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ZANZIBAR ENVIRONMENTAL STUDY
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A. RECONNAISSANCE SURVEY OF ZANZIBAR
FORESTS AND COASTAL THICKET

by

H. J. Beentje

for

The Commission for Lands and Environment,
Zanzibar.

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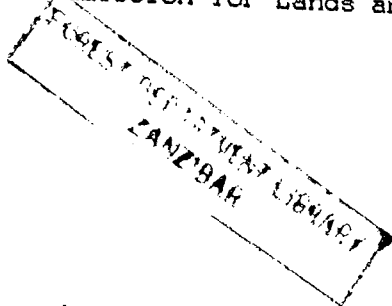
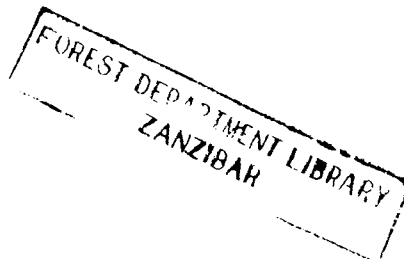
A RECONNAISSANCE SURVEY OF ZANZIBAR FORESTS AND COASTAL THICKET

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H.J.Beentje

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The Commission for Lands and Environment, Zanzibar



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The Zanzibar Environmental Study Series comprises reports on environmental topics by staff of the Commission for Lands and Environment or by other researchers on behalf of the Commission. The views expressed in the reports are those of the authors and do not necessarily represent the views of the Commission.

Titles in the series so far are:

1. Summary of marine resources in Zanzibar.
2. Pollution by industry and other users of chemicals.
3. Report of a survey done on the perspective of rural women on environmental change in Paje and Bwejuu.
4. A study of environmental change in the coral rag ecosystem.
5. The distribution and status of mangrove forests in Zanzibar and Pemba Islands: a survey.
6. A preliminary study of pollution levels in and around Zanzibar Town.
7. A reconnaissance survey of Zanzibar forests and coastal thicket.
8. Botanical assessment of Ngezi Forest, Pemba.
9. Ecological baseline surveys of coral reefs and inter-tidal zones around Mnemba Island and Zanzibar Town.

A RECONNAISSANCE SURVEY OF ZANZIBAR FORESTS AND COASTAL THicket

H.J. BEENTJE

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INTRODUCTION

In December 1989 and January 1990 I visited both Unguja and Pemba on behalf of the Department of the Environment of the Commission of Lands and Environment. The following sites were visited:

Dec.3	Snake Island, Grave Island, Prison Island
Dec.5	Jozani E
Dec.6	Muyuni B
Dec.7	Muyuni A
Dec.8	Muyuni coastal sites
Dec.9	Jozani W
Dec.11	Jozani N
Dec.12	Bawi Island
Dec.13	Pongwe
Dec.14	Uzi Island
Dec.15	Unguja Ukuu/Pete
Dec.26	Verani
Dec.28	Verani
Dec.29	Ras Kiuyu
Jan.3	Msitu Mkuu
Jan.4	Misali Island
Jan.10	Jozani

In these sites I made a survey of the woody vegetation in natural woody vegetation types such as forest, coral rag thicket and evergreen bushland.

RECOMMENDATIONS

1. Verani tourist development: the establishment of a hotel for sport fishing is not compatible with the function of a Forest Reserve. It is recommended that the hotel is sited elsewhere. If this is not possible, strict guidelines should be adhered to; the site for the hotel should not be as large as 900 x 300 meter; and the fishing boat harbour for the hotel should under no circumstances be sited on the southeast of the Verani/Tondooni peninsula, because of the fragile and unique vegetation there. The authority of the hotel site should remain under the Forest Department, so the FD can keep control over any changes on the site. The permanent accommodation for researchers, as recommended by Bensted-Smith, in the form of two bandas, would greatly help the research on Ngezi by Tanzanian and overseas researchers.

2. At Misali Island and the islands off Zanzibar town the establishment of nature trails should go hand in hand with tourism development. This might ensure the conservation of indigenous vegetation, and will provide additional interest to the visitor.

3. Research should be undertaken in sites not yet visited by me, such as Ole Makaani (Pemba) and possible forest remnants in west and south Pemba; at Masingini and Kichwele on Unguja; and more research should be done at sites such as Pongwe (Unguja), Uzi island, Muyuni (inland), Ras Kiuyu (north), Misali island (south).

4. Research should be done on the provision of alternative sources of firewood and poles, especially on coral rag soils of Unguja Island. The establishment of plantations of exotics by the Forest Department is already being undertaken, but the establishment of small woodlots of indigenous species close to threatened areas of natural vegetation might alleviate the pressure on such areas. Species such as Mjoma and Mkururu (see 3.3) might be excellent candidates for such woodlots, but this requires silvicultural research.

