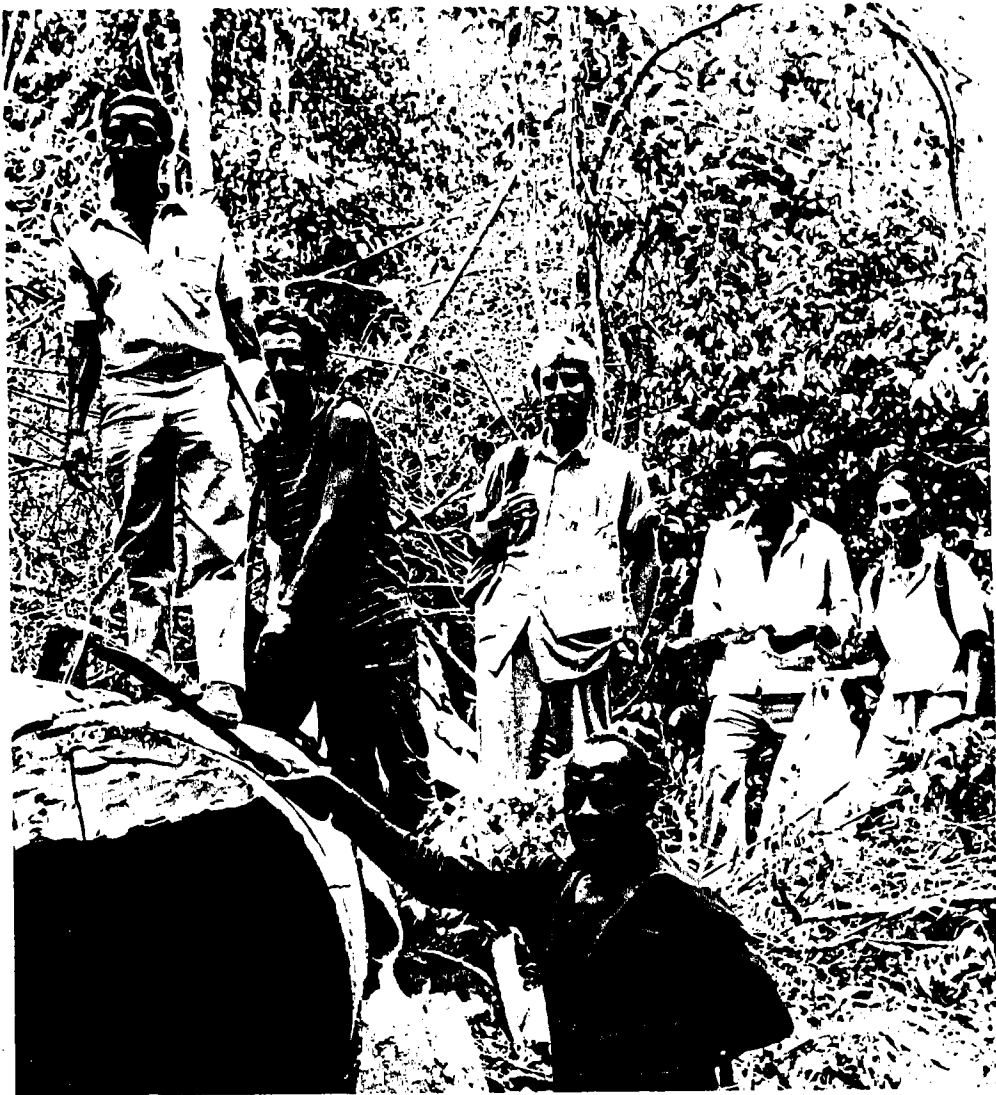


MATUMBI



Interim Report.

INTERIM REPORT on the Frontier Tanzania Project on the Matumbi Hills Forests

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INTERIM REPORT ON THE FRONTIER TANZANIA PROJECT IN THE MATUMBI HILLS FORESTS

LOCATION OF STUDY : The Kiwengoma Forest Reserve situated between the Maba and Mwengei-Magugu Rivers $38^{\circ} 54'$ - $38^{\circ} 57' 40''$ East and $8^{\circ} 18' 20''$ - $8^{\circ} 22' 30''$ South.

PERIOD OF STUDY

26th of October 1989 - 9th of December 1989.

On the 31st of October suitable site for a road-head base camp was found from which footpaths into the study area were established.

This road-head camp was established close to the western bank of the Nambunjo River at about $38^{\circ} 57'$ East and $8^{\circ} 19'$ South.

From road-head footpaths were established up to the Nambunjo and Mwengei rivers to traverse the study area.

The first ten days were mainly occupied by survey, mapping and habitat-typing of the area. The remaining period to records, collection and observation.

PERSONNEL

C. Clunies-Ross
B. Hynd
J. Kingdon
H. Rowan
K. Salusbury
D. Sheil
J. Willott
J. Hellin
H. Suleman - visitor
F. Mbago - visitor

RESEARCH ASSISTANTS

A. Dickenson
C. Downey
L. Ewing
K. Kennedy
J. Murray
A. Pegg
S. Perry
M. Shears
K. Tilbrook
D. Withers

The principal informant and guide was Mr Abdullah Abdul Mbonde.

2.

INTRODUCTION

At the time of Uhuru in 1961 the First President of Tanzania, Mwalimu Julius Nyerere chose the Wa Matumbi people to illustrate the spirit of Independence. Why? Because hostile forces, slavery, colonisation and the 1914-18 conflict had all been unable to follow these people into their remote, densely forested hills.

The Matumbi Hills also symbolise the many aspects of Tanzania that are unknown to the outside world because of prejudice, neglect or a short age of funds.

As this report shows, the Matumbi Hills have unique geological structures, unusual climate and an isolated geographic position that influence the flora and fauna of its forests. Unique ecological conditions and past physical isolation give a special interest to the Matumbi forest.

A new global appreciation of Africa's rich genetic resources and the fragility of her natural heritage has given new impetus to the study and conservation of Tanzania's coastal and montane forests because of the many unique endemic species that shelter there.

The Matumbi Hills forests are largely contained within and confined to the Kiwengoma Forest Reserve which has been the site of our study. This forest Reserve is so small and remote from established roads that it has been the least known of Tanzania's eastern forests; indeed even the very existence of forest communities has been doubted.

Within severe limits of trained personnel, equipment, logistics, funds and above all time Frontier Tanzania's Matumbi project has set out to make a preliminary assessment of the status of these forested Hills and their fauna and flora. We report in a tentative preliminary

3.

way on what has been found so far and it will be followed by a Full Report when the data has been processed and the species observed or collected have been identified and their biogeographic and ecological affinities have been assessed.

We have also mapped the Kiwengoma Reserve, recording the area's extent and type of past and present human influence. We have carefully noted the years when the settlers are reported to have left each area. From this data-base further studies could provide important information on the little-known processes of forest regeneration and the rates at which natural communities re-establish themselves.

Targeted on a significant area, we believe the central usefulness of our work is as a humble contribution towards the Inventory of Tanzania's Natural Resources.

In some small way we hope that our work and the reports that follow may redress neglect of one of the most interesting, valuable and beautiful Forest Reserves in our host country, Tanzania.



