve be carried out on a regular basis.

6.5 RESEARCH, MONITORING AND EDUCATION

6.5.1 COASTAL FOREST STUDY CENTRE

Recommendation: A feasibility study for the establishment of a Coastal Forest Study Centre on the site with facilities for research, education, and/or recreation is undertaken. This document must cover all aspects including: aims; management proposals; finance; personnel; access to the site; any necessary amenities, their construction and upkeep; visitor potential (of both Tanzanian nationals and tourists); education facilities; research possibilities and proposed programme; costs, both of initial establishment and day to day running; possible participating NGOs and business and their proposed roles.

6.5.2 LOCAL CONSERVATION EDUCATION PROGRAMME

Recommendation: The development of a Conservation Education Programme for the local area, comprising visits to schools and villages is considered. This would aim to explain the importance of the site and how and why it is being conserved.

6.5.3 SUGGESTED AREAS FOR FURTHER RESEARCH

- a) Interactions between surrounding future populations and the Forest Reserve.
- b) Feasibility study of the value and management of a proposed utility zone.
- c) Seasonal importance of the site as a food and water source for game in the area.
- d) Degree and effects of water stress in the forest and the importance of past and possible future droughts in shaping forest ecology.
- e) Further characterisation of the role of natural tree-falls in maintaining forest diversity, and the effects of possible "treefall epidemics" on the forest community.
- f) Natural woodland-forest succession on the eastern boundary for application to management policies for this and other similar sites.
- g) Vegetation population/community dynamics through on-going monitoring of permanently marked vegetation plots/transects.
- h) Regeneration/succession in cleared areas of former forest for application to management policies for this and other similar sites.
- i) Continuation and expansion of research into the medicinal properties of forest and woodland plants.
- j) Disturbance effects of logging tracks and total forest clearance on vertebrate and invertebrate ecology.
- k) Characterisation of invertebrate communities, densities and richness, and seasonal ecology of vertebrates and invertebrates to improve global understanding of coastal forest ecology and importance.
- l) Seasonal ecology of coastal forest plants (phenology).

Much of the above research can be carried out by the University of Dar es Salaam supported by Frontier-Tanzania, but would be open to involvement by other bodies such as Tanzania Forestry Research Institute (TAFORI).

7.0 Bibliography

- Akitanda P.C. (1991). *The Tanzania Catchment Forestry Project*. Forestry and Beekeeping Division of the Ministry of Tourism, Natural Resources and Environment, Tanzania.
- Bensted-Smith R. and Msangi-Msangi T.H. (1989). *Tanzania Forestry Action Plan 1990/91 - 2007/08*. Forestry and Beekeeping Division of the Ministry of Lands, Natural Resources and Tourism.
- Burgess N.D. (1990). *Preliminary Results of Biological Surveys in Seven Coastal Forests of Tanzania: July to September 1989*. Interim Report. The Society for Environmental Exploration, London.
- Burgess N.D., Cutts C.J., and Huxham M.R. (1991). New records of the Sokoke Pipit *Anthus sokokensis* from Kiono Forest Reserve, Bagamoyo District, northeastern Tanzania. *Scopus* **15**: 56-57.
- Burgess, N.D., Dickinson, A. and Payne, N.H. (1993). Tanzanian coastal forests - new information on status and biological importance. *Oryx* **27** (3) : 169-173.
- Burgess, N.D., FitzGibbon, C.D. and Clarke, G.P. (in press). Coastal forests. In: McClanagan (ed.); *Ecosystems and their conservation in East Africa*. W.C.I.
- Burgess N.D., Huxham M.R., Mlingwa C.O.F., Davies S.G.F. and Cutts C.J. (1991). "Preliminary Assessment of Forest Birds in Kiono, Pande, Kisiju and Kiwengoma Coastal Forests, Tanzania." *Scopus* **14**: 97-106.
- Burgess, N.D., Mwasumbi, L.B., Hawthorne, W.J., Dickinson, A. and Doggett, R.A. (1992). Preliminary Assessment of the Distribution, Status and Biological Importance of Coastal Forests in Tanzania. *Biological Conservation*. **62**: 205-218.
- Clarke G.P. (in press). *Checklist of the vascular plants from 13 coastal forests, Tanzania*. The Society for Environmental Exploration, London.
- Cockle A.C. and Dickinson A.D. (in prep.). *Preliminary Results of Biological Surveys of Zaraninge/Kiono Forest Reserve and Mkwaja Dry and Riparian Forests, Tanzania*. Interim Report. The Society for Environmental Exploration, London.
- Collar N.J. and Stuart S.N. (1985). *Threatened Birds of Africa and Related Islands: The ICBP/IUCN Red Data Book, Part 1 (Third Edition)*. International Council for Bird Preservation and International Union for the Conservation of Nature and Natural Resources, Cambridge, UK.
- Dickinson, A., Burgess, N.D. and Clarke, G.P. (in press). Tanzanian coastal forests: status and biological diversity. In: *Proc. Workshop on Conservation of Biodiversity in Africa*. Nat. Mus. Kenya.
- Faldborg J., Halberg K., Brammer F. and Erikson T. (1991). *Observations of Birds and Mammals in Six Coastal Forests of Tanzania*. A Preliminary Report of the Danish Tanzanian ICBP Expedition 1990.

SITE DESCRIPTION AND CONSERVATION EVALUATION

Mlingwa C.O.F. (1991). "Further Records of the Sokoke Pipit *Anthus sokokensis* from Tanzania." *Scopus* 15: 57-58.

Mwasumbi L.B. and Burgess N.D. (in prep.). *Quantitative Assessment of Floral Variation Between Pande and Kiono Coastal Forests, Tanzania.*

Nsemwa Y.N.S. and Mkilanya C.M.K. (1991). *Forestry Action Plan for Coast Region 1990/91 - 2007/8.* Regional Development Directors Office, Coast Region, Tanzania.

Nkunya M.H.H., Weenen H., Bray D.H., Mgani Q.A. and Mwasumbi L.B. (1990). "Antimalarial Activity of Tanzanian Plants and their Active Constituents: The Genus *Uvaria*". *Planta Medica* Paper 24/490 930 Biological Activities.

Ogle S. (1990). *Relationships Between Birds and Vegetation in Eight Coastal Forests of Tanzania.* Cambridge University Undergraduate Report, Unpublished.

O'Hara T.A., Weale M.E. and Allen J.A. (1990). *Butterflies of Pande and Kiono Coastal Forest (mainland Tanzania) and Kilindoni (Mafia Island), collected between July and October 1989.* Unpublished Report.

Polhill D. (1988). *Flora of Tropical East Africa - Index of collecting localities.* Royal Botanic Gardens, Kew.

Ponder, K.L., Clarke, G.P. and Bayliss, J.L. (in press). *Scientific references and reports of the Coastal Forest Research Programme.* The Society for Environmental Exploration, London.

Sheil, D. (1992). Tanzanian coastal forests - unique, threatened, and overlooked. *Oryx* 26 (2): 107-114.

Sheil D. and Burgess N.D. (1990). *Preliminary Results of Biological Surveys of Zaraninge (Kiono) and Kiwengoma (Matumbi Hills) Coastal Forests, Tanzania.* Interim Report. The Society for Environmental Exploration, London.

Stubblefield, L.K. and Dickinson, A. (eds.) (in press). *Management Summaries of the coastal forests of Tanzania.* The Society for Environmental Exploration, London.

White F. (1983). *The Vegetation of Africa - A Descriptive Memoir to Accompany the UNESCO/AETFAT/UNSO Vegetation Map of Africa.* UNESCO, Paris.

APPENDIX A :

Vertebrate species recorded at Zaraninge (Kiono)
forest by Frontier-Tanzania
(Aug. '89, Jan. '90 and Sep. '91).

Key to the vertebrate species annotations:

Habitat preference:

Fo = Forest Sw = Swamp Sh = Shamba Wo = Woodland fs = forest/swamp border

Abundance at Kiono:

1 = Occasional 2 = Common 3 = Very abundant

International status:

W = Widespread L = Localised VL = Very Localised

FISH

unidentified Killifish Sw 2

AMPHIBIANS

Hyperoliidae (tree-frogs)

<i>Leptopelis argenteus</i>	fs	1	L
<i>Leptopelis flavomaculatus</i>	Fo	2	W
<i>Hyperolius argus</i>	Sw	1	L
<i>Hyperolius nasutus</i>	Sw,fs	3	W
<i>Hyperolius parkeri</i>	Sw	2	L
<i>Hyperolius tuberilinguis</i>	Sw,fs	3	L
<i>Afrixalus pygmaeus</i>	Sw	1	W
<i>Afrixalus fornasini</i>	Sw	2	W
<i>Kassina maculata</i>	Sw	1	W
<i>Kassina senegalensis</i>	fs	1	W

Racophoridae

Chiromantis xerampelina (Foam-nest frog) 1 W

Ranidae

<i>Hemisus marmoratus</i> (Shovel-snouted frog)	Fo,Sw	2	W
<i>Ptychadena anchietae</i> (Ridgeback frog)	Sw	2	W
<i>Pyxicephalus adspersus</i> (African bullfrog)	Sw	1	W
<i>Hylarana galamensis</i>	Sw	1	W
<i>Phrynobatrachus cf acridoides</i> (Puddle frog)	Sw	3	W

Pipidae

Xenopus cf muelleri (Clawed toad) Sw 1 ?

