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Subject: Climate, Vegetation and Availability of Some Active Plants In the Usambaras and Southern Highlands, Tanzania

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Some limiting factors concerning 22 active species available in Tanzania were discussed in a separate memorandum. Here I will focus on the two selected field sites, northeast Tanzania and Southern Highlands. The distributions of the active species for each of the two areas will be shown in relation to rainfall distribution, vegetation, potential drying sites and possible living quarters for the botanist.

RAINFALL, VEGETATION, AND FLORA OF TANZANIA

The rainfall distribution at various localities in East Africa is shown in Figure 1. Rainfall is minimal in the summer months for both northeast Tanzania (Dar-es-Salaam) and Southern Highlands (Mbeya).

A very general description of broad vegetation types can be found in vegetation south of the Sahara (Acta Phytogeographical Suecia: 54, Tanzania by R. M. Polhill). A Xerox of the vegetation map is shown here (Figure 2). Most of Tanzania is woodland, but the 22 active species occur in forest (green), bushland and thickets (orange) and wooded grassland and grassland (yellow). In northeast Tanzania, 21 active species are distributed in all three types. At Mufindi, we will mostly need to work in forests and grasslands.

Other outlines of Tanzanian vegetation have been published by Rea (1935) and Phillips (1931). Their classifications, however, are not used by current authorities.

Tanzania may contain about 8,000 species of vascular plants. The coastal forests and bushlands are floristically rich and highly endemic. From the high number of endemics and their taxonomic relationships, one might view the coastal districts as two groups of islands situated somewhere between eastern Africa and Madagascar. One group of islands includes the Usambara, Nguru and Uluguru Mountains. The other island centers in the Lindi District. Although endemism is high in these islands, species that characterize the vegetation, with some exceptions, are nonendemic.

Some endemics occur in the Southern Highlands but are found in genera that are usually large and associated with secondary vegetation. Relics that occur here are associated with the sclerophyllous shrublands - Maytenus buchananii, Choristylis rhamnoides, Dais cotiniifolia, Acokanthera oppositifolia. The latter two are disjunct, occurring also in South Africa.

One major problem in working in the Usambaras, in contrast to the Southern Highlands, will be in field identification.

NORTHEAST TANZANIA (Usambara Mountains and Coastal Lowlands).

The following illustration (Figure 3) is a cross section of the Usambaras and coastal lowland (from Moreau, 1935). Probable locations of active species are shown in relationship to rainfall, elevation, vegetation, and distance from the Indian Ocean.

The active species are distributed over an 80 mile range. An East African road map published by the Kenya government (First Edition, 1974) indicates hotels at Tanga, Lushoto, and Mombo. From my experience, I feel that the hotel in Tanga is acceptable, but I am uncertain about the other two. If either of the hotels and Mombo or Lushoto are habitable, then two separate drying sites might be constructed, one at Tanga for the lowland forest and bush species and one at Mombo (?) for the Highland Zone species.

Small to large forest reserves are scattered throughout.

LOWLAND ZONE

Four active species are often associated with thorny, deciduous thickets and bushlands (Sansevieria, Excoecaria, Ximenia, and Commiphora), three usually occur in wooded grasslands (Gardenia, Psorospermum, and Parinari), and three are expected in lowland evergreen forests and thickets (Tabernaemontana, Uvaria, and Monanthotaxis).

The estimated time to collect each species in the lowland zone is evaluated along with other factors below.

I. From Thorny Thickets and Bush

Sansevieria ehrenbergii st-lf. This species is more common in north central Tanzania and Kenya but is expected to be available in fair abundance near Tanga. About three days to collect 300 pounds of leaves. Most of the sample will consist of Agave-like leaves and drying this sample will be slow.

Excoecaria bussei sb. This species is more common in central Tanzania but is expected to be fairly common near Tanga. About three days to collect 300 pounds of bark.

Ximenia caffra ws-sb. Should be available near Tanga. About one day or less to collect 300 pounds of stems.

Commiphora boiviniana tw. Should occur near Tanga, but its identification will depend on the presence of leaves which are often absent. This species was not found in the ecological literature and was observed as occasional shrub near Jilore, Kenya. Expect to collect about tp pounds of twigs per day.