Riverine Forest in the Mwengei valley

GEOGRAPHIC BACKGROUND (Geology, climate and human impact)

The Matumbi massif is jurassic (142-212 million years old) and comprises shales sandstones etc known as the Matumbi series. Its upper hill tops are sandy or have rocky outcrops. There are a wide variety of soils derived from the parent sandstones and shales.

The Matumbi Hills peak at 2,432 ft ASL and cover a total area of about 400 sq km most of which is dissected by numerous eroding valleys. The northern and western faces capture most rain and several major seasonal rivers drain northwards into the Rufiji basin. Our study area is in the zone of northerly draining rivers which is covered by the Kiwengoma Forest Reserve.

There are no weather stations nearer than at Utete and Kilwa. The weather pattern over the Matumbis, although typical for the coastal region, is said to be heavier and more prolonged in the upper reaches of the hills.

Our daily observation, during a dry period, of dense clouds and dew fall above the 1,750 ft contour is of some significance. Local people assert that this is typical even in the driest of years. Although the soils and vegetation above this contour are dried out quite rapidly by diurnal winds the general effect is to make the hilltops strikingly cooler, even during hot dry season afternoons.

The sandstones, shales and clays underlying most river bottoms ensure that trapped underground water supports forest vegetation in most valleys of the Reserve. It is likely that this once applied to most, if not all, of the valleys which are now cultivated or settled..

The local population report that there has been a significant decline in the availability of surface water and a diminution of spring-water

5.

over the last sixty years or so. Whether this has been influenced by long or short term fluctuations or by clearance of natural vegetation is an open question. Although previously settled for several hundred years, the Kiwengoma Forest Reserve is reported to have been founded as an exclusive area in German times but to have been reopened to temporary settlement under the "Taungya" system in 1922. Large numbers of people farmed most of the gentler more fertile slopes until about 1946. Post-war restlessness affected much of Tanzania at this moment and it combined with diminished water and declining agricultural yields to encourage large-scale emigration from the area. The few remaining settlers left the Kiwengoma Forest Reserve in 1962 by which time the Taungya system had been abandoned and the area became an exclusive forest reserve once again.

Taungya plantings of Cassia and other exotic trees have remained vigorous in several former settlement areas but most former fields have been invaded by a variety of colonising plants from annual grasses and herbs to fast growing shrubs and trees. We estimate that a very high proportion of the reserve has been cultivated. The remaining areas fall into 3 categories, stony valley bottoms subject to seasonal flooding, very steep slopes, the more rocky ones supporting many large trees, the looser slopes with more thicket-type vegetation and dry, infertile or sandy hillsides mostly dominated by Brachystegia. The forests were left relatively untouched until 1986, since which time both licenced and pirate pit-sawyers, mostly from outside Rufiji District, have taken virtually every large timber tree from the Mwengei, Magugu and Nyambunjo valleys. Canopies have been opened up but young timber trees are not uncommon in the remaining vegetation. A small number of large timber trees still grow in the more remote valleys. Local interest in the Forest Reserve centres on its usefulness as a source of medicines, fibres and light poles for hut construction. By contrast with external timber sawyers the impact of local exploitation on the vegetation is light, even if sustained.

BIOGEOGRAPHY

Several aspects of the Matumbi Hills are of biogeographic significance.

1. Higher ground close to the eastern coast of Africa has always tended to capture moisture from the Indian Ocean in the form of rain, mist or dew blown in by the prevailing easterly winds. This climatic peculiarity has created ecological "islands" on all the massifs of eastern Tanzania. The Matumbi Hills also have moist "island" habitats in spite of their small extent and relatively low altitude.

2. Matumbi is the first promontory of higher ground south of the Rufiji River (which serves as an important boundary in the distribution of many organisms). Forest fauna and flora from north of the Rufiji River are now reasonably well known. By contrast the moist habitats of southern Tanzania and Mozambique have received little attention, although known to differ in important respects.

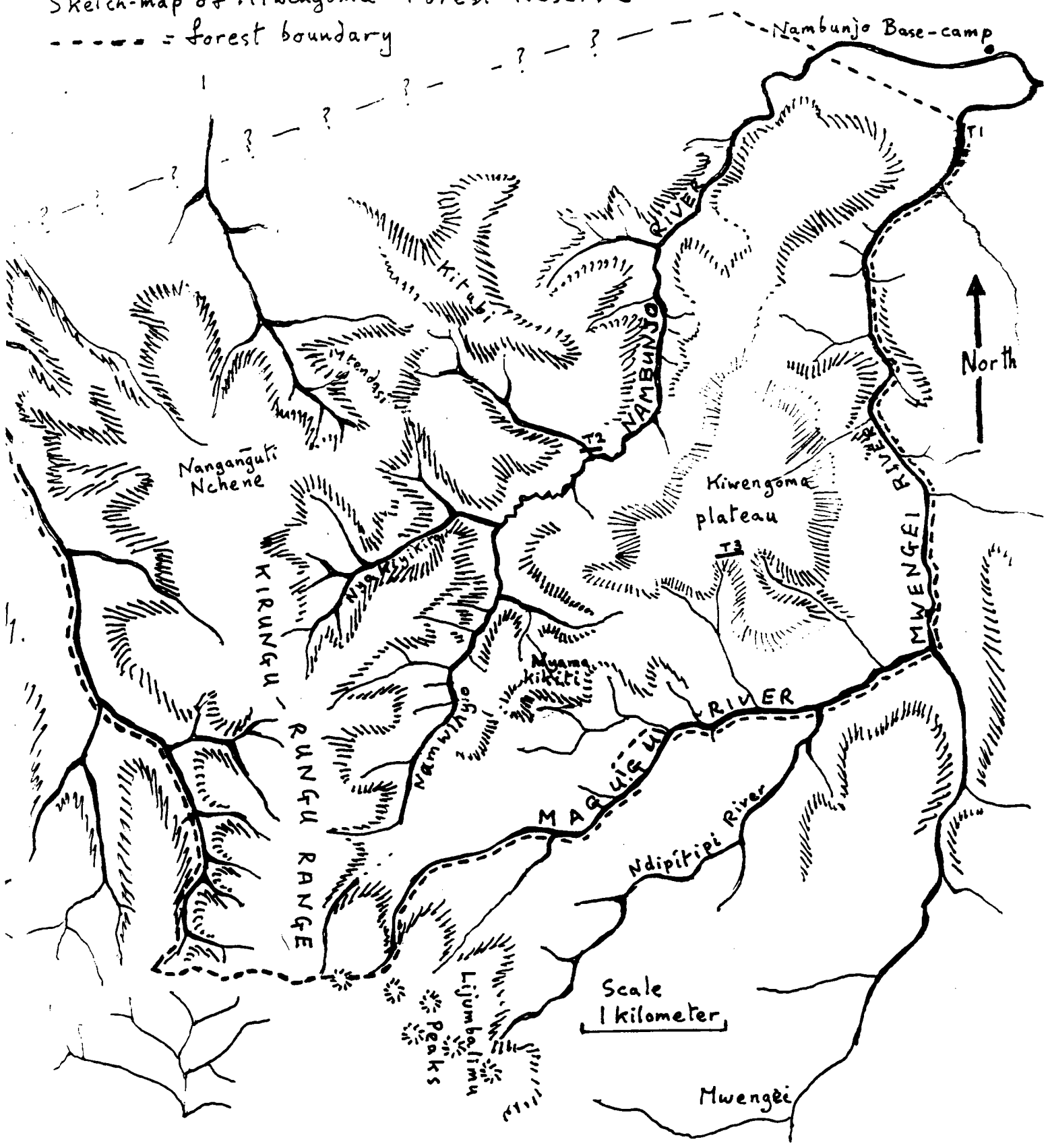
3. The Indian Ocean is known to have been higher in the past million or so years and to have reached Stiegler's Gorge. This would have made the Matumbis an island (like Zanzibar) with physical separation temporarily reinforcing the more persistent ecological isolation. Genetic differences in Matumbi populations can be expected under these circumstances.