Arthroleptidae

Arthroleptis stenodactylus (Leaf-litter frog) Fo 3 ?

Bufonidae

Bufo gutturalis (Common toad) Sw 1 W

SITE DESCRIPTION AND CONSERVATION EVALUATION

REPTILES

Snakes

Leptotyphlopidae

<i>Leptotyphlops scutifrons merkeri</i> (Merker's worm snake)		2	L
---	--	---	---

Viperidae

<i>Bitis gabonica</i> (Gaboon viper)	Fo	2	W
--------------------------------------	----	---	---

Colubridae

<i>Dipsadoboa aulica</i> (Southern marbled tree snake)	Fo	3	W
--	----	---	---

<i>Thelotornis capensis mossambicanus</i> (Mozambique twig snake)	Fo	3	L
---	----	---	---

<i>Crotaphopeltis hotamboeia</i> (Herald snake)		2	W
---	--	---	---

<i>Aparallactus capensis</i> (Cape centipede eater)		2	W
---	--	---	---

<i>Philothamnus hoplogaster</i> (Southeastern green snake)		2	L
--	--	---	---

<i>Prosymna ambigua stuhlmanni</i> (East African shovel snout)		2	W
--	--	---	---

Elapidae

<i>Naja melanoleuca</i> (Forest cobra)	Fo	2	W
--	----	---	---

Boidae

<i>Python s. sebae</i> (African rock python)	Sw	2	W
--	----	---	---

Lizards

Varanidae

<i>Varanus niloticus</i> (Nile monitor)	Sw	2	W
---	----	---	---

Agamidae

<i>cf Stellio</i> (Tree Agama)	Sh	3	W
--------------------------------	----	---	---

Lacertidae

<i>Gastropholis prasina</i> (Green keel bellied lizard)		1	L
---	--	---	---

<i>Holaspis guentheri laevis</i> (Eastern serrate toed tree lizard)		1	L
---	--	---	---

<i>Heliobolus spekii spekii</i> (Southern Speke's sand lizard)	Sh	3	L
--	----	---	---

Gekkonidae

<i>Hemidactylus platycephalus</i> (Flat headed house gecko)	Fo	3	W
---	----	---	---

<i>Hemidactylus mabouia</i> (Tropical house gecko)	Fo	3	W
--	----	---	---

<i>Hemidactylus squamulosus squamulosus</i>		2	L
---	--	---	---

<i>Lygodactylus sp. near conradti</i> (Conradt's dwarf gecko)		1	VL
---	--	---	----

<i>Lygodactylus l. luteopicturatus</i> (Yellow headed dwarf gecko)	Fo,Sh	2	L
--	-------	---	---

Scincidae

<i>Mabuya m. maculilabris</i> (Speckle lipped skink)	Fo,Sh	3	W
--	-------	---	---

<i>Mabuya s. striata</i> (Common striped skink)	Sh	2	W
---	----	---	---

Cordilidae

<i>Cordylus t. tropidosternum</i> (East African girdled lizard)	Fo	1	L
---	----	---	---

<i>Gerrhosaurus nigrolineatus</i> (Lined plated lizard)	Sh	2	W
---	----	---	---

REPTILES, contd.

Chameleonidae

<i>Chameleo d. dilepsis</i> (Flap neck chameleon)	Fo	2	W
<i>Rhampholeon brevicaudata</i> (Short tailed leaf chameleon)	Fo	1	L
<i>Rhampholeon ? sp.2</i> (Leaf chameleon)	Fo	1	-

Terrapins

Pelomedusidae

<i>Pelusios c. castanoides</i> (Yellow bellied hinged terrapin)	Sw	2	W
---	----	---	---

SITE DESCRIPTION AND CONSERVATION EVALUATION

BIRDS

Accipitridae

<i>Stephanoaetus coronatus</i> (Great ^C Crowned eagle)	Fo	W
<i>Haliaeetus vocifer</i> (African fish eagle)		W
<i>Accipiter tachiro</i> (African goshawk)	Fo	W
<i>Accipiter melanoleucus</i> (Great sparrowhawk)		L
<i>Circaetus gallicus</i> (European short toed eagle)		W
<i>Circaetus fasciolatus</i> (Southern banded snake eagle)		L

Alcedinidae

<i>Ispidina picta</i> (Pygmy kingfisher)	Fo	W
<i>Halcyon albiventris</i> (Brown hooded kingfisher)		W

Bucerotidae

<i>Tockus alboterminatus</i> (Crowned hornbill)		W
<i>Bucorvus leadbeateri</i> (Ground hornbill)		W
<i>Bycanistes bucinator</i> (Trumpeter hornbill)		W

Burhinidae

<i>Burhinus capensis</i> (Spotted stone curlew)		W
---	--	---

Campephagidae

<i>Campephaga sulfurata</i> (Black cuckoo shrike)		W
---	--	---

Capitonidae

<i>Pogoniulus simplex</i> (Green tinkerbird)	Fo	W
<i>Pogoniulus bilineatus</i> (Golden rumped tinkerbird)		W

Coliidae

<i>Colius striatus</i> (Speckled mousebird)		W
---	--	---

Columbidae

<i>Treron australis</i> (Green pigeon)	Fo	W
<i>Streptopelia semitorquata</i> (Red eyed dove)		W
<i>Turtur tympanistria</i> (Tambourine dove)		W
<i>Turtur chalcospilos</i> (Emerald spotted wood dove)		W

Coraciidae

<i>Eurystomus glaucurus</i> (Broad billed roller)		W
---	--	---

Corvidae

<i>Corvus albus</i> (Pied crow)		W
---------------------------------	--	---

Cuculidae

<i>Centropus superciliosus</i> (White browed coucal)		W
<i>Ceuthochares aereus</i> (Green coucal) ^{Yellow bill}	Fo	L
<i>Chrysococcyx klaas</i> (Klaas' cuckoo)		W

Dicruridae

<i>Dicrurus ludwigii</i> (Square tailed drongo)	Fo	W
<i>Dicrurus adsimilis</i> (Drongo)		W

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

BIRDS, contd.

Estrildidae

<i>Mandingoa nitidula</i> (Green backed twinspace)		W
<i>Lonchura cucullata</i> (Bronze mannikin)		W
<i>Hypargos niveoguttatus</i> (Peter's twinspace)		W

Eurylaimidae

<i>Smithornis capensis</i> (African broadbill)	Fo	W
--	----	---

Indicatoridae

<i>Indicator variegatus</i> (Scaly throated honey guide)		W
--	--	---

Laniidae

<i>Malaconotus quadricolor</i> (Four coloured bush shrike)		W
<i>Laniarius ferrugineus</i> (Tropical boubou)		W
<i>Malaconotus blanchotti</i> (Grey headed bush shrike)		L
<i>Dryoscopus cubla</i> (Black backed puffback)		W

Meropidae

<i>Merops pusillus</i> (Little bee eater)		W
<i>Merops albicollis</i> (White throated bee eater)		W

Motacillidae

<i>Anthus sokokensis</i> (Sokoke pipit)	Fo	VL
---	----	----

Muscicapidae

<i>Chloropetella (Erythrocerus) holochlora</i> (Little yellow flycatcher)		W
<i>Trochocercus cyanomelas</i> (Crested flycatcher)		L
<i>Alcedo cinereus</i> (Ashy flycatcher)		L
<i>Batis mixta</i> (Forest batis)		W
<i>Terpsiphone viridis</i> (Paradise flycatcher)		W

Musophagidae

<i>Tauraco livingstonii</i> (Livingstone's turaco)		L
--	--	---

Nectariniidae

<i>Anthreptes reichenowi</i> (Plain backed sunbird)	Fo	VL
<i>Anthreptes neglectus</i> (Uluguru violet backed sunbird)	Fo	VL
<i>Anthreptes collaris</i> (Collared sunbird)		W
<i>Nectarinia olivacea</i> (Olive sunbird)	Fo	L

Numinidae

<i>Guttera pucherani</i> (Kenya crested guineafowl)		L
---	--	---

Oriolidae

<i>Oriolus auratus</i> (African golden oriole)		L
--	--	---

Phoeniculidae

<i>Phoeniculus purpureus</i> (Green wood hoopoe)		L
--	--	---

Picidae

<i>Campethera cailliautii</i> (Little spotted woodpecker)	Fo	W
<i>Campethera abingoni</i> (Golden tailed woodpecker)		W

SITE DESCRIPTION AND CONSERVATION EVALUATION

BIRDS, contd.