II. From Wooded Grasslands

Gardenia jovis-tonantis tw. One or two other closely related species are likely to occur with this species near ecotone of thickets and grasslands southwest of Tanga. Flowers seem essential for positive identification. If identified, we might collect 500 pounds of twigs in four days.

Psorospermum febrifugum rt. This species is not reported from the Tanga Province but is expected to occur with Gardenia and Parinari in other districts southwest of Tanga near exotone of thickets and wooded grassland (see vegetation map). Expect about 80-100 pounds of roots one day, and five to six days to collect 500 pounds.

Parinari curatellifolia fr. Both Parinari and Psorespermum are typical of wooded grasslands (savannas) in Zaire. Distributions are often discontinous. Two related elements are recognizable: one is the Guinee-Sudan grassland occurring from Ghana to Uganda, and the second is the Zambezi grasslands that are represented in Tanzania. If fruits are available, it would seem more practical to purchase these rather than employing labor. Such purchases could be conducted in phase with other collecting but is likely to add one to two days time (300 pounds).

III. From Lowland Forest (Tanga-East Usambara Mountains)

Tabernaemontana ventricosa rt, ws-sb. Recorded from Masheua (Kivindo), Usambara. Expected abundance unknown because much of the lowland forests have been disturbed. Also recorded from Mt. Kilimanjaro and abundant in Lake Manyara National Park, (Greenway, 1969).

Monanthotaxis buchananii. Probably available (occasional-frequent) between Tanga and the mountains. Four other species also occur here: M. faulknerae, M. fornicata, M. trichocarpa, and one unnamed species. Identification will likely depend on the presence of flowers. If 300 pounds are available at one collection site, it may take four to five days.

Uvaria kirkii tw-lf. Uvaretin has been isolated by Cole from U. acuminata which sometimes occurs with U. kirkii. Identification might be a problem. Expect to collect 300 pounds in three to four days.

INTERMEDIATE ZONE

None of our needed actives appear to be common in this zone which, from Moreau's description, is fairly rich and highly endemic. Some forests in the lowland zone may be dominated by species of Cynometra (Trapnell and Langdale-Brown,

1972) and at slightly higher elevations by Parinari excelsa (cited by Lind and Morrison); a trend seen in vegetation of eastern Zaire and Uganda. Beilschmiedia (Lauraceae) is also common here. This genus has numerous species in the West African lowland rain forests and has not been recorded from Kenya. Other genera found include: Antiaris, Rhodognaphalon, Chlorophora, Newtonia, Zanha, Diospyros, Khaya, Pachystela, Terminalia, Celtis, Cephalosphaera, Macaranga and Tabernaemontana holstii. Many of these occur together in the Mwele Mdogo Forest, Shimba Hills and at Kakamega, Kenya.

HIGHLAND ZONE

Seven of eight active species associated with this zone also occur at Mufindi. The forests vary from a very wet Ocotea-Podocarpus to a dry Juniperus (Cedar) type. Moreau's "Semi-humid plus" may be similar to the Mufindi escarpment forests. Also, a "Semi-humid" forest probably was once at Mufindi where apparent remnants are seen as clusters of trees and shrubs on grasslands.

The Usambara Highland forests can also be seen as consisting of forest types found on Mt. Londiani, Mt. Kenya, and at Nairobi and Mufindi. Pitt-Schenkel (1938) has described the Magamba, West Usambara vegetation in detail.

Time and other factors concerning each active species are as follows:

Acalypha stuhlmannii pl. Probably occasional to frequent at forest edges but of wide distribution in the highland zone. Other more common species of Acalypha will be encountered and identification may be a problem if flowers are not present. About four to five days to collect 300 pounds.

Afrocrania volkensii sb. Reported as a co-dominant tree with Ficlhoa (Ericaceae) on the Mporoto Mountains and Mt. Rungwe. Recorded in several associations by Pitt-Schnekel and also listed by Lind and Morrison in the Ocotea-Podocarpus Forest, West Usambara. Probably occurs throughout the highland zone. About three to four days to collect 300 pounds of bark.

Aguaria salicifolia sb. Expect this tree to be common in secondary forests. About three to four days to collect 300 pounds of bark.