4. Matumbi's peculiar geological structure and water regimes can be predicted to encourage local adaptation.

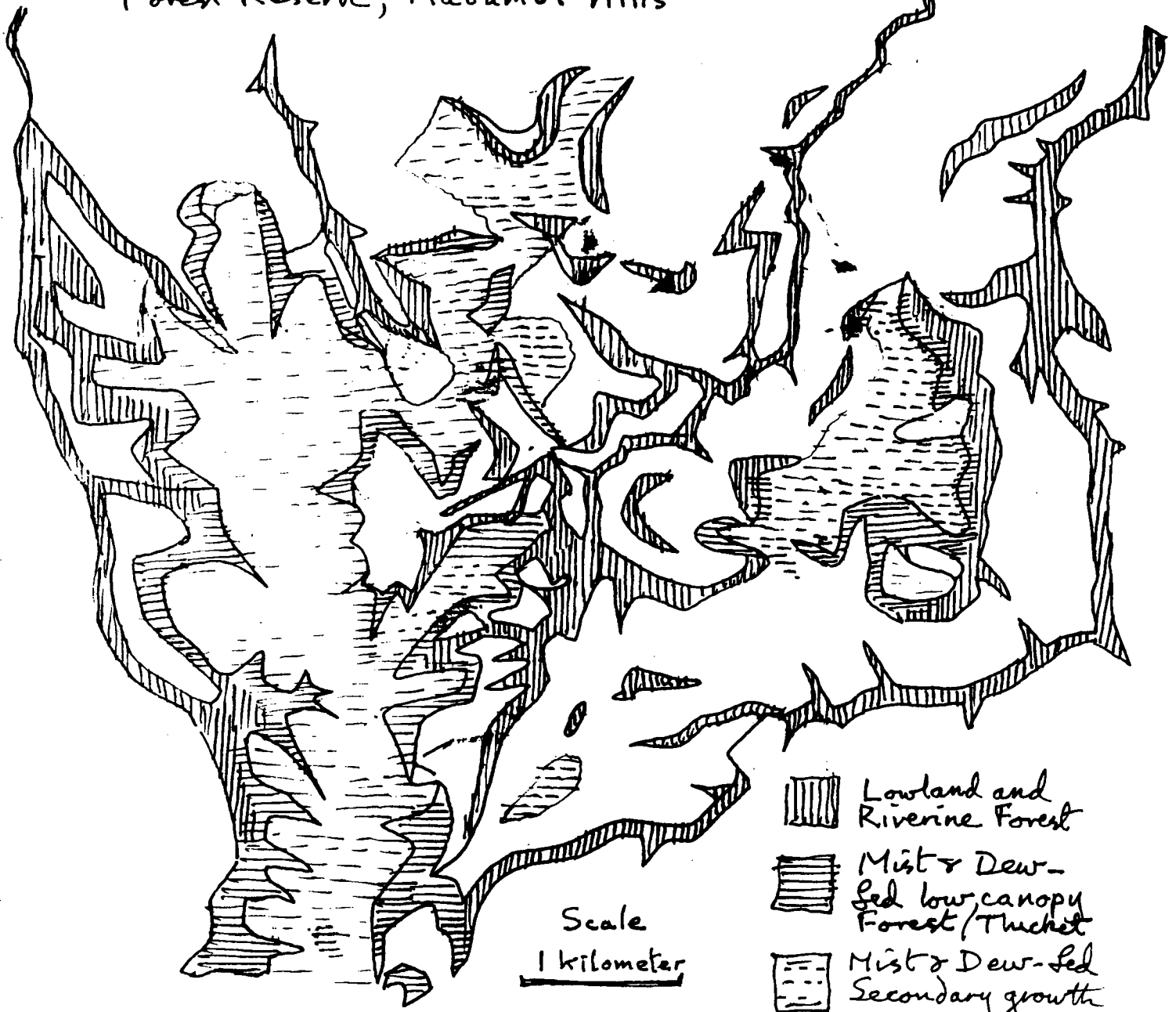
5. The relative stability and predictability of the Matumbi micro-climates should have allowed the area to serve as a refuge area for many moisture-adapted organisms. That this is so has been shown by our collection of three or four different species of freshwater crabs and numerous other moisture-dependent organisms such as St Paulia, Impatiens and various frogs.

Sketch-map of Kiwengoma Forest Reserve

----- = forest boundary



Sketch-map of forest habitats in the Kivengoma Forest Reserve, Matumbi Hills



7.

HABITATS

The Kiwengoma Forest Reserve was thoroughly traversed on foot and observed, noted, photographed and mapped from a large number of elevated view-points. These observations were transferred to base-maps which were derived from the 1: 50,000 sheet No 239/4, series Y 742 of KIPATIMU (which was made in 1966 by a combination of aerial photography and electronic control and compiled photogrammetrically).

Habitats were classified in the following categories.

A Altitude

- i.e. a) Hilltops above 1,750 ft
b) Intermediate land 1000 - 1,750 ft
c) Land lying below 1000 ft

B Landform

- a) Uplands, plateaux and slopes
b) Valleys and steep hillsides

C Substrate

- a) Steep rocky hillsides, outcrops, gorges and rock/sand
b) Valley bottoms
c) Predominantly fertile soils, loams and sandy soils
d) Predominantly infertile, lateritic or sandy soils.

D Water Regime (in dry season)

- a) Well-drained
b) Dew and mist-fed (occult precipitation)
c) Retentive of residual or mobile water (over rock or clay)

E Leaf-type

- a) Mainly evergreen
b) Mainly deciduous
c) Mixed

8.

F Vegetation height

- a) High (30 ft +)
- b) Medium (15 to 30 ft)
- c) Low (- 15 ft)

G Vegetative layering

- a) Canopy
- b) Subcanopy
- c) Understorey
- d) Herb layer

H Interference factors

- a) Anthropogenic (subcategories C. past cultivation, F. fire, T. Taungya, P. pit-sawing, J. Elephant damaged)

In practice these categories break down in the following way and may be related to some of Vollesens (1980) vegetation types:

1. Most valleys are in the intermediate land with rocky or sandy bottoms and sides, retentive of water and mainly evergreen with a high canopy, a medium understorey, occasional and indistinct subcanopy, and no herblayer except in chablis (tree-fall) openings. This category appears to correspond with Vollesens lowland evergreen and riverine forest types. Several steep rocky hillsides also carry an impoverished type of evergreen forest.