Ploceidae

<i>Ploceus ocularis</i> (Spectacled weaver)		W
<i>Ploceus bicolor</i> (Dark backed weaver)	Fo	L

Prionopidae

<i>Prionops scopifrons</i> (Chestnut fronted shrike)		L
--	--	---

Psittacidae

<i>Poicephalus meyeri</i> (Brown parrot)		W
<i>Poicephalus robustus</i> (Brown necked parrot)		L

Pycnonotidae

<i>Pycnonotus barbatus</i> (Yellow vented bulbul)		W
<i>Phyllastrephus fischeri</i> (Fischer's greenbul)	Fo	L
<i>Phyllastrephus flavostriatus</i> (Yellow streaked greenbul)	Fo	L
<i>Phyllastrephus debilis</i> (Smaller yellow streaked bulbul)	Fo	L
<i>Chloroceryle flaviventris</i> (Yellow bellied greenbul)		W
<i>Nicator chloris</i> (Nicator)	Fo	W

Scopidae

<i>Scopus umbretta</i> (Hamerkop)		W
-----------------------------------	--	---

Strigidae

<i>Ciccaba woodfordii</i> (African wood owl)		L
<i>Bubo africanus</i> (Spotted eagle owl)		L

Sturnidae

<i>Lamprotornis corruscus</i> (Black breasted glossy starling)		L
--	--	---

Sylviidae

<i>Apalis melanocephala</i> (Black headed apalis)	Fo	L
<i>Camaroptera brachyura</i> (Green backed camaroptera)		W
<i>Cisticola brunnescens</i> (Pectoral patch cisticola)		L
<i>Macrosphenus kretschmeri</i> (Kretschmar's longbill)	Fo	L
<i>Prinia subflava</i> (Tawny flanked prinia)		W

Trogonidae

<i>Apaloderma narina</i> (Narina's trogon)	Fo	L
--	----	---

Turdidae

<i>Neocossyphus rufus</i> (Red tailed ant thrush)		L
<i>Erythropygia quadrivirgata</i> (Eastern bearded scrub robin)	Fo	W
<i>Cossypha natalensis</i> (Red capped robin chat)	Fo	W
<i>Pogonocichla stellata</i> (White starred bush robin)		W
<i>Turdus gurneyi</i> (Orange ground thrush)		L

Fischer's
Chloroceryle

Tiny greenbul

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

MAMMALS

Insectivora

Soricidae

Suncus varilla (Shrew) Fo 1 W

Macroscelididae

Rhynchocyon petersi (Black and rufous elephant shrew) Fo 2 L

Petrodromus tetradactylus (Four toed elephant shrew) Fo 3 W

Chiroptera (bats)

Pteropidae (fruit bats)

Epomophorus cf wahlbergi (Wahlberg's epauleted fruit bat) Sw,Fo 2 W

Lissonycteris (Rousettus) angolensis (Angolan rousette) Sw,Fo 2 W

Hipposideridae

Hipposideros ruber (Noack's african leaf nosed bat) Fo,Sw 2 W

Triaenops persicus (Persian leaf nosed bat) Fo 1 L

Vespertilionidae

Eptesicus cf capensis (Cape serotine) Fo,Sw 2 W

Eptesicus sp. (Serotine) Fo 1 -

Glauconycteris variegata (Butterfly bat) Sw 2 W

Glauconycteris argentata (Silver bat) Sw 2 W

Scotophilus viridis (Lesser yellow house bat) Sw,Fo 2 W

Rodentia

Sciuridae

Paraxerus palliatus (Red bellied coast squirrel) Fo 2 L

Muridae

Praomys sp. (Multimammate rat) Sw 3 -

Thamnomys dolichurus (Narrow footed thicket rat) Fo 1 W

Cricetidae

Cricetomys gambianus (Giant gambian pouched rat) Fo 1 W

Beamys hindei (Lesser pouched rat) Fo 2 L

Muscardinidae

Graphiurus murinus (African dormouse) Fo 3 W

Thryonomyidae

Thryonomys swinderianus (Marsh cane rat) Sh 2 W

Hystricidae

Hystrix sp. (Porcupine) Wo 1 W

SITE DESCRIPTION AND CONSERVATION EVALUATION

MAMMALS, cont.

Primates

Cercopithecidae

<i>Papio sp.</i> (Baboon)	Sw, Wo	2	-
<i>Cercopithecus albogularis</i> (Sykes' monkey)	Fo	2	L
<i>Colobus angolensis palliatus</i> (Tanzanian black & white colobus)	Fo	2	L

Galagidae

<i>Galago cf garnetti</i> (Garnett's bushbaby)	Fo	?	L
<i>Galago cf zanzibaricus</i> (Zanzibar bushbaby)	Fo	?	L

Carnivores

Viverridae

<i>Herpestes ichneumon</i> (Egyptian mongoose)	Wo	2	W
<i>Genetta sp</i> (Genet)			
<i>Viverra civetta</i> (African civet)	Wo	1	W

Felidae

<i>Panthera leo</i> (lion)	Wo	1	W
<i>Panthera pardus</i> (leopard)	Fo	1	W

Ungulates

Bovidae

<i>Syncerus caffer</i> (Cape buffalo)	Fo, Sw	2	W
<i>Cephalophus natalensis</i> (Red duiker)	Fo	2	L

Suidae

<i>Potamochoerus porcus</i> (Bush pig)	Fo	2	W
<i>Phacochoerus aethiopicus</i> (Wart hog)	Sw, Wo	2	W

APPENDIX B :

Checklist of the vascular plants of Zaraninge (Kiono) forest.

Key to the plant species annotations:

Column 1 : Plant Growth Form

H = Herb	C = Climber
S = Shrub	L = Liana
B = Bush	T = Tree

Column 2 : Habitat

F = Forest	RF = Riverine Forest
W = Woodland	B = Bushland
G = Grassland	R = Rocky habitats
FE = Forest Edge	Wa = Wasteland & Cultivation
T = Thicket	S = Swamp and areas with high groundwater

Column 3 : Phytogeographical Distribution

Z-I	=	Zanzibar-Inhambane Regional Mosaic
ZA	=	Zambesian Regional Centre of Endemism
AM	=	Afromontane Archipelago-like Centre of Endemism
G-C	=	Guinea-Congolia Regional Centre of Endemism
T-P	=	Tongaland-Pondoland Regional Mosaic
L-V	=	Lake Victoria Regional Mosaic
S-M	=	Somalia-Masai Regional Centre of Endemism
SUD	=	Sudanian Regional Centre of Endemism
KALA	=	Kalahari-Highveld Regional Transition Zone
MAD	=	Madagascar and/or Mascarene Phytogeographical Units
[blank]	=	widespread distribution

Phytogeographical Units follow: F.White (1983). *The vegetation of Africa*. UNESCO, Paris.

Column 5 : Collection number(s)

"Collection number" is the unique number assigned to each herbarium specimen in the "Frontier" series. Specimens are deposited at the Herbarium of the Department of Botany at the University of Dar es Salaam, and at Kew Gardens, London.