Begonia meyer-johannis pl. A climbing, fleshy herb which may occur in abundance in local situations. About three to four days to collect 300 pounds.

Gnidia kraussiana pl. Probably most abundant at Mufindi but populations of up to 50 pounds may frequently be encountered. Perhaps it may be practical to purchase samples.

Millettia oblata rt, sb. Possibly a frequent tree in ravine forests. About four to five days to collect 300 pounds of roots, also including 300 pounds of bark.

Periploca linearilifolia st-lf. A woody climber, common at edges of dry forest types as at Nairobi and Maybe in the West Usambaras. About three to four days to collect 300 pounds.

Warburgia salutaris sb. Common in Nairobi forests and similar forests on Mt. Kilimanjaro extending south along the Pare Mountains to the extreme northwest Usambaras where it usually occurs in Cedar forests. One other related endemic species is also common in the lowland-intermediate zone forest and thickets. About four days to collect 300 pounds of bark.

SOUTHERN HIGHLANDS

Figure 4 roughly illustrates the vegetation of the loop area near Mufindi, Tanzania. Extensive Eucalyptus and Pine plantations are not shown here.

As I recall, the distances in miles are short between the main highway (Iringa-Mbeya Road) and the "Loop Road", but the roads are all very slow going. It also seemed that the roads improve as one travels further away from the Tea Estates - either on the grassland or along the escarpment forests.

I assume that the botanist will reside near Lake Ngwazi where the drying will also take place. It takes about 45 minutes to drive a heavily loaded vehicle from Lake Ngwazi to John's Corner or to favorable sites within the forest.

WOODED GRASSLANDS

Much of the area near Lake Ngwazi might return to forest if left undisturbed. Apodytes dimidiata, Rapanea rhodendroides and Croton macrostachyus are commonly scattered in this area. However, continued burning seems to favor expansion of the more recent invaders: Psorospermum ~~benguelensis~~, Gardenia jovistonantis and Excoecaria bussei. The following actives are those most likely to be found in abundance:

Psorospermum febrifugum rt. Locally abundant on hilltop grassland just above Lake Mgwazi. About three to four days to collect 500 pounds of roots.

Parinari curatellifolia fr. Probably widely scattered throughout this zone. Fruits could probably be purchased if available.

Aguaria salicifolia sb. Possibly common with Rapanea on slopes just above Lake Ngwazi or in thicket scrub on higher hills or at edges of forest near escarpment. About three to four days to collect 300 pounds of bark.

Gnidia kraussiana pl. Small populations were frequently encountered but some burning had occurred over extensive areas and these areas had an abundance of this species. About three days to collect 500 pounds.

FORESTS

Of ten highland forest types recognized by Lind and Morrison, two are evident at Mufindi from a review of lists of collections made separately by Perdue and Paget-Wilkes. Floristically, the forests appear to be similar to those in Malawi and on mountains along the eastern border of Zaire.

CASSIPOUREA FOREST

The Cassipourea forest might be fairly extensive along the escarpment as it is elsewhere in Tanzania. The attached Table ("1.6") from Lind and Morrison list many of the trees associated with this forest. Perdue has collected most species listed. Those species underlined are often characteristic trees that were not collected by either Perdue or Paget-Wilkes.

The Cassipourea forest appears favorable for collecting the following:

> Bridelia brideliifolia rt. About six to seven days to collect 500 pounds of roots.
>
> Millettia oblata rt, sb. About four to five days to collect 300 pounds of roots and bark.
>
> Begonia meyer-johannis pl. About three to four days to collect 300 pounds.

ARUNDINARI FOREST

I observed this frequently along the escarpment - about one hour's drive from Ngwazi. Lind and Morrison mention that Afrocrania, among several other species, is often near this zone.

MISSING FORESTS?

Some usually common forest trees that would be expected here were not recorded by Perdue or Paget-Wilkes. These are species of Entandrophragma, Ficalhoa, Calodendrum, Strombosia, Ocotea, Aningeria, and Parinari excelsa. The recorded Podocarpus milanjianus was observed to be rare in occurrence.