2. Lower altitude slopes (700-1400) often have well-drained infertile (lateritic or sandy) soils and carry a high to medium height canopy of deciduous trees with a poorly developed understorey and herb layer. This category appears to correspond to Vollesens woodland on sandy soil (Miombo) and is dominated by a canopy of Brachystegia macrophylla

3. Other slopes and plateaux are almost wholly influenced by past cultivation (vacated at various dates between 1929 to 1962). Small patches equivalent to Vollensen's coastal thicket appear to have provided the principal colonists for what Vollensen terms relic cultivation. In some localities Cassia or other plantation trees have become established under the Taungya system.

9.

Heavy elephant browsing is very frequent within most of this zone, especially in areas of dense liana tangles. Canopies are of medium height, (deciduous or mixed) sometimes with a low understory which intergrades from deciduous to evergreen down the slope where woodland intergrades in a narrow mixed deciduous/evergreen zone with the evergreen valley forest below.

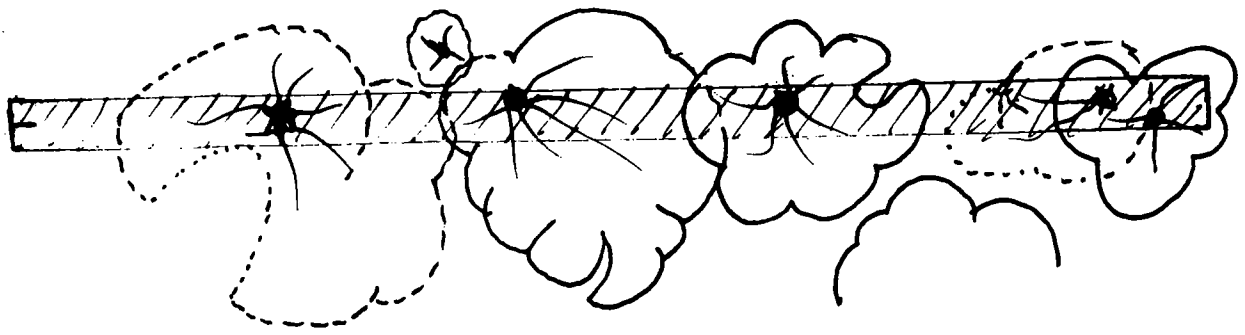
Vegetation above the 1,750 ft contour is influenced by dew/mist and cooler temperatures. Floristic differences are evident in the appearance of sedges and other green plants in the herb layer and areas of very dense evergreen low canopy thicket and forest sharing many species with coastal thicket and forest areas.

The classification of habitats has been limited in scope by several factors but we have attempted to map obvious and at least estimatable differences that appeared to correspond to Vollesen's categories.

After the overall mapping of gross vegetation types almost all attention was focused on those habitats and microhabitats most likely to represent "island habitats".

Transects . To this end transects were prepared. One below the 1000 ft contour, one at 1,250 ft in a valley bottom and one at 2000 ft on the southern lip of the Kiwengoma plateau.

Each transect site was determined by preferential samplings and measured 100 X 4 m. Simple measurements of BDH, total height, height at bole and width of canopy were plotted in plan and section. Identifications in Kimatumbi were made by Mr Abdallah Mbonde and each species was cross-referenced to the plant collection so that scientific names can be attached once identifications are confirmed. Dominant trees, understory shrubs, herbs and seedlings were noted. Intensive collection and observation of invertebrates, rodent trapping and mist-netting were conducted along each transect..



Plan and Section of transect A. Lowland forest.



10.

At each transect site a soil profile was drawn indicating the dominant characteristics of the soil and processes occurring within it. Studies were also made of the soils within the river bed in the lowlands and on an area of cultivated land on the plain.

Of the rocks outcropping in the area sandstone is the dominant type, although mudstones are also exposed at certain locations.

Geomorphology. Cross sections were drawn and measurements made of the rivers at transects A and B. In addition to this we also noted the influence of slope on soil characteristics especially at transect B.

Hydrology. It was noted that the two rivers within the study area possess two fundamental differences. Firstly the river valley upon which transect A is located is much more moist than the river of transect B. One of the main reasons for this is the presence of impermeable mudstone banding at several locations down valley inducing the formation of surface springs. Secondly the deposits in each river are significantly different. In transect A river deposits are essentially of fluvial origin, ranging from coarse sand to large rounded sandstone boulders indicating the potential high discharge rate of the river. The other river is essentially a rock bed river containing more angular deposits originating from the valley sides rather than upstream, this river is dryer and has much lower transport and discharge rates.

BOTANICAL COLLECTION

The aim of the botanical collection is to secure identifications and to provide as comprehensive a collection as possible to several local and other diagnosing Herbaria, i.e. University of Dar-es-Salaam (4 sets), the National Herbarium of Tanzania (1 set), Sokoine University (1 set). Most identifications will be made by the major international authority, Dr Kai Vollesen (who worked for the Miombo Research Centre , UDS and DANIDA on a plant check-list in the Selous Reserve). His Opera Botanica International Monograph No 59 (1980) has been an important guide to our interpretation of the vegetation.



African violet - St Paulia

Dr Vollesen is attached to the Institute of Systematic Botany in Copenhagen and Kew Royal Herbarium in London. J. Lovett is also taking a kind interest in the collection and its identification. The collectors' work was augmented by a three day visit from Herji Suliman and Frank Mbago from the University of Dar-es-Salaam. All Research Assistants and Researchers on the Matumbi Hill project have contributed to the field work, which has involved several overnight camps in the less accessible regions of the project area.

Specimens were collected by the 'Schaffer' method, being pressed in the field in newspaper and then transferred as soon as possible to a sealed bag and saturated with methylated spirit for storage, thus avoiding the problem of damp conditions.