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
ACANTHACEAE					
<u>Asystasia gangetica</u> (L.) Anders (syn <u>A. multiflora</u>)	H	Not forest, G, Wa			426
<u>Ecbolium amplexicaule</u> S. Moore (syn <u>E. auriculatum</u>)	H	F, T, Wa	Z-I Near End. K7, T3, 6, 8; M; P		595
<u>Ecbolium umbrosus</u> = <u>Megaloclamys mwasumbii</u> ??			Z-I End. ??		NCI P, K
<u>Elytraria minor</u> Dokosi					477, 847
<u>Justicia fittonioides</u> S. Moore	H	F, RF, T	Z-I Near End.		61, 417, 896
<u>Usticia nyassana</u> Lindau	H	F, RF, FE, W, S, Wa	A-M, ZA		17, 463, 536
<u>Megalochlamys mwasumbii</u> Vollesen, ined.		Forest only	Z-I Endemic		476
<u>Pseuderanthemum hildebrandtii</u> Lindau	S, B, H	F, RF, T, S	Z-I, A-M		581B
<u>Rhinacanthus gracilis</u> Klotzsch	H	FE, W, B, T	S-M, ZA, Z-I		427, 462
<u>Ruellia patula</u> Jacq.	H	RF, B, G, Wa			944, 948
<u>Sclerochiton vogelii</u> (nees) T. Anders	S	F, W, T	Z-I, G-C iso. pop.		NCI P, K
ssp. <u>holstii</u> (Lindau) Napper	S	F, W, T	End. ssp. Z-I, Guinea, Congo		480
<u>Whitfieldia stuhlmannii</u> (Lindau) C.B. Clarke	S	Forest only	Z-I, G-C, L-V		626, NCI P, K
AMARANTHACEAE					
<u>Achyranthes aspera</u> L.	H	F, W, B, T, Wa			1032, 1203, 1422B
<u>Aerva lanata</u> (L.) Schultes	H	F, FE, W, B, T, Wa			465
<u>Psilotrichum scleranthum</u> Thwaites	H	FE	ZA, Z-I, MAD, Deccan		424, 685
<u>Pupalia lappacea</u> (L.) Juss.	C, H	FE, B, G			251, 410, 419, 518, 681, 701, 1271, 1423B
AMARYLLIDACEAE					
<u>Scadoxus multiflorus</u> (Martyn.) Raf.	H	F, W, G			5, 112, 312, 692, 1039, 1523
ANACARDIACEAE					
<u>Lannea schweinfurthii</u> (Engl.) Engl.	T, S	F, W, B	Z-I, ZA, Sud		NCI P, 1055, 1280
ANNONACEAE					
<u>Asteranthe asterias</u> (S. Moore) Engl. & Diels	T, S	F, B, T	Z-I Near End.		588, 1080, NCI P, K
<u>Melodorum gracile</u> (Engl. & Diels) Verdc.	T, S, L	RF, W, B	Z-I Near End.		1000
<u>Monanthes buchananii</u> (Engl.) Verdc.	T, L, S	F, RF, B, T, G	Z-I, ZA, G-C, L-V, S-M		77, 88, 718, NCI K
<u>Monanthes fornicata</u> (Baill.) Verdc.	T, C, S	F, W, B, T	Z-I Near End.		NCI P, K
<u>Monodora grandidieri</u> Baill.	T, S	F, B, T, G	Z-I Near End.		NCI K
<u>Monodora minor</u> Engl. & Diels	S	Not forest ??	Z-I Near End.		NCI P, 1088
<u>Ophrypetalum odoratum</u> Diels	T, S	F, W	Z-I Near End.		46, 624, NCI K, 1052
<u>Uvaria acuminata</u> Oliv.	T, L, S	F, W, B, T	Z-I, Mad		277?, 557, NCI P, K

SITE DESCRIPTION AND CONSERVATION EVALUATION

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
ANNONACEAE, contd.					
<u>Uvaria kirkii</u> Hook. f.	S	Not forest	Z-I Near End.		438, 514
<u>Uvaria pandensis</u> Verdc.	L	Forest only	Z-I Endemic to Pande and Kiono (T6)		486, 584, 899, 991, 992, NCI P, K
<u>Uvaria tanzaniae</u> Verdc.	L	Forest only	AM & Z-I Near End.		NCI K
<u>Uvaria</u> sp. nov.					NCI P, K
<u>Uvariadendron kirkii</u> Verdc.	T, S	F, B	Z-I Near End.		NCI K
APOCYNACEAE					
<u>Ancyllobthrys petersiana</u> (Klotzsch) Pierre	C, S	Not forest			528, 958, 1511
<u>Carissa tetramera</u> (Sacleux) Stapf	S	Not forest, W, B, T	Z-I, T-P, ZA		600, 986, 993
<u>Holarrhena pubescens</u> (Buch. Ham.) Wall.	T, S	Not forest, W, T		Forest in NCI	302, 741, 809, NCI P, K
<u>Landolphia kirkii</u> Dyer	L, S	F, FE, W, B	AM, ZA, Z-I		223, 512, NCI P, K
<u>Schizogygia coffaeoides</u> (Boj.) Baill.	S	Forest only	Z-I, ZA, MAD	Monospecific genus	473
ARACEAE					
<u>Gonatopus boivinii</u> (Decne.) Engl.	H	F/W	Z-I, ZA		324, 664, 1040
ARALIACEAE					
<u>Cussonia zimmermannii</u> Harms	T	F, RF, W, T	Z-I Near End.	0-400m	NCI (P?K?), 313
ARECACEAE					
<u>Hyphaene coriacea</u> Gaertn.	T	Not forest	MAD, Z-I, T-P & inland		973, 1423A
ASCLEPIADACEAE					
<u>Ceropegia brevirostris</u> Bally & D. Field	C	F, B	Z-I Near End.		1076
<u>Cynanchum tetrapterum</u> (Turcz.) Bullock	C, H	FE, B			1003
<u>Tylophora tenuipendunculatum</u> K. Schum.					1103
ASTERACEAE (COMPOSITAE)					
<u>Achyrothalamus marginatus</u> O. Hoffm.	H	Not forest	Z-I Near End.		460
<u>Ageratum conyzoides</u> L.	H	Not forest			NCI P, K, 150, 936
<u>Elephantispernum zanguebaricum</u> Oliv. & Hiern	C, S	FE, W, B	Z-I, AM		NCI K
<u>Blumea aurita</u> (L.f) Wight	H	Not forest			NCI P, K, 1437
<u>Brachylaena huilensis</u> O. Hoffm.	T	FE, W, B	Z-I, ZA		NCI K, 1057
<u>Emilia coccinea</u> (Sims) G. Don (syn <u>E. javanica</u>)	H	FE, WA			432, 1326, NCI P, K
<u>Tridax procumbens</u> L.	H	T, G, Wa	G-C, S-M, Z-I ? (possibly wrong Family)		NCI P, K

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
ASTERACEAE (COMPOSITAE), contd. <u>Vernonia aemulans</u> Vatke	S, H	Not forest	S-M, AM		444
BIGNONIACEAE <u>Marthamia obtusifolia</u> (Bak.) Sprague <u>Marthamia zanzibarica</u> (DC.) K. Schum.	T T, S	FE, W, B, G F, RF, W, B	Z-I, AM, ZA Z-I, ZA, L-V		524, 740, 951 NCI K
BORAGINACEAE <u>Bourreria nemoralis</u> (Guerke) Thulin (syn. <u>E. litt.</u>)	T, S	F, W, B, T, WA	Z-I Near End.	0-600m	531
BURSERACEAE <u>Commiphora africana</u> (A. Rich.) Engl.	T, S	Not forest			596, 838
BUXACEAE <u>Buxus obtusifolia</u> (Mildbr.) Hutch. (syn <u>Notobuxus o.</u>)	T, S	F, W, B, T	Z-I Endemic to K7 & coastal TZ		NCI K, 897, 934, 1047
CAMPANULACEAE (LOBELIACEAE) <u>Lobelia fervens</u> Thunb.	S, H	FE, G, S, WA	Z-I, S-M, ZA, AM, MAD		538, 1232
CELASTRACEAE <u>Hippocratea africana</u> (Willd.) Loes. <u>Hippocratea clematoides</u> Loes. <u>Maytenus mossambicensis</u> (Klotzsch) Blakelock <u>Mystroxydon aethiopicum</u> (Thunb.) Loes. <u>Salacia elegans</u> Oliv. <u>Salacia erecta</u> (G. Don) Walp. <u>Salacia madagascariensis</u> (Lam.) DC. <u>Salacia</u> sp.	L, S S, B T, S T, S L, S L, S L, S	F, FE, W, RO F, RF, B RF, FE, W, T F, FE, W, T, G F, RF, FE, B F, T RF, W, B, T	G-C, ZA & Pugu Z-I Near End.		NCI K NCI K 91, 546, 612, 1527 594, 1318, 1383 95, 195, 237, NCI P, K 430, 500 1002, NCI P, K, 1307, 1344, 1396 980, 1250, 1259
CLUSIACEAE (GUTTIFERAE) <u>Garcinia buchananii</u> Bak. <u>Garcinia volkensii</u> Engl. <u>Harungana madagascariensis</u> <u>Vismia orientalis</u> Engl.	T, S T, S T, S T, S	F, RF, T, G Forest only WE Forest only F, B, S	A-M, Z-I, ZA AM, Z-I Z-I Near End.	W at Kiono	343, NCI K, 1424 NCI K NCI K 425, 736, 864, NCI P