A mixed Chrysophyllum Forest may be or may have been present. The Malawi Cryptocarya and East African Casearia were recorded but missing is Aningeria or Entandrophragma. Some of its usual understory trees and shrubs are included in Perdue's list (see also review of Tabernaemontana holstii).

Grasslands near Lake Ngwazi have scattered trees of Croton, Apodytes, Rapanea, Cassine and many others. Thickets of shrubs (Allophylus, Canthium, Toddalia, Maytenus) often surround the trees. Judging from the floristic composition, one might expect a cedar (Juniperus) forest to have occurred here. A few

scattered trees of Schrebera alata also suggests a forest once similar to that near Nairobi.

Secondary sclerophyllous scrub forests or thickets occur locally on heavily wooded slopes and on higher hills (Irundi and Sao). These thickets probably include species of Myrsine, Buddleia, Toddalia, Gnidia, Olea, Rhamnus, Rhus, Cluytia, Maytenus, Berberis, Euclea, Trichocladus, Carissa, and Cassine which would be similar to vegetation on Mt. Londiani, Kenya.

Sclerophyllous forest remnants also occur along watercourses and in ravines. Syzygium was commonly seen along one small watercourse. Garcinia, Kiggelaria, Ilex, Canthium, Olea, Trichocladus, Psychotria are examples of other genera that probably occur here.

Many of our Tanzanian active collections were obtained within the Loop Area whose vegetation has been highly modified by man. Because of this, it is rather difficult to make judgements on which active species we might find in abundance. O. K. Kerfoot's account of the vegetation of the Mbeya Range appears to correspond to that in the Loop Area and may give us some indication as to abundance of active species. Interestingly, Kerfoot's checklist includes Maytenus Ovatus var. ovatus.

OTHER ACTIVE SPECIES OR PLANTS OF INTEREST NOT PREVIOUSLY MENTIONED

Two active species, Hypoestes verticillaris and Phoenix reclinata, are widely distributed. These could probably be obtained where it's most convenient.

Maytenus buchananii: Two ecotypes might be encountered in the coastal districts, but it is felt that neither will be common. One record was reported from the Pangani District. Based on vegetation reviewed, the other possibility lies in the northwest Usambaras. Pitt Schnekel frequently cites other species of Maytenus in the understory forests of West Usambara.

Maytenus buchananii would appear to be more frequently encountered in the Central Province of Tanzania, Rift Valley Province and parts of the Central Province in Kenya. All upland records in Uganda correlate well with the distribution of either the dry evergreen (sclerophyllous) montane thickets or its climax forest, Podocarpus-Juniperus. Phillips (1930) commonly mentions five to six species of Maytenus in his evergreen forests. Greenway's (1969) description of a hilltop forest seems to belong here as well as Kerfoot's (1964) list of understory thicket species in montane woodland.

Brucea ssp: Possibly two species occur in the Usambaras which B. antidysenterica is most likely the one to be found.

Tacazzea galactogoga: In Tanzania recorded from Mt. Kilimanjaro and the Mbeya Range. Perdue collected the more common T. apiculata at Mudindi. This species should occur in West Usambara.