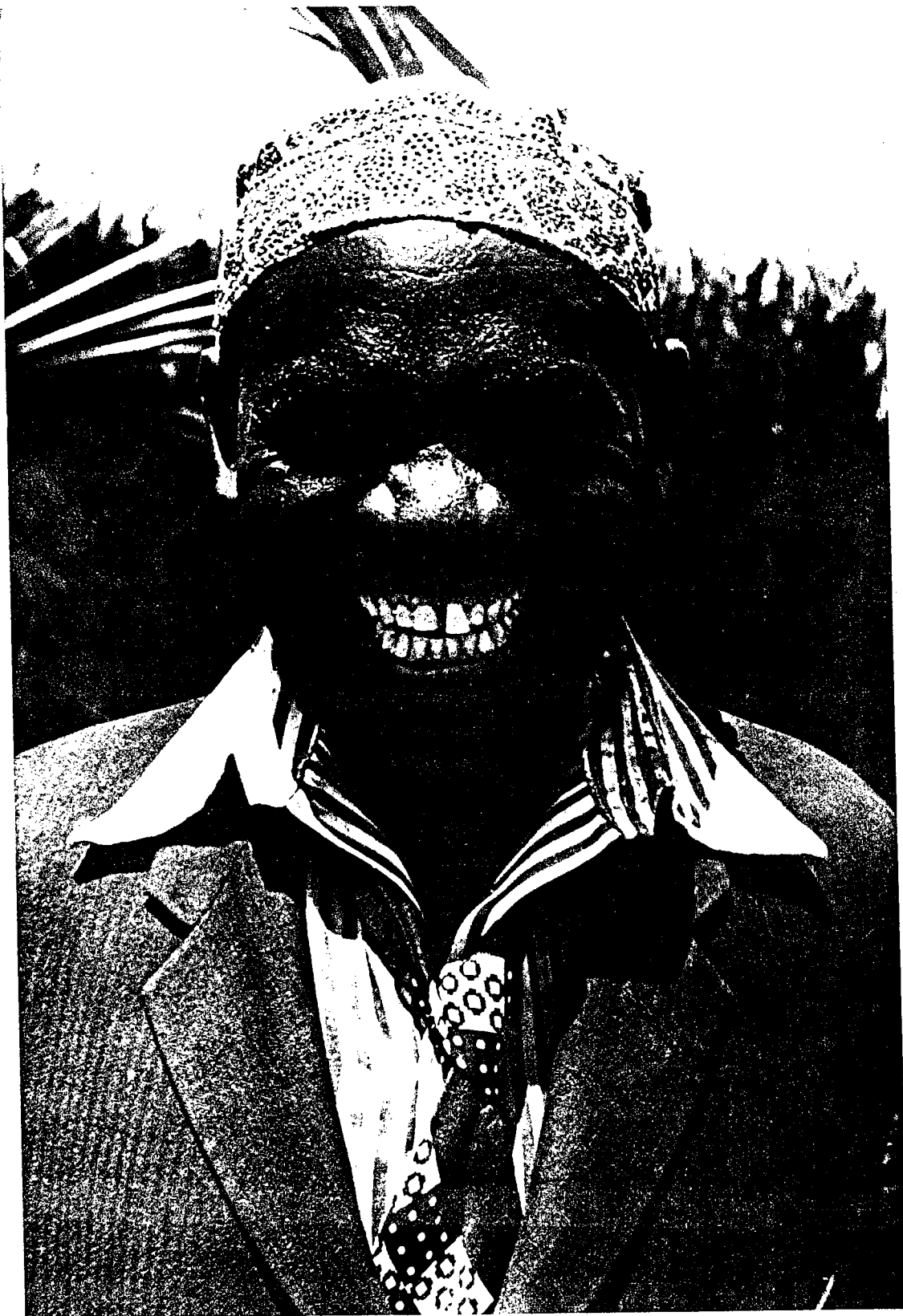
Descriptions of habitat, flowers, fruit bark slash, growth form and other distinctive features have been made, as appropriate, for all species collected.

Mr Abdallah Mbonde, our local guide and colleague provided Kimatumbi and, in many cases, Kiswahili names for all the species collected. As an expert on the medicinal uses of these plants he has generously imparted details of traditional use for the vast majority of the species found.

Specimens have been deposited with the University of Dar-es-Salaam for final drying, preliminary identification and formal documentation.

Collecting equipment was provided by Frontier Tanzania, the University of Dar-es-Salaam and the Oxford Forestry Institute. So far about 2000 specimens have been collected. This represents in the order of 400 species and includes virtually all the dominant forms of trees and shrubs. Each has been described by form, habitat and local use. Several highly significant finds have already been made including Impatiens spp and Saintpaulia spp.

The botanical collection will provide the basic data-base for evaluating the ecology of the Matumbi Hills as one of the most significant areas of Tanzania.



Abdullah Abdul Mkonde -

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When identified the collection will

1. Provide the first species-list ever made for the Matumbi Hills. This will be incorporated in the forthcoming Flora of Tanzania Project.
2. Provide indicator species for ecological, edaphic and climatic conditions
3. Enlarge our understanding of plant biogeography in eastern Africa.
4. Provide material for the study of genetic differences in an isolated locality, possibly including the description of new species and subspecies. Of exceptional interest is the discovery of several StPaulia (African violet) species and a balsam (Impatiens) both indicators of permanent moist conditions.

The collection of specimens was conducted by Douglas Sheil , Cass Clunies-Ross and Abdullah Mbonde with periodic assistance from Anne Pegg and Carol Downey and made very considerable demands upon their time, energies and skills.

ZOOLOGICAL STUDIESA Invertebrates

Invertebrates were collected, preserved and labelled systematically by Bert Hynde, John Willott and Alex Dickinson with the periodic participation and assistance of all other members of the team.

The sampling programme was designed to provide a start, a preliminary check-list of those forest invertebrates that might a) be indicators for especially isolated and localised or unusual habitats b) to find specialists who would be willing to make identifications. Various techniques were used, from hand netting and catching, Malaise trap, Mercury Vapour Lamp, pitfall traps, fogging and dredging through debris.

Preliminary observations suggest that while there are a considerable number of species occurring throughout the range of forest habitats there are many confined to quite specific vegetation or in sites that are mediated by altitude, aspect, climate or substrate. Given the unique geology, climate and history of isolation we expect many species to be uniquely endemic to the area and therefore new to science. This will greatly enhance the wildlife inventory of Tanzania's natural resources.

Consecutive nights' sampling in the same place have produced quite different catches which suggests that many more remain to be discovered, for example, the tailed emperor moth, Antistathmoptera is reported to emerge in March and April and is seldom seen at other times.

Particular attention has been devoted to those groups in which the available personnel have experience and expertise such as myriapods, mollusc, spider, dragonflies, lacewings and some families of beetles.

A vast effort at labelling, documenting and identifying the specimens must now begin, even so the Frontier Tanzania observations represent only a small sample of the Matumbi invertebrate ecosystems.

VERTEBRATES

A Herpetology

Many species of frogs were collected several of which showed unusual and highly specialised adaptations. Lizards are abundant in Matumbi forests but only a very small sample of specimens was secured. Likewise very few snakes were collected although many were seen. Bell's hinged tortoises are common..

The Zoology Department of Dar-es-Salaam University has made the following determinations of specimens.

Snakes. Typhlops

Psammophis substriatus

Psammophis phillipsi

Natriciteres

Thelatomis

Aporallactus (centipede eater) *

Chameleons.

Rhampholeon spp

Chameleo melleri

Lizards

Lygodactylus

Hemidactylus

Cremaspis

Agama

Cordylus tropidasternum

Lygosoma

Mabuya

15.

Frogs.

Bufo gutturalis

Stephopaedes

Mertensophryne (rondoensis ?)

Xenopus

Breviceps mossambicus

Arthroleptis

Phrynobatrachus

Ptychocheilichthys

Leptopelis

Hyperolius

Several of these are exclusively forest genera and several represent East African endemics.

Birds

Birds had inadequate attention but several exceptionally interesting records and observations were made.

A small number of the semi-nocturnal olive ibis were tentatively identified. The long-billed apalis and tiny greenbul are forest birds of limited distribution that were identified with some confidence. The bronze-naped pigeon is another indicator of forest conditions, as are East African crested guinea fowls, Narina's trogon, yellow-streaked bulbul, the green backed Camaroptera, Stuhlmann's weaver and several wood pecker species.

Abundant prey for large and medium sized predators is some indication of high productivity in a locality, because these higher levels of the food chain or pyramid denote still larger resources in the vegetation. It was therefore significant that crowned hawk eagles were found nesting at several of the richest forest sites in the Matumbi Hills. The spoil below their nests was collected and demonstrated that monkeys were by far the largest item in their diet followed by red duikers, suni, mongooses and elephant shrews. More occasional prey included squirrels, monitor and girdled lizards, a porcupine and guinea fowls. No typical



Measuring specimens in camp

non-forest species appears in the spoils their nests and the eagles appear to hunt exclusively in the forest.