SITE DESCRIPTION AND CONSERVATION EVALUATION

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
COMBRETACEAE					
<u>Combretum illairii</u> Engl.	C, S	F, W, B	Z-I Near End. ?		499, NCI K, 1520
<u>Combretum pentagonum</u> Laws.	C	F, FE, T	Z-I, ZA		59, 81, 249, 347?, 688, NCI P, K, 1514
<u>Combretum schumannii</u> Engl.	T, S	F, W, G	Z-I, ZA		NCI K
<u>Combretum</u> sp.	T, S	Dry F, B	Z-I, MAD		1051, NCI K 1011, 1481
<u>Terminalia boivinii</u> Tul.					
COMMELINACEAE					
<u>Anellema aequinoctiale</u> (p. Beauv.) Kunth	H	F, WA			177, 183, 582, 658, 1030, 1116
<u>Anellema petersii</u> (Hassk.) C.B. Clarke	H	Not forest, B	Z-I, S-M, ZA		533
<u>Commelina lagosensis</u> C.B. Clarke	H	F, RF, W, G	??		402, 846
<u>Cyanotis foecunda</u> Hassk.	H	FE, B, G, RO			136, 162, 617, 1091
CONVOLVULACEAE					
<u>Bonania mossambicensis</u> (Klotzsch) Hall.f.	C	F, T	Z-I Near End.		NCI P, K
<u>Evolvulus alsinoides</u> (L.) L.	H	Not forest, W, G, S, WA			613
<u>Evolvulus nummularius</u> (L.) L.	H	Not forest, Wa			1118
<u>Ipomoea ficifolia</u> Lindl.	P	Not forest, B, R, WA			505
<u>Ipomoea venosa</u> (Desr.) Roem. & Schult.	P	Forest only	Z-I, MAD (T3, 6, 8)		615
<u>Xenostegia tridentata</u> (L.) Austin & Staples (= <u>M.t.</u>)	P	Not forest	W, T, G, WA		924, 1244A, 1325
CRASSULACEAE					
<u>Kalanchoe</u> sp. nov. ?					TZ01K
CUCURBITACEAE					
<u>Coccinia</u> sp.					NCI K
<u>Coccinia</u> sp. B of FTEA	C	Forest only	Z-I Near End. 80-300m K7, T6		1041
<u>Eureiandra</u> sp. A of FTEA	C	F, B	Z-I Near End. 0-100m		1061
<u>Kedrostis heterophylla</u> A. Zimm.	C	Forest only	Z-I Near End. (AM & MAD?)		999, 933
CYCADACEAE					
<u>Encephalartos hildebrandtii</u> A. Br. & Bouche	T, S	F, B, RO	Z-I Near End.		1038, NCI P, K obsv.
CYPERACEAE					
<u>Bulbostylis pilosa</u> (Willd.) Cherm.	Sedge	Not forest, G			451
<u>Cyperus exaltatus</u> Retz.	Sedge	Not forest, S			950

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
CYPERACEAE, contd.					
<u>Cyperus halpan</u> L.	Sedge	Not forest, G, S			468?
<u>Cyperus</u> , not matched	Sedge	Forest swamp only	Z-I Endemic to Kiono T6		458
<u>Cyperus tenax</u> Boeck.	Sedge	Not forest, W, G			456
<u>Fimbristylis longiculmis</u> Steud.	Sedge	Not forest, G, S, Shore	Z-I & MAD ? (Not K7)		472
<u>Fuirena ciliaris</u> (L.) Roxb.	Sedge	Not forest, S			952
<u>Fuirena pubescens</u> (Lam.) Kunth	Sedge	Not forest, G, S			471, 541
<u>Kyllinga</u> sp., immature					403, 1365
<u>Rhynchospora candida</u> (Nees) Boeck.	Sedge	Not forest, G, S			467, 550
<u>Scleria lithosperma</u> (L.) Sw.	Sedge	F, T			NCI P, K, 412, 642, 1001, 1429
DICHAPELALACEAE					
<u>Dichapetalum arenarium</u> Breteler	L, S	F, B	Z-I Near End.		NCI K, 1245, 1260
DILLENIACEAE					
<u>Tetracera boiviniana</u> Baill.	S	Not forest, W, T	Z-I Near End. 50-350m		443, 561, 1298
DIOSCOREACEAE					
<u>Dioscorea sansibarensis</u> Pax	P, C	F, RF, W, B			172, 238, 611, 711, 891A, 987, 1123
EBENACEAE					
<u>Diospyros consolatae</u> Chiov.	T, S	Dry F, B, R	Z-I, ZA, S-M		1013, 1432, 1518
<u>Diospyros greenwayi</u> F. White	T	Forest only	Z-I Near End.		NCI K
<u>Diospyros kabuyeana</u> F. White (syn. <u>D. brucei</u>)	T	F, RF	Z-I Near End.		54, 686, NCI K
<u>Diospyros natalensis</u> (Harv.) Brenan	T, S	Forest only	T-P, ZA, KALA, CAPE, MAD, S-M, Z-I, I-V		1004
<u>Diospyros shimbaensis</u> F. White	T	Forest only	Z-I End. New to Tanz. (& K7) 2 & 3 collection		498, 1449
<u>Diospyros squarrosa</u> Klotzsch	T	Not forest	Z-I, ZA	In F Pande, Kiono	NCI (P?K?), 216
<u>Diospyros verrucosa</u> Hiern	T, S	F, FE	Z-I Near End. (Tanz. & Mozam.)		36, 85, 562, 689, 876, 1093, NCI P, K
ERYTHROXYLACEAE					
<u>Erythroxylum</u> sp.					NCI K
PHORBIACEAE					
<u>Acalypha neptunica</u> Muell. Arg. T, S	T, S	F, FE, B	G-C, Z-I ? Check		240, 422, 849, NCI K
<u>Antidesma venosum</u> Tul.	T, S	F, RF, FE, W, B			328, 387, 520, 956, 1390
<u>Bridelia cathartica</u> Bertol. f.	T, S	RF, W, B, T	Z-I, AM, S-M, ZA		597, 840, 1281

SITE DESCRIPTION AND CONSERVATION EVALUATION

	GROWTH	HABITAT	DISTRIBUTION	NOTES	COLLECTION NUMBER(S)
PEORBIACEAE, contd.					
<u>Bridelia micrantha</u> (Hochst.) Baill.	T, S	F, FE, B, T, S			880, NCI K
<u>Croton pseudopulchellus</u> Pax	T, S	F, FE, W, B, T			NCI K, 1054
<u>Dalechampia scandens</u> L.	C	RF, B, T	var Hildebrandtii Z-I Near End.		507
<u>Dalechampia trifoliata</u> Verdc. & Greenway	H	Not forest, W, B	Z-I, SUD 60-600m		506
<u>Drypetes arguta</u> (Muell. Arg.) Hutch.	T, S	F, W, T	Z-I, ZA, T-P		10, NCI P, K
<u>Drypetes parvifolia</u> (Muell. Arg.) Pax & K. Hoffm.	T, S	Forest only	G-C, Z-I 0-450m		408, 1075, 1095
<u>Drypetes reticulata</u> Pax	T, S	F, RF, T	Z-I, T-P, ZA 0-500m		NCI K
<u>Erythrococca usambarica</u> Prain	S	Forest only	Z-I, AM Near End. 300-1000m		1058
<u>Euphorbia candelabrum</u> Kotschy	T	Not forest, G, R	ZA, S-M, Z-I, AM		904
<u>Euphorbia systyloides</u> Pax	H	Not forest, W, WA			446
<u>Excoecaria madagascariensis</u> (Baill.) Muell. Arg.	T, S	F, RF, T	S-M, AM, MAD		481
<u>Mallotus oppositifolius</u> (Geiseler) Muell. Arg.	T, S	F, RF, FE, B, T	(Z-I Near End. var.)	20, 21, 64, 475, 559, 609, 694, 1016, 1082, 1406	
<u>Margaritaria discoidea</u> (Baill.) Webster	T, S	F, FE, W	AM, G-C, ZA, Z-I		464
<u>Mildbraedia carpinifolia</u> (Pax) Hutch.	T, S	F, RF, FE, W, WA	AM, Z-I Near End. K7; T3, 6; Z		34, 404, 406, 484, NCI K
<u>Phyllanthus kaessneri</u> Hutch.	T, S	F, B	Z-I & Zambia?? 0-520m K7; T3, 6		526, 843
<u>Phyllanthus nummulariifolius</u> Poir.	S, H	FE, W, G, S, WA			71, 144, 433, 1109
<u>Phyllanthus welwitschianus</u> Muell. Arg.	T, S	F, W, B, S, WA			565
<u>Pycnocomma littoralis</u> Pax	T, S	Forest only	Z-I Near End. K7; T3, 6		405
<u>Suregada zanzibariensis</u> Baill.	T, S	F, W, B	Z-I, AM, MAD		371, 608, 863, NCI K, 1301
<u>Synadenium</u> sp., sterile					932
<u>Tragiella natalensis</u> (Sond.) Pax & K. Hoffm.	H	F, RF, FE, B, S, WA	AM, S-M, ZA		495
FABACEAE					
<u>Acacia adenocalyx</u> (Brenan & Exell.)	T, S	Not forest, B, T	Z-I Near End. 45-450m in forest TZ01		126, 423, 523, 547, NCI P, K
<u>Albizia gummifera</u> (J.F. Gmel) C.A. Sm.	T	Forest only			418? (sterile)
<u>Albizia petersiana</u> (Bolle) Oliv.	T	F, RF, W	AM, S-M, ZA 380m-1700m		199, 619, 1015
<u>Angylocalyx braunii</u> Harms	T	Forest only	Z-I, AM Near End.		NCI K
<u>Baphia kirkii</u> Bak.	T	F, B, T	Z-I Near End. T3, 6 & Jubba Riverine		217, NCI P, K, 1205, 1509
<u>Cassia abbreviata</u> Oliv.	T, S	Not forest, W, B, G			622, 807
<u>Cassia mimosoides</u> L.	H	F, FE, W			535
<u>Craibia brevicaudata</u> (Vatke) Dunn	T, S	Forest only	Z-I, S-M, AM		NCI K
<u>Crotalaria goodiiiformis</u> Vatke	S, B	F, FE, W, B, G, WA	Z-I, S-M, ZA		122, 341, 607, 621, 715
<u>Cynometra suaheliensis</u> (Taub.) Bak. f.	T, S	F, RF, B	Z-I Near End. K7; T3 0-150m		NCI K
<u>Cynometra</u> , sterile					NCI (P?K?), 336
<u>Dalbergia obovata</u> E. Mey	T, S	F, RF, FE, B, T, G	Z-I, T-P, ZA, CAPE		885, 927