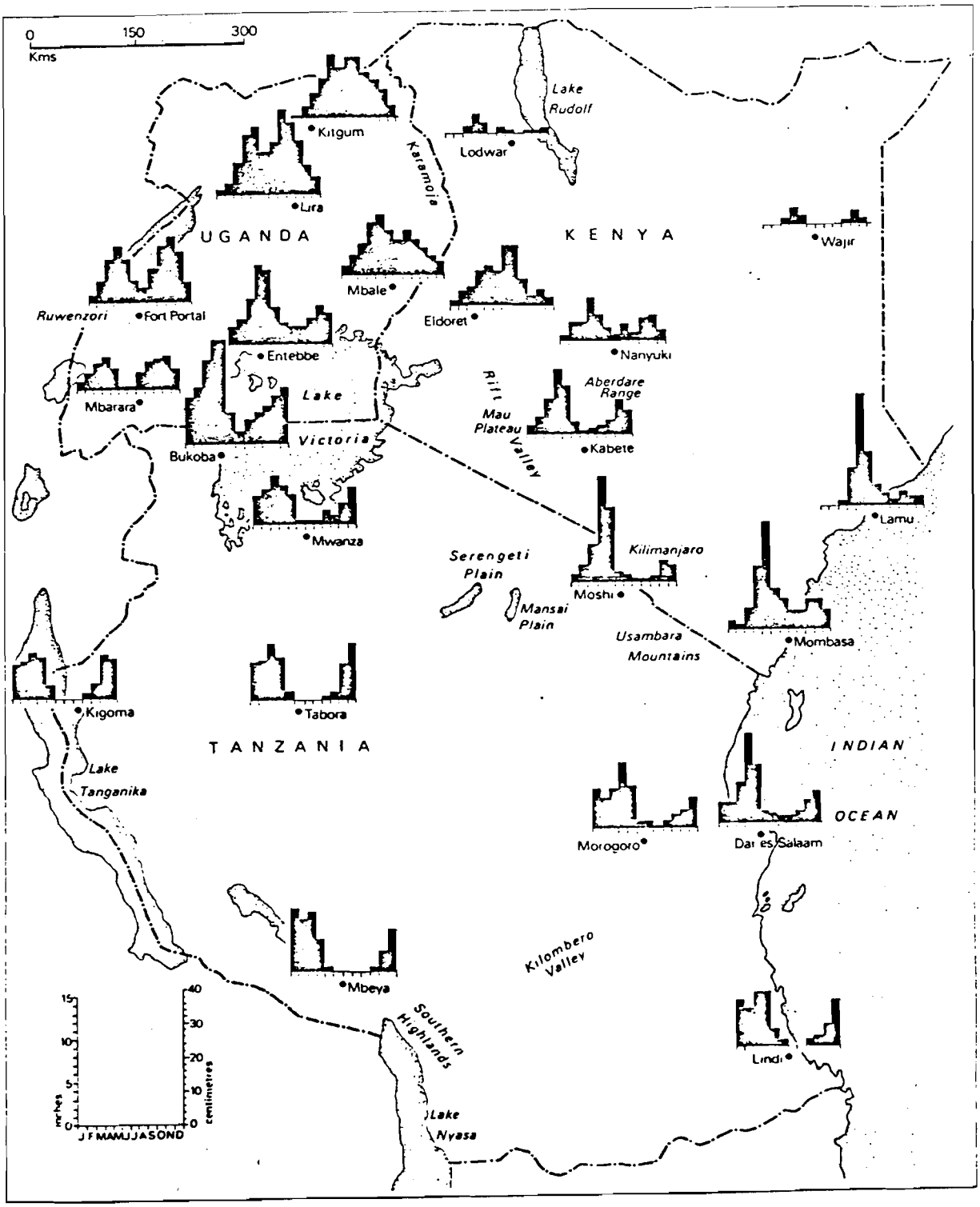


Fig. 6.1 Seasonal rainfall regimes in East Africa. (Kenworthy, 1966)