Other raptors recorded are mountain buzzard, African goshawk (nesting) and tentatively southern banded snake-eagle . Angola pittas were strikingly common at the time of our study as were African broadbills, southern bearded scribb robin, red capped robin chat and olive and variable sunbirds. Schalow's turaco is very abundant in all the valley forests and the violet crested turaco seems to occur outside the forest. Crowned and trumpeter hornbills are both abundant but range well beyond the forest.

The brown-necked parrot roosts (and probably nests) in the highest reaches of the forest but flies out into the lowlands every day.

Owls are exceptionally common at all camping sites and the eagle owls may include the Nduk. Two species of crakes were heard at night.

Two uncertain identifications concern a green barbet and green-headed oriole.

Mammals .

The dominant mammals in Matumbi are homo sapiens and elephants and their marks are everywhere over valleys, hillsides and hilltops.

Bushpig, red duiker and suni are very common, while buffaloes are regular visitors and sable antelopes sometimes enter for water. The abundant invertebrate fauna supports large numbers of aardvarks and elephant shrews but we were unable to catch any shrews, although we were told they are present. Porcupines and giant rats are common and the former has given its name to the central range of hills because it is so common there.

Gentle monkeys are very abundant in the moister, higher forests but are scarce in the drier valleys. Baboons and vervets occur on the margins. The two commonest galagos are the Zanzibar and Garnett's

galagos but a rarer unnamed species was heard and seen in three lowlying dense forest localities. Other galago species occur immediately outside the forest area.

The red legged sun squirrel is common in the moister valleys. Rodent trapping in the forest was disappointing but did reveal the presence of the very rare and little known lesser pouched rat , Beamys hindei, at 700 ft and 1,900 ft, also Praomys rats occur in the valleys. The pre-eminence of ants ensured that both baits and captures were rapidly eaten.

Bats were netted and included very numerous Rousettus aegyptiacus and several specimens of the newly discovered fruit bat Myonycteris relicta Of insectivorous species Hipposideros ruber and H. commersoni were caught., also Triaenops persica and three species of Rhinolophus,, Scotophilus nigrita, Scotoeas , Pipistrellus nanus and Nycteris. Virtually all species were in breeding condition.

Leopards are scarce but widespread, lions are very occasional visitors. Spotted hyaenas only occur outside the forest. Wild cats, genets and serval cats also occur. March mongoose were seen in the camp area and bones of dog-footed mongoose, Bdeogale, occur in the debris from eagles' nests.

At present no livestock is kept by villagers near the forest and no signs of goats, sheep dogs were seen but a single Rattus rattus was trapped in base-camp.

Colobus monkeys, hyraxes and flying squirrel (Anomalurus) are significant absentees. A possible explanation is that the moist habitats are too narrow and include too many dominant evergreens that are protected by ants or by secondary chemical compounds.. For these folivorous animals the choice and volume of plant foods could therefore be reduced to critical levels during dry seasons. Yet suni, red duiker and gentle monkeys are abundant in the moister valleys and especially



Area of logged forest, Mwengei valley

18.

above the 1,750 ft contour.

Vertebrates have been found to represent a mix of arid-adapted woodland and thicket species and a smaller number of specialised forest species. Some of these are only known from Usambara, Pugu or Rondo and the texture of the fauna is a mix of endemics typical of the northern Tanzania coast and southern "Mozambique" types.

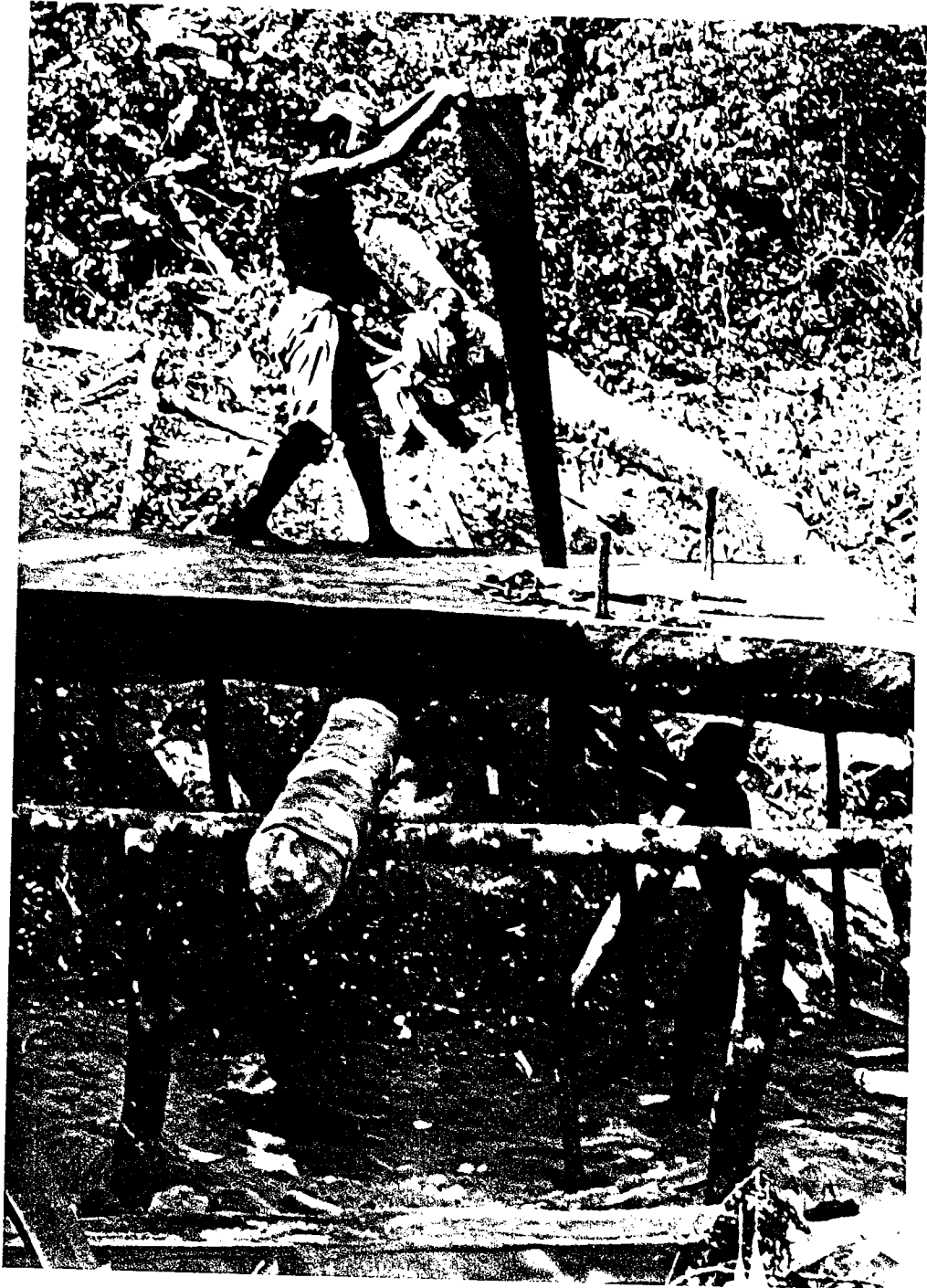
HUMAN ACTIVITIES AND HISTORY

According to tradition the Wamatumbi have been settled in the Matumbi Hills for at least seven or eight hundred years and they believe that they migrated north-east from the region that is now southern Malawi.