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

	GROWTH	HABITAT	DISTRIBUTION	NOTES	COLLECTION NUMBER(S)
FABACEAE, cont.					
<u>Dichrostachys cinerea</u> (L.) Wight & Arn.	T, S	FE, B, T, G, WA			339, 554, 760
<u>Eriosema nutans</u> Shinz	H	FE, G	AM 12-2400m	(check)	949
<u>Eriosema verrucosa</u> Gaertn.	T	F, W, B	Z-I, MAD 15-240m		113, 975, 979, 1097, 1226, 1350
<u>Indigofera cuneata</u> Bak.	H	Not forest, G	Z-I and inland		445, 551
<u>Indigofera ormocarpoides</u> Bak.	S	Not forest, B	Z-I, ZA, MAD		503, 604, 726, 886, 1106
<u>Indigofera spicata</u> Forssk.	H	Not forest	Scarce below 700m		938, 970
<u>Macrotyloma axillare</u> (E. Mey.) Verdc.	C, H	F, B, G, S			549
<u>Millettia impressa</u> Harms	L	FE, G	Z-I, G-C 10-200m iso. pop.		Forest P, K 38, NCI P, K
<u>Millettia lasiantha</u> Dunn	L	Forest only	Z-I & Malawi Near End. 10-300m		1029
<u>Ormocarpum sennoides</u> (Willd.) DC. ssp. <u>orientalis</u> Verdc.	T, S	F, W, T	Z-I Near End. 0-600m		1043, 1412
<u>Rhynchosia minima</u> (L.) DC.	C, H	Not forest	Z-I Near End.		502
<u>Scorodophloeus fischeri</u> (Taub) J. Leon	T	Forest only, ?G	B, T, S		945
<u>Tamarindus indica</u> L.	T	Not forest, W, B, G	Z-I Near End.		53, 501B, 1096, NCI P, K
<u>Tephrosia noctiflora</u> Bak.	H	Not forest, T, G, WA			839, 1048, 1227
<u>Vigna vexillata</u> (L.) A. Rich.	C, H	F, B, T, G			515
					532, 540, 1108
FLACOURTIACEAE					
<u>Dovyalis hispidula</u> Wild	T, S	Not forest, W, T, Ro	Z-I & Zimbabwe		997
<u>Grandidiera boivinii</u> Taub.	T, S	Forest only	Z-I Near End.	Monotypic genus	8, 40, 485, 527, 780
<u>Ludia mauritiana</u> Gmelin	T, S	F, B	Z-I, AM, MAD		586, 1495
HYMENOCARDIACEAE					
<u>Hymenocardia ulmoides</u> Oliv.	T, S	F, B, T			873, NCI K, 1323, 1276
ICACINACEAE					
<u>Apodytes dimidiata</u> E. Meyer ex Arn.	T, S	F, B	Z-I, AM, Deccan		957
LAMIACEAE (LABIATAE)					
<u>Becium obovatum</u> (Benth.) N.E. Br.	H				603
<u>Leucas glabrata</u> (Vahl) R. Br.	H	Not forest, W, B			440, 447, 508
<u>Solenostemon latifolius</u> (Benth.) J.K. Morton	H				578, 1117
LAIURACEAE					
<u>Cassytha filiformis</u> L.	C	F, B, T, Wa			521

SITE DESCRIPTION AND CONSERVATION EVALUATION

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
LENTIBULARIACEAE					
<u>Ultricularia</u> sp.					974
LILIACEAE					
<u>Albuca abyssinica</u> Murr.	H	Not forest, W, B, G			448, 466
<u>Anthericum subpetiolatum</u> Bak.	H	F, W, B, G			891B, 985
<u>Asparagus falcatus</u> L.	L, C, S	F, W, B	Eastern Africa & Deccan		164, 407, 416, 580, 898, 1083, NCI K, 1265, 1333
<u>Chlorophytum heynei</u> Bak.	H	Forest only			138, 288, 420, 574, 575, 591, 703
<u>Chlorophytum sparsiflorum</u> Bak.	H	Forest only	AM, G-C		750, 1062
<u>Sansevieria conspicua</u> N.E. Br.	H	Not forest, W, B, T, Ro	Z-I, S-M		569, 851, 852, 1254, 1336
LINACEAE					
<u>Hugonia castaneifolia</u> Engl.	T, L, S	F, RF, B	Z-I Near End. K7, T3, 6; Z		342, 496, 754, 895, 983, 1120, NCI P, K, 1478
LOGANIACEAE					
<u>Mostuea brunonis</u> Didr.	L, S	F, RF, W, B, T			474, 573, 842, 879, 984, NCI K
<u>Strychnos henningsii</u> Gilg	T, S	F, RF, W, B, T			1092
<u>Strychnos madagascariensis</u> Poir.	T, S	F, RF, W, B			928
<u>Strychnos panganensis</u> Gilg	S	F, RF, B, T	Z-I, MAD		491, 962, NCI K
<u>Strychnos usambarensis</u> Gilg	T, S	F, RF, FE, B			NCI K
LORANTHACEAE					
<u>Agelanthus subulatus</u> (Engl.) Polhill & Wiens	C	Forest only	Z-I, AM		954
LYTHRACEAE					
<u>Ammannia</u> sp.					935
MALVACEAE					
<u>Gossypioides kirkii</u> (Mast.) Hutch.	S	FE, B, T	Z-I, T-P		68, 1065
<u>Hibiscus cannabinus</u> L.	H	Not forest, G, S			922?, 1235
<u>Pavonia leptocalyx</u> (Sond.) Ulbr.	S, H	F, RF, B, T	Z-I, T-P		539, 1297
<u>Thespesia danis</u> Oliv.	S	Not forest, W, B, T	Z-I, S-M		943, 1102
MELASTOMACEAE					
<u>Dissotis rotundifolia</u> (Sm.) Triana	H	RF, W, G, S			314, 534, 661
<u>Memecylon sansibaricum</u> Taub.	T, S	RF, F, W	Z-I, ZA Disjunct altitudinal ranges		1074, NCI K, 1455

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER (S)</u>
MENISPERMACEAE					
<u>Tinospora caffra</u> (Miers) Troupin	L	F, B, Ro	AM, ZA, S-M, LV, SUD		NCI P, K
MORACEAE					
<u>Ficus tremula</u> Warb.	T, S	F, W, B	Z-I, T-P, G-C 1650-2300m		592
NYMPHAEACEAE					
<u>Nymphaea nouchali</u> Burm. f.	H	Swamps, lakes			901, 1221
OENACEAE					
<u>Brackenridgea zanguebarica</u> Oliv.	T, S	Forest only	Z-I, AM		509
<u>Ochna holtzii</u> Gilg	S	Forest only, T	Z-I Near End. T6, 8; K7		988, 994, 1089, Pande
<u>Ochna mossambicensis</u> Klotzsch	T, S	F, B	Z-I Near End.		441, 614, 1193B, 1218, 1300, 1405
<u>Ochna thomasiana</u> Engl. & Diels	T, S	Forest only	Z-I Near End.		NCI K, 1440
OLEACEAE					
<u>Jasminum fluminense</u> Vell.	C, S	F, RF, W, B, G, Ro, S			941, 1288
<u>Jasminum meyeri-johannis</u> Engl.	T, C, S	F, RF, B	Z-I, AM, ZA		555
ONAGRACEAE					
<u>Ludwigia octovalvis</u> (Jacq.) Raven	S, H	Swamp only			902, 1225
ORCHIDACEAE					
<u>Microcoelia exilis</u> Lindl.	E	F, RF, FE, W, B	Z-I, T-P, ZA, MAD		479, NCI K
OXALIDACEAE					
<u>Biophytum umbraculum</u> Melw.	H				930
PASSIFLORACEAE					
<u>Adenia kirkii</u> (Mast.) Engl.	C	F, G	Z-I and inland T2 0-700m		525, 816
<u>Adenia lindiensis</u> Harms	C	FE, B	Z-I, AM Near End.		1037
POACEAE (GRAMINAE)					
<u>Alloteropsis papillosa</u> Clayton	G	Not forest, G	S-M, Z-I, T-P		439, 925
<u>Bothriochloa glabra</u> (Roxb.) A. Camus (syn. <u>B. bladhii</u>)	G	RF, S			470
<u>Cymbopogon caesius</u> (Hook. & Arn.) Stapf	G	B, G, Ro			553