FIGURE 2. VEGETATION TYPES MAP OF TANZANIA

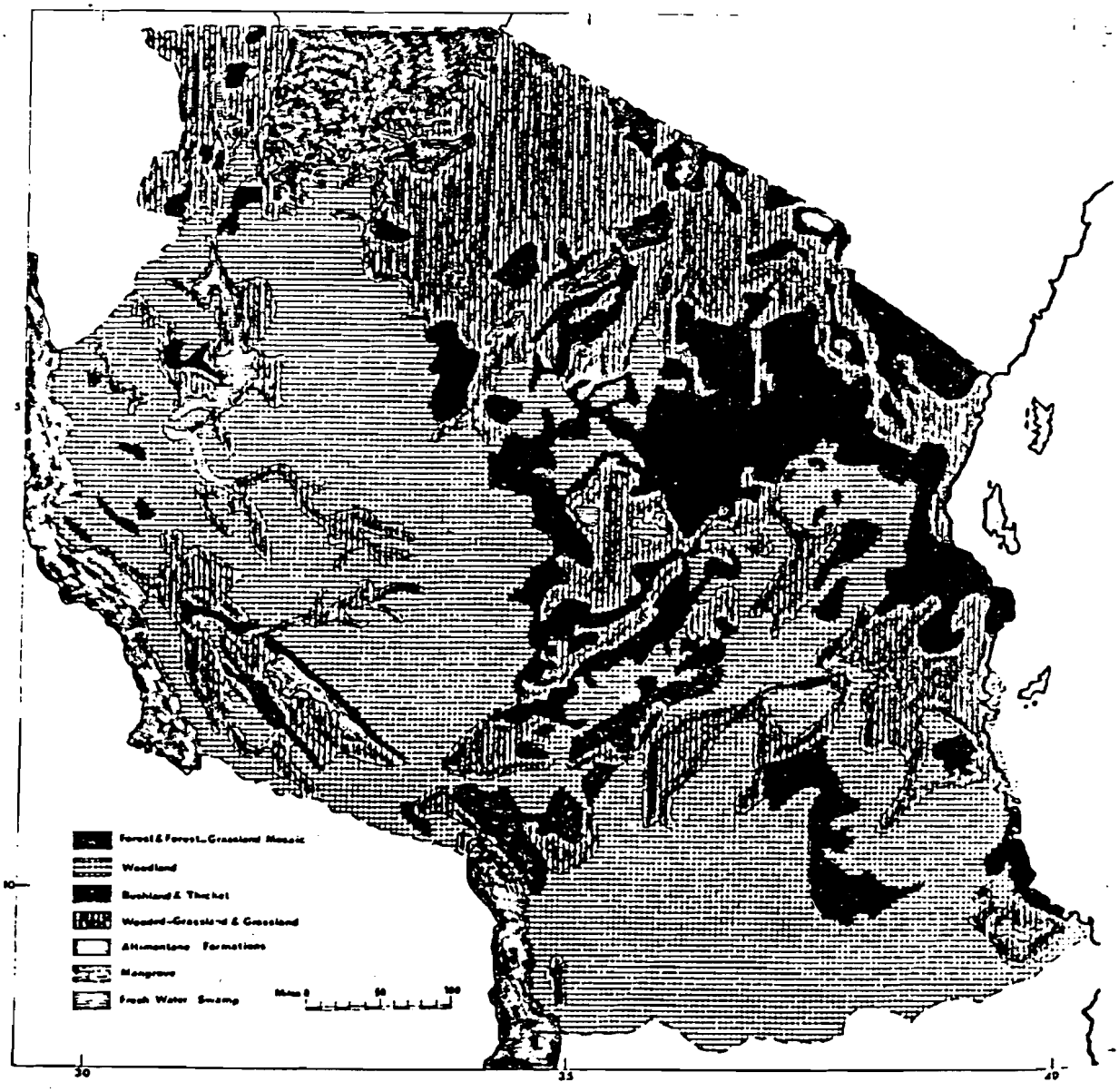
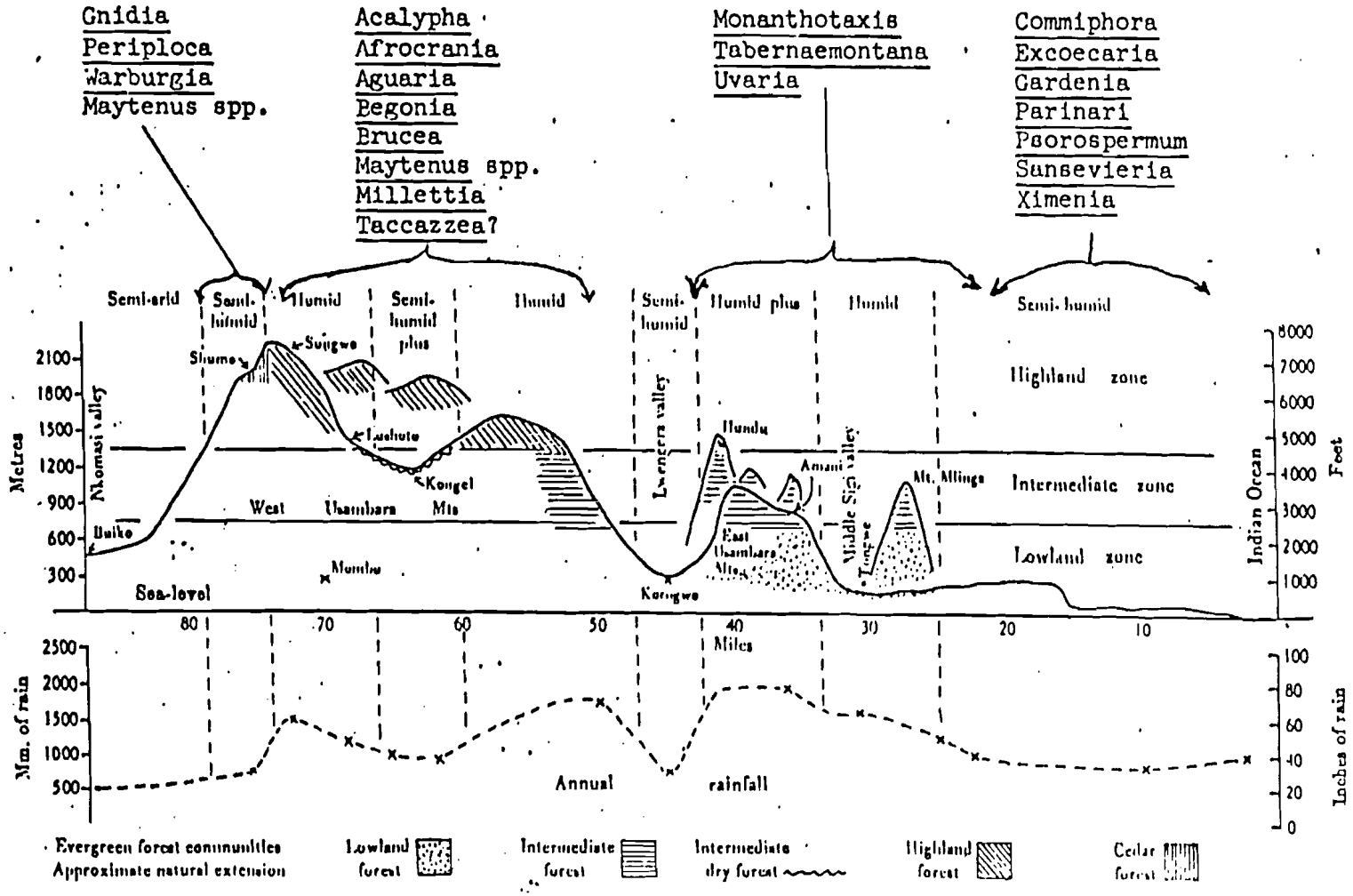