Human impact on the more fertile areas of these hills is therefore very great and has been sustained over many centuries. Populations are also known to have fluctuated and the Kiwengoma Forest Reserve area has seen several cyclic phases of settlement and depopulation.

At the present time many ex-Ujamaa families are reclaiming land that has lain fallow for a decade or more as well as felling forests and woodlands that are very much older. Before long cultivation will press up against the boundaries of the Forest Reserve from all side and the thoroughness with which natural vegetation is being burnt out implies that the forests will eventually receive heavy pressure for bush poles and light building materials.

Until 1986 the Mwengei, Mugugu and Nambunjo valleys would have represented over twenty kilometres of continuous closed-canopy mahogany forest, all densely shaded. Numerous shorter tributary valleys more than double this area of forest while shorter evergreen growth above the 1,750 ft contour further increases the area of forest-like habitats. Some hunting for duiker and suni brings a small number of opportunistic and part-time hunters into the forest. In recent years the numerous elephants have also attracted ivory hunters, the most recent killing being in March this year.



Pit-sawyers at work, Nwengei valley

Honey hunting and apiculture (using both bark and hollowed log hives) are practised but not in a very intensive way. Nonetheless we observed several diggings for the highly prized aromatic honey of stingless ground bees.

Collection of plant parts of medicinal uses is the most obvious value of the forest to local people. According to Mr Mbonde more than two hundred plant species have some sort of traditional use and we have documented his knowledge. Natural copal resins have been of significant economic value in the past, being saleable to Indian merchants in Utete.

The most negative human impact on the basic ecology of the forest has been pit-sawyers felling almost every mahogany (Khaya natalensis) and Mvule (Chlorophora excelsa) in the three main valleys. Many of the trees felled were undersized and in most instances only a very small proportion of the total tree has been used. The local Forest Officer is conscientious and visits the forest five or six times a year. He has monitored the felling and has put embargoes on illegal "pirate" fellings and only issued proper licences to several pit-sawing timber firms. The Forest Officer is stationed at Mohoro and can only visit Kiwengoma by foot or bicycle.

The narrowness of these valleys means that simultaneous felling of all the large trees has opened up the canopy every hundred metres or so, leaving very restricted refuge areas for shade-dependent species (such as Saintpaulia and olive ibis).

The medicinal use of plants, their local names and general guidance throughout the period of our study has been generously imparted by Mr Abdullah Abdul Mbonde, who is the grandson of a famous local herbalist and inheritor of his traditional pharmacopeia. The Mbonde family used to be the principal farmers and owners of the area, centred on the Kiwengoma and Kirungurungu plateaux.

20.

It has been a long tradition to live in permanently watered valleys , such as the upper Mwengei and lower Nambunjo, and farm the land above 1,750 ft on a seasonal basis moving to the upland fields for the sowing and maturing season when the crops have to be protected from pigs and monkeys. This tradition is maintained up to the present with numerous fields once again becoming cultivated in the uplands south of the Kiwengoma Forest Reserve boundary.

The status of Kiwengoma as a Forest Reserve ensures its maintenance as a water catchment and timber reserve area as well as a Nature Sanctuary but the ecological impact of a single massive assault upon its timber resources (that have accumulated over several hundred years) should not be under-rated.

The value of Kiwengoma as a water catchment area would be enhanced if the southern boundaries took in a larger area of headwaters than they do at present.

SCHEDULE FOR FULL REPORT

The Full Report depends upon the determinations, notes and discussions of a very large number of scientists and specialists. It can be anticipated that this will require several months' work before it can be synthesised into final form. A target date of May 1990 has been set for all participants.

The final work will greatly enlarge on this report but will follow a similar format.

APPENDIX I.PARTICIPATION BY FRONTIER TANZANIA ASSOCIATES AND RESEARCHERS

Cass Clunies Ross - Forest Botanist - BA Natural Sciences (Plant Ecology), MSc in Forestry and its relation to Land Use. Has made forest surveys in Kenya, Bangladesh and Jamaica.

Has implemented and organised the Botanical Collection in co-operation with Douglas Shill. Has trained all Research Assistants in botanical collection, documentation and preservation.

Has recorded the Kimatumbi and Kiswahili names and local uses imparted by Mr Abdullah Abdul Mbonde..

"The most valuable aspect of the project was working with Mr Abdullah Mbonde. His knowledge of the forest, his acute powers of observation combined with a rich sense of humour and generous spirit brought the project to life".

Bert Hynd - Entomologist currently working on the taxonomy and ecology of Neuroptera (lacewings) also has a broad-based interest in African insects. Will mediate and expedite the identification of specimens by specialists in the British Museum.

Jonathan Kingdon - Evolutionary biologist with a special interest in Biogeography and Mammals. Initiated this expedition and its rationale and therefore provided some conceptual and practical frame works which would contain the diverse activities of the expedition. Taught various ecological techniques including trapping, netting, recording and preserving specimens, mapping and transect profile drawing. Acted as liason (through Kiswahili) with authorities, auxiliaries, assistants and with the interested public (often small boys with wide open eyes or women with sceptical questions).

"I believe Frontier offers young scientists the opportunity to participate in multi-disciplinary and international scientific work on the environment. As a Briton born in Tanzania I applaud the development of this type of linkage between the people of both these countries. I believe that Frontier offers unique resources for very many worthwhile projects that might otherwise be neglected for lack of funds or skilled assistance and performance. I enjoyed planting some maize seeds

in Matumbi soil. I hope the harvest will be good."

Abdullah Abdul Mbonde - Former Game Guard and Guide, Tanzania Wildlife Division, Assistant to the Director Miombo Research Centre, Kingupira and leading a leading member of the local Society and of the Party. His family were once the traditional owners of large parts of the study area and have been settled here for some forty or more generations. His father, grandfather and great grandfather were famous as traditional herbalists, a reputation and knowledge that has been inherited and practiced by Abdullah Abdul up to the present time. Unlike most herbalists he has not been secretive and has freely imparted information to members of the Frontier team. His guidance and knowledge have informed the content of almost every area of our work and he is in a real sense the senior author of our studies.

"I have enjoyed working with these people and I am pleased that this is the first scientific study of my home area of Matumbi".

Heather Rowan - Registered General Nurse with qualifications in Occupational Health Nursing. Medical Officer for the project. Supervised health and hygiene but also participated in botany, insect collecting and mist-netting.

"It has been an honour to spend some time in Tanzania and learn some thing about this country, its people and its natural history".

Kate Salusbury - Camp leader BSc in Biological Sciences. Employed Public Housing Sector before joining Frontier. Has concentrated in setting up and running a camp that would facilitate the scientists in their work. Has helped with botany.

"I wanted to return to my roots as a biologist and get some fieldwork experience as I hope eventually to work in conservation. I have developed great respect for the customs of the Matumbi people and I hope to return to work in Tanzania. Thanks are due to Mr Ibrahim Madenari, Utete Ward Secretary and Mr Karim Ngaglio Party Chairman Mbware; their help was invaluable.