SITE DESCRIPTION AND CONSERVATION EVALUATION

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
POACEAE (GRAMINAE), contd.					
<u>Digitaria gymnostachya</u> Pilg.	G	Not forest, W, G	Z-I, T-P		572, 756
<u>Diheteropogon amplexans</u> (Nees) Clayton	G	Not forest, B, W, Ro			459
<u>Hyperthelia dissoluta</u> (Steud.) Clayton	G	Not forest, W, B, WA			454
<u>Loudetia simplex</u> (Nees) Hubbard	G	Not forest, W, B, Ro, S			456
<u>Megastachya mucronata</u> (Poir.) P. Beauv.	G	Forest only		Monotypic genus	288, 457, NCI K, 1270
<u>Panicum deustum</u> Thunb.	G	F, FE, B, G			NCI K
<u>Panicum infestum</u> Peter	G	Not forest, W, B, S			453
<u>Panicum laticomum</u> Nees	G	Forest only	Z-I, T-P, ZA		409
<u>Panicum trichocladium</u> K. Schum.	G	F, B			542, NCI P
<u>Paspalum giunaceum</u> Clayton	G	FE, S	Z-I, ZA, S-M, MAD		618
<u>Perotis patens</u> Grand.	G	Wasteland	300-2000m		452
<u>Schizachyrium sanguineum</u> (Retz.) Alston	G	Not forest, B, W, Ro			450
POLYGALACEAE					
<u>Carpolobia goetzei</u> Guerke (not <u>Polygala g.</u>)	T, S	F, W, B, T	Z-I Near End.		23, 998, 1494
<u>Polygala sphenoptera</u> Fresen	S, H	FE, B, G, WA			605, 929
REAMNACEAE					
<u>Ziziphus pubescens</u> Oliv.	T, S	F, W, G			212, 614A, 677
RHIZOPHORACEAE					
<u>Cassipourea</u> sp.					NCI K
RUBIACEAE					
<u>Agathisanthemum bojeri</u> Klotzsch	S, H	FE, W, B, T, WA	Z-I, S-M, ZA		530, 903
<u>Aida</u> sp. Procter 2813 (sp. aff <u>gardneri</u>)	S	Forest only	Z-I End. T3, 6 250-300m		NCI K
<u>Canthium mombazense</u> Baill.	T, S	F, W, B	Z-I Near End.		552, 1006, 1119, NCI K
<u>Canthium setiflorum</u> Hiern	S	F, B, T	Z-I, ZA, T-P		NCI K
<u>Chassalia umbraticola</u> Vatke	S	F, FE, W, B, WA		(check distrib.)	379, 401, 545, 808
<u>Coffea sessiliflora</u> Bridson ssp. <u>mwasumbii</u> Bridson	S	Forest only	T7 and Pugu		489, 490, 893
<u>Crossopteryx febrifuga</u> (G. Don) Benth.	T	F, W, B, Ro		Monotypic genus	544
<u>Gardenia transvenulosa</u> Verdc.	T, S	F, W, B	Z-I Near End. K7, T3, 6, 8 10-700m		487, 887, 977
<u>Geophila obvallata</u> (Schumach.) F. Didr. ssp. <u>ioides</u> (K. Schum.) Verdc.	H	F, W			171, 478, 704, 739, 842
<u>Heinsia crinita</u> (Afz.) G. Taylor	T, S	FE, B	Z-I, LV Z-I, ZA		602, 1360

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
RUBIACEAE, contd.					
<u>Keesia zanzibarica</u> (Klotzsch) Bridson (syn <u>C. z.</u>)	T, S, L	F, FE, B, T, S	G-C, ZA, Z-I, S-M		953, 1228, 1319
<u>Kraussia kirkii</u> (Hook.f.) Bullock	S	F, W, B, Mangroves	Z-I Near End.		556, 1461
<u>Meyna tetraphylla</u> (Hiern) Robyns	T, S	F, RF, W, B, T	SUD, Z-I, Comoros iso.pop.		599
<u>Oldenlandia johnstonii</u> (Oliv.) Engl.	H	F, W, G, RO	Z-I, AM		435, 1033
<u>Oxyanthus zanguebaricus</u> (Hiern) Bridson	T, S	Forest only	Z-I Near End. 60-240m		31, 429, 707, NCI K
<u>Pavetta crebifolia</u> Hiern	S	F, B	Z-I, AM Near End.		1035
<u>Pavetta stenopala</u> K. Schum.	S	F, B, T	Z-I, AM Near End.		97, 272, 511, 1121, 1419B, 1517
<u>Pentodon pentandrus</u> (Schumach. & Thonn.) Vatke	H	Swamp only			133, 537, 699, 937, 1359, 1462
<u>Polysphaeria parvifolia</u> Hiern	T, S	F, W, B, T, WA	Z-I Near End. (inc. Somalia)		436, 806
<u>Psychotria holtzii</u> K. Schum.	S	F, RF, T	Z-I Near End. K7, T3, 6		NCI K
<u>Psychotria lauracea</u> (K. Schum.) Petit	T, S	F, RF, T, S	Z-I, AM		66, 497
<u>Psychotria riparia</u> (K. Schum. & K. Krause) Petit	T, S	RF, FE, W, B, RO	Z-I, ZA, S-M		NCI K, 1493
<u>Psydrax schimperiana</u> (A.Rich) Bridson (= <u>Canthium s.</u>)	T, S	F, B, T			NCI K
<u>Pyrostria bibracteata</u> (Bak.) Cavaco (= <u>Canthium b.</u>)	T, S	FE, B	Z-I & Zim, MAD		1086
<u>Rothmannia macrosiphon</u> (Engl.) Bridson	T, B	Forest only	Z-I Near End. 60-450m		NCI P, K
<u>Rytigynia bugoyensis</u> (K. Krause) Verdc.	T, S	F & Heath	AM 900-2400m		996, 1005, 1023
<u>Rytigynia celastroides</u> (Bak.) Verdc. (syn. <u>R. micro.</u>)	T, S	F, RF, W, B, T, G	Z-I and inland		NCI P, 382, 529, 947
<u>Rytigynia decussata</u> (K. Schum.) Robyns	S	Not forest, W, T, G	Z-I Near End.		431, 752
<u>Tarenna nigrescens</u> (Hook.f.) Hiern	T, C, S	FE, B	Z-I, MAD & Comoros 0-350m		NCI K, 1487
<u>Tricalysia allocalyx</u> Robbrecht	S	F, T	Z-I Endemic to Pugu, Kichi Hills & Kiono		NCI P, K
<u>Tricalysia ovalifolia</u> Hiern	T, S	F, B, T, G	Z-I, MAD		461, 878, 1034, NCI P, K
<u>Vangueria randii</u> S. Moore	T, S	F, W, T	Z-I Near End.		494
<u>Vangueria</u> sp., sterile					234, 434
RUTACEAE					
<u>Clausena anisata</u> (Willd.) Benth	T, S	F, FE, B, G			73, 78, 263, 519, 1112
<u>Teclea amaniensis</u> Engl.	S	F, FE, B	AM, Z-I Near End. K7, T3, 6 360-2000m		567, 583
<u>Teclea simplicifolia</u> (Engl.) Verdoorn	T	F, B, G	AM, Z-I 300-2300m		NCI K, 1451
<u>Teclea trichocarpa</u> (Engl.) Engl.	T, S	F, RF, G	Z-I, AM		NCI K
<u>Teclea</u> sp.					1056, 1196, 1472
<u>Toddalopsis sansibarensis</u> (Engl.) Engl.	T, S	F, B	Z-I Near End.		601, 1010, 1124
<u>Zanthoxylum chalybeum</u> Engl.	T, S	Not forest, W, B	S-M, ZA, Z-I, G-C		620
<u>Zanthoxylum holtzianum</u> (Engl.) Waterm.	T, S	F, B	Z-I Near End. 1-230m		1073, NCI P