FIGURE 3. DISTRIBUTION OF ACTIVES IN THE USAMBARA MOUNTAINS AND ADJACENT LOWLANDS



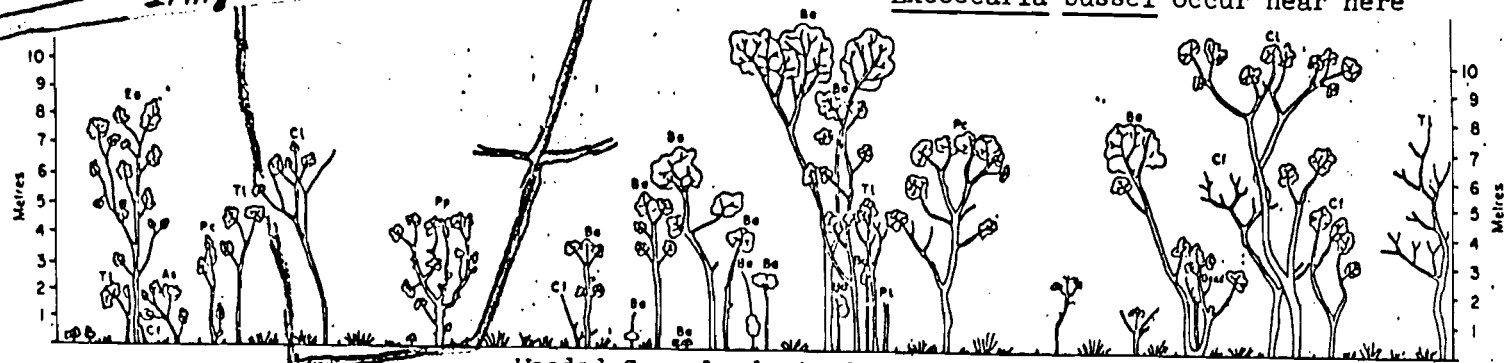
1. Diagrammatic section of the Usambara Mountains, south-east—north-west.