23.

Douglas Sheil - Coordinator, BA in Natural Sciences and MSc in Forestry. Previous experience in India, Kenya, Sahara and Bangladesh. A two-fold role in the project: "Firstly to overview the venture with the aim of optimising the potential for rational scientific research, collection and inter-disciplinary cooperation. Secondly to be responsible (+ Cass) for the running of the Botanical Collection and associated vegetation studies. I have been able opportunistically contribute to the zoological work. I have drawn schematic profile diagrams corresponding to each of the transects.

The value of the project is at two levels

1. As an opportunity to promote international cooperation and extend mutual understanding with Tanzania^{ns}.
2. That the information has academic value but also provides a basis for future policy."

John Willott - BSc in Zoology, currently a PhD candidate in insect ecology. Has been coordinating an insect sampling programme, concentrating on mercury vapour lamp trapping. "There is a strong case for further intensive sampling at all different times of the year to reveal the true extent of the diversity and unique nature of the Matumbi Forest insect fauna."

John Hellin -MSc in Forestry and Land-use. Experience in tropical forestry in Costa Rica. Responsible for establishing 100 X 4 m transects and recording/estimating the timber production and harvest in the Mwengei and Nambunjo valleys.

" I hope one consequence of our work will be international recognition of the conservation value of the Matumbi Hills with a consequent release of badly needed funds to protect the forest areas. Working here has given me an insight into the way of life of the Matumbi people who show a strong independent streak in their character and are also very proud and honest."

Frank Mbago Former Forest Officer, currently curating Botanist in the Dar-es-Salaam Herbarium. Assisted in habitat-typing and plant identification as well as conducting what were effectively field-classes in the taxonomic characteristics of those plant groups most commonly found in Matumbi. Brought humour and energy to a much appreciated visit.

Hirji Suleiman - Assistant Curator of the Dar-es-Salaam Herbarium collections. Supported Frank Mbago with his extensive knowledge of local botany and helped to crosscheck Swahili names for commonly used trees and timbers.

Alex Dickinson - BSc Zoology. Systematised the general animal collection and carried out systematic sampling along transects investigating tree bark, rock crevice and leaf-litter fauna as well as larger organisms using pitfall traps and similar methods. Helped in the collection, processing, storage and preservation of both animal and plant specimens.

" Hopefully our project will contribute towards worldwide appreciation of Tanzania's biological resources. I have been consistently impressed by the diversity and adaptations of fauna here. Equally rewarding for me has been experiencing a new culture, there is much to learn when the very language is based on concepts of friendship and good humour."

Carmel Downey -Experienced in the education and care of young children Carmel acted as a valuable interface with the numerous small visitors to the camp. Also provided valuable assistance in the collection, preservation and recording of both animal and plant specimens. Helped assemble an impressive collection of bones from below the eagle's nest.

Lee Anne Ewing - Joining the project after earlier work in Pande Forest. Assisted in the marking, measuring and recording of transects and pathways and the day to day organisation of camp and temporary field-camps. Exemplary in her high energy performance.

Katherine Kennedy - BSc in Environmental Science majoring in Geology. Detailed recording of soils at each transect site and general profile of the geology as it affects the distribution of habitats in Matumbi. "The project has greatly increased my understanding of the need to look at our environment from a multi-disciplinary angle, confirming that all physical, biological and chemical components of this system are dependent upon one another for future growth. In addition to this I find the scenery at Matumbi both thought-provoking and mysterious."

James Murray - BSc in Ecology. Assisted in the location and laying down of forest transects and in entomological collection and documentation. Previously helped collect plants in Pande Forest. " My first experience of a tropical forest I have greatly enjoyed seeing the tremendous diversity of species but deforestation is always shocking in the damage it inflicts to the forest ecosystem and I might hope that our work would help establish the true value of this region as beyond that of its marketable timber species. I have witnessed the Tanzanian people' tremendous self-respect and spirit."

Anne Pegg - BSc in Natural Sciences with Honours in Botany. Helped with most aspects of field work including vertebrate collection, bird and bat netting and collection of plant specimens. " I feel sure this previously unstudied region of forest will prove to be of great interest. I have felt privileged to be involved with the initial stages of the work. It has been a unique insight into Tanzania, both its land and culture and we have met with unforgettable hospitality during our stay."

Stuart Perry - BSc in Zoology. Involved in the trapping and netting of birds and mammals and assisting in the collection of invertebrate and botanical specimens.

" I see this project contributing a great deal towards knowledge of one of Tanzania's lesser known natural resources. Hopefully we have helped put this area "on the map". My visit to Tanzania has been a real eye-opener to the customs and life-styles of a country. I feel privileged to have been part of this project and to have worked with local people in a little known part of Tanzania."

Mark Shears - BA in Economics. Coming in at a late stage from work in the Pande Forest took on the physical task of measuring and recording transects and providing the data for transect profile drawings. Brought energy and enterprise to the frequent making and breaking of temporary field camps. Hopes to write brief essays on the expedition.

Katrina Tilbrook - BSc in Biology. Has gained valuable experience in the capture, measurement and detailed recording of data on mammals, birds, insects and plants. Helped in all these aspects especially mist-netting and mercury vapour lamp trapping.

" Limited as we were by time, we have only begun what could be quite an extensive survey. I do hope that the work will be continued. I certainly have found it a very rewarding experience and had the good fortune to live in a Tanzanian village in one of the more remote areas. This has been my first visit to Africa."

Darren Withers - BSc in Ecology with experience of Wildlife Societies, voluntary conservation action and handling animals at a Wildlife Centre. Helped in preliminary mapping, botanical and zoological collecting, trapping, netting and concentrated especially on the Herpetology (mainly snakes, lizards and frogs).

"Hands-on experience of both fieldwork and specialist activities represents a unique and privileged opportunity.. Contact and liason between locals and visitors has been important for both relationships and to facilitate scientific work".

APPENDIX II

ORIGINAL OBJECTIVES ACHIEVED IN THIS STUDY

1. To map the present extent and assess the status of moist forest within a provisional study area of approximately 35 sq km comprising the Kiwengoma Forest Reserve.
2. To provide species lists for all organisms and to observe and record selected diagnostic organisms for comparison with comparable fauna and flora from north of the Rufiji River, from the Rondo Plateau and from Mozambique, (in *Field Report*)
3. To determine whether genetic differentiation of local populations of animals and plants has occurred through past isolation of this area by the Rufiji River or by marine incursions or climatically and geologically based ecological isolation, (in *Full Report*)
4. To provide an ecological description of the study area by means of systematic observations, measurements and collections. To this end several transects have been clearly marked and are available for long-term study or physical extension. The spatial and ecological distribution of selected species has also been studied and organisms limited to moist forest habitats have received special study and have been focused in the immediate vicinity of the transects.
5. To provide up-to-date information on the present status and species lists of fauna and flora for the Tanzanian conservation authorities.
6. To provide appropriate Tanzanian authorities with reports that will include information on
 - a) the status of this area within the National Conservation Estate.
 - b) a map of habitat types
 - c) specialist reports and publications deriving from study of particular scientific subjects, i.e. species-lists, distribution maps, etc.
 - d) A synthesis of the overall biogeographic significance of Matumbi.
 - e) A summary of the ecological data collected.