SITE DESCRIPTION AND CONSERVATION EVALUATION

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
SAPINDACEAE					
<u>Allophyllus africanus</u> P. Beauv.	T	F, RF, FE, W, T, G, Wa			587, 746
<u>Allophyllus pervillei</u> Blume	C, S	Forest only	Z-I, MAD		510, 513A, 1008, 1199, 1236, 1308
<u>Blighia unijugata</u> Baker	T	F, RF, G			NCI P, K, 1473
<u>Haplocosium inopleum</u> Radlk.	T	F, RF, B, T	Z-I Near End. T3, 6, 8; K7, Jubba		NCI K
<u>Haplocosium trigonocarpum</u> Radlk.	T, S	F, RF, T	Z-I Near End. T3, 6, 8; K7; P & Moz. 1-300m		NCI P, K
<u>Pancovia golungensis</u> (Hiern) Exell & Mendonca	T, S	Forest only	ZA, AM? First TZ record 1980		1068, 1195, 1413
<u>Pancovia hildebrandtii</u> Gilg		Forest only?	Z-I Endemic to T6, K7 New to TZ? No spec. UDSM		NCI P, K
<u>Pancovia holtzii</u> Gilg	S	F, RF, T	Z-I Near End.		NCI K, 13?? NCI K
<u>Pancovia</u> sp. nov., not matched at Kew		Forest only	Z-I Endemic to Kiono		413, 522
SAPOTACEAE					
<u>Bequaertioidendron</u> , sterile					493
<u>Manilkara sausbarensis</u> (Engl.) Dubard	T	F, W, B	Z-I Near End. 0-300m		120, 976, NCI K, 1515B
<u>Manilkara sulcata</u> (Engl.) Dubard	T	F, W, B, T, Heath	Z-I and inland	(check)	492, 1045, 1046, NCI P, K, 1433, 1471
SCROPHULARIACEAE					
<u>Bacopa crenata</u> (P. Beauv.) Hepper	H	W			939
SOLANACEAE					
<u>Solanum zanzibarense</u> Vatke	S, H	Not forest, W, B, T, G	Z-I, ZA		558, 1397B
STERCULIACEAE					
<u>Cola clavata</u> Mast.	T	RF only?	Z-I Near End. Mozambique, T6, 8		NCI P, K
<u>Cola microcarpa</u> Brenan	T, S	Forest only	AM Near End.		51, 198, 229, 1031, 1042, NCI P, K
<u>Sterculia africana</u> (Lour.) Fiori	T	FE, W	S-M, ZA, Z-I		598, 1110
<u>Waltheria indica</u> L.	H	Not forest, W, B, T, G			926, 946
THYMELAEACEAE					
<u>Synaptolepis kirkii</u> Oliv.	C, S	F, W, B	Z-I, T-P		NCI P, 246, 278, 442, 1009
TILIACEAE					
<u>Grewia conocarpa</u> K. Schum.	T, S	F, T	Z-I Near End.		449, 755, 861
<u>Grewia forbesii</u> Mast.	T, S	F, W, B, T, Wa	Z-I & Malawi		437, 812, NCI K
<u>Grewia goetziana</u> K. Schum.	T, S	F, RF, FE, W, G	Z-I Near End.		356, 648, 815, NCI K
<u>Grewia holstii</u> Burret	T, L, S	F, FE, W, B, T	Z-I Near End.		571, 1084

ZARANINGE (KIONO) FOREST, BAGAMOYO DISTRICT, TANZANIA

	<u>GROWTH</u>	<u>HABITAT</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>	<u>COLLECTION NUMBER(S)</u>
TILIACEAE, contd.					
<u>Grewia lepidopetala</u> Gareke	I, S	RF only	Z-I and inland to Zim & Malawi		516
<u>Grewia microcarpa</u> K. Schum.	I, S	RF, FE, W, B	Z-I, ZA		593
<u>Grewia stuhlmannii</u> K. Schum.	S	RF, FE, W, B, T,	Z-I Near End.		616
<u>Triumfetta rhomboidea</u> Jacq.	S, H	F, B, G, W			414, NCI K
URTICACEAE					
<u>Laportea lanceolata</u> Engl.	H	F, FE, W, Ro	Z-I, ZA Near End. G-C?		568, 724, 732
VERBENACEAE					
<u>Clerodendrum capitatum</u> Schum. & Thonn.	S	F, FE, W, B			NCI P, K
<u>Clerodendrum incisum</u> Klotzsch	S, H	F, FE, W, T, Wa			564, 729, 894, 990
<u>Lantana viburnioides</u> (Forsk.) Vahl	S	FE, W, B, T			147, 606
<u>Fremaa chrysoclada</u> (Bojer) Guerke	S	Not F., W, B, T, G, WA	Z-I Near End.		610, 942
<u>Vitex doniana</u> Sweet	T	F, W, G			940, 1392
<u>Vitex ferruginea</u> Schumach. & Thonn.	T	Forest only	Z-I, G-C, ZA, AM		483, 504
<u>Vitex ssp. amboniensis</u> (Guerke) Verdc.	T		Z-I, AM Endemic to Usambaras & Kiono		560
<u>Vitex payson</u> (Lour.) Merr.	T, S	Forest only?	AM, ZA		
VIOLACEAE					
<u>Rinorea</u> sp.					190, 844, 1087, 1098
VITACEAE					
<u>Ampelocissus africana</u> (Lour.) Merr.	L, C	RF, FE, WA, W			517
<u>Cissus producta</u> Afz.	C	Forest only	G-C, ZA, Z-I		NCI P, K
<u>Cissus quadrangularis</u> L.	C	RF, FE, B, T, Ro			577, 589, 1431, 1439
<u>Cissus rotundifolia</u> (Forsk.) Vahl	C	RF, W, B	Z-I, T-P, Arabia and inland		585, 955, NCI K, 1483
<u>Cyphostemma borensense</u> (Klotzsch) Descouings	C, H	F, RF, W	Z-I, ZA		1115
<u>Cyphostemma</u> sp. sterile					290, 299, 1111
<u>Rhoicissus revoilii</u> Planch.	T, L, S	RF, B, T, G			1059, 1081, NCI K, 1482
ZINGIBERACEAE					
<u>Siphonochilus aethiopicus</u> (Schweinf.) B.L. Burtt	H				1, 469

SITE DESCRIPTION AND CONSERVATION EVALUATION

COLLECTION NUMBER (S)

NOTES

DISTRIBUTION

HABITAT

GROWTH

PTERIDOPHYTA

<u>Microgramma lycopodioides</u> (L.) Copeland (= M. owari.)	F	Forest only	579
<u>Microsorium scolopendrium</u> (Burm. f.) Copeland	F	Forest only	482, 581A

THIS PUBLICATION FORMS PART OF THE FRONTIER TANZANIA SERIES.

OTHER TITLES IN THIS SERIES INCLUDE:

1. May 1990. The feasibility of road improvement and construction within the southern sector of Mikumi National Park, Morogoro Region, Tanzania.
2. June 1990. Preliminary results of biological surveys in seven coastal forests of Tanzania: July to September 1989. N.D. Burgess.
3. June 1990. Frontier Tanzania Mafia Island Marine Survey: Interim Report M.D. Richmond and G. Gaudian.
4. July 1990. Mangrove response to sea level rise: the Rufiji Delta, Tanzania: Interim Report. Dr J Pethick and Dr T Spencer.
5. October 1990. Preliminary results of biological surveys in Zaraninge (Kiono) and Kierengoma (Matumbi Hills) coastal forests, Tanzania: January to March 1990. R.D. Sheil and N.D. Burgess.
6. December 1990. Mafia Island project report No.1: aims, methods and preliminary findings. J.C. Horrill.
7. October 1991. Mafia Island Report No. 2: Results of the physical, biological and resource use surveys: Rationale for the development of a management strategy. J.C. Horrill and M.A.K. Ngoile.
8. October 1991. Mafia Island Report No. 2, 2nd Edition: Results of the physical, biological and resource use surveys: Rationale for the development of a management strategy. J.C. Horrill and M.A.K. Ngoile. (Two Volumes).
9. August 1992. Preliminary results of biological surveys of Mchungu Forest Reserve and six other coastal forests of Tanzania: July to September 1990. T. Waters, N.D. Burgess and A. Dickinson.
10. December 1993. Medicinal Plants of the Tanzanian Coastal Forest: a list of species with local names and applications. Paul Matthews.
12. August 1994. Management Summaries of the coastal forests of Tanzania. L.K. Stubblefield and A. Dickinson (eds.).

TITLES IN PREPARATION:

Checklist of the vascular plants from 13 coastal forests, Tanzania. G. P. Clarke.

December 1993. Scientific references and reports of the Coastal Forest Research Programme. K. L. Ponder, G. P. Clarke and J. L. Bayliss.

Site Description and Conservation Evaluation: forest and thicket of Mafia Island, Tanzania. A. Dickinson.

Site Description and Conservation Evaluation: Kazimzumbwe forest, Kiserawe District, Tanzania. N.D. Burgess and A. Dickinson.

Site Description and Conservation Evaluation: Gendagenda forest, Pangani and Handeni Districts, Tanzania. G.P. Clarke and P. Matthews.

Series Editors:

Prof J.A.Kapuya
Dr M.A.K.Ngoile

Prof K.M.Howell
Dr N.D.Burgess

Prof A.K.Semesi

THE SOCIETY FOR ENVIRONMENTAL EXPLORATION

ISSN 0960 - 2437