Fig. 4. N W + E S LOOP AREA NEAR MUFINDI, TANZANIA

To Johns Corner

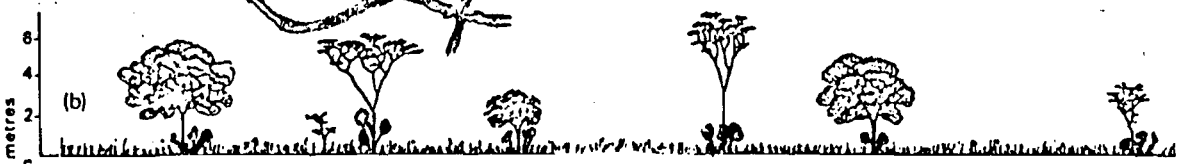
Miombo (Brachystegia) Woodland. Gnidia kraussiana was abundant here where extensive areas were recently burned. Gardenia jovis-tonantis, Ximenia caffra, and Excoecaria bussei occur near here

Iringa - Mbeya Road



Wooded Grassland mixed with Forest Remnants: Parinari curatellifolia, Psorospermum febrifugum (locally abundant near here), Aguaria salicifolia probably on slopes above lake

Lake Ngwazi



Forest remnants on grassland.

3.5 miles →

Leap Road to Tea Factory →

Escarpment →
Mostly a Cassipourea Forest?

Acalypha & Aguaria near edges?, Millettia & Afrocrania locally on slopes or in ravines within forest?

Table 1.6 Composition of the Pillar wood, Cassipourea malosana forests in Tanzania (2500 m altitude). (After Gilchrist, 1952 and Rea, 1935)

TREES IN THE STRATUM (9—21 m)	
Cassipourea malosana accompanied by—	Rhizophoraceae
Albizia gummifera	Leguminosae subfam. Mimosoideae
A. schimperiana	Leguminosae subfam. II Mimosoideae
Apodytes dimidiata	Icacinaceae
Calodendrum capense	Rutaceae
Casearia battiscombei	Flacourtiaceae
Dombeya spp.	Sterculiaceae
Ekebergia capensis	Meliaceae
Fagara amaniensis	Rutaceae
Hagenia abyssinica	Rosaceae
Ilex mitis	Aquifoliaceae
Macaranga kilimandscharica	Euphorbiaceae
M. conglomerata	"
Myrica salicifolia	Myricaceae
Nuxia spp.	Loganiaceae
Ocotea usambarensis	Lauraceae
Parinari excelsa	Rosaceae
Podocarpus milanjianus	Podocarpaceae
Prunus africana	Rosaceae
Rapanea rhododendroides	Myrsinaceae
Strombosia scheffleri	Olacaceae
Syzygium guineense	Myrtaceae
TREES AND SHRUBS IN THE STRATUM (0—9 m)	
Bridelia brideliifolia	Euphorbiaceae
B. scleroneuroides	"
Mystroxylon aethiopicum	Celastraceae
Cassipourea gummiflua	Rhizophoraceae
Cordia africana	Boraginaceae
Flacourtia spp.	Flacourtiaceae
Gnidia glauca	Thymeliaceae
Psychotria spp.	Rubiaceae
Maytaenus spp.	Celastraceae
Olea africana	Oleaceae
Pittosporum viridiflorum	Pittosporaceae
Teclea spp.	Rutaceae
Syzygium guineense	Myrtaceae
Tetrorchidium didymostemon	Euphorbiaceae
TREES USUALLY IN THE STRATUM (0—9 m)	
Acalypha sp.	Euphorbiaceae
Allophylus macrobotrys	Sapindaceae
Glyphea brevis	Tiliaceae
Mimulopsis sp.	Acanthaceae
Myrianthus holstii	Moraceae
Teclea nobilis	Rutaceae
Xymalos monospora	Monimiaceae

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