5. The establishment of Nature Reserves or National Parks on both Unguja and Pemba Islands is recommended. Natural forests and coral rag thicket are part of the cultural heritage of Zanzibar; in the recent past (less than 150 years ago) such habitats were still very common. The remnants which are now being destroyed are still full of interesting species, both with regard to regards plants (see 11) and animals. Many aspects of this species richness have not been studied (e.g. insects, small herbaceous plants) and I believe many exciting new finds are to be made. The

two most important sites are Jozani and Ngezi, both under the Forest Department; both have whole ranges of natural habitats, and would be prime sites as National Parks. They both have recreational and educational value for Zanzibaris and tourists; the tourists would be a source of money, as well. The conservation of both areas would safeguard a large amount of indigenous species, some of them unique; these genetic resources should be saved from extinction for the benefit of present and all future generations.

Jozani could be gazetted with the inclusion of the high forest, the evergreen bushland to the east, the forest to the north, and part of the mangrove to the north. A buffer zone to the west (now planted with exotics) could have an intermediate designation.

Other areas which are worth conserving are the coastal forest west of Muyuni; the south part of Uzi Island; Ras Kiuyu on Pemba. All these sites are presently in danger through overutilization by firewood and pole collecting and shifting agriculture.

6. I recommend the establishment of permanent transects in sites of disturbance, to monitor changes in botanical/biological diversity. The forest/thicket at Muyuni, Uzi Island, Unguja Ukuu and Ras Kiuyu as well as Msitu Mkuu areas are candidates for such transects.

1. SITE NOTES

KIBANDIKO ISLAND (Snake Island, Bat island)

An island off Zanzibar town, some 200 x 100m. It rises steeply from the water, consists of pure coral with undercut sides, and is covered with dense, tangled vegetation. There is a large heronry (black or western reef heron, green-backed heron, night heron, cattle egret) with some Indian house crows. There are no signs of human disturbance, although there were some signs that people occasionally visit the island. The vegetation is probably its own protection, being very dense and difficult to penetrate. Soil is very shallow with many coral outcrops.

Dominant species are all shrubs: *Grewia glandulosa*, *Commiphora eminii* ssp. *zimmermannii*, *Flueggia virosa*.

Emergent trees are *Sclerocarya birrea* and *Lecaniodiscus fraxinifolius*

Common shrubs are *Acridocarpus zanzibaricus*, *Grandidiera boivinii*

Common lianas are *Cissus rotundifolia*, *Dalechampia scandens*, *Dioscorea sansibarensis*, *Rhoicissus revoilii*, *Ficus tremula*, *Salacia* cf. *madagascariensis*, *Tinospora oblongifolia*, *Secamone* sp., *Landolphia* cf. *kirkii*

The only common herb was *Zamioculcas zamiifolia*.

CHAPWANI or GRAVE ISLAND

An island off Zanzibar town, 750 x 100m. There are no buildings on the island as yet, but the building of tourist facilities is envisaged on the western side, and clearing was taking place on both the western side and in the part north of the graveyard. I saw many large bats roosting in low trees just northeast of the graveyard.

Casuarina; there are quite a number of exotics - *Lantana camara*, *Euphorbia tirucalli*, citrus trees and papaya; I also found the shrubs *Flueggia virosa*, *Euclea racemosa* and *Euphorbia nyikae*; the herbs *Zamioculcas zamiifolia*, *Gonatopus boivinii*, *Sansevieria kirkii*, *Acalypha* sp., and the lianas *Landolphia* cf. *kirkii*, *Ficus tremula*.

The eastern side was almost undisturbed. This is a rather narrow tongue of land with many species common to beach edges and coastal bushland on coral: the trees and shrubs *Grewia glandulosa* (common), *Grandidiera boivinii* (common), *Casuarina equisetifolia*, *Euphorbia nyikae*, *Euclea racemosa*, *Flacourtia indica*, *Guettarda speciosa*, *Haplocoelum trigonocarpum*, *Lasiiodiscus pervillei*, *Pandanus kirkii*, *Pemphis acidula*, *Pycnocomma littoralis*, *Sideroxylon inerme*, *Sophora tomentosa*, *Suregada zanzibarensis*, *Xylocarpus moluccensis* the climbers *Capparis cartilaginea*, *Landolphia kirkii*, *Rhoicissus revoilii*, *Sarcostemma viminalis*, the herbs *Zamioculcas zamiifolia*, *Gonatopus boivinii*.

CHANGUU or PRISON ISLAND

An island off Zanzibar town, some 700 x 250m, with several buildings on it, including a restaurant. Much visited by tourists. There are paths and coral quarry sites which have been adapted as swimming sites.

Near the restaurant there are some introduced trees, such as frangipani, an Australian *Acacia*, papaya, a lemon tree, *Terminalia catappa*, and the small Madagascar periwinkle shrub. Some large *Encephalartos hildebrandtii* near the restaurant entrance are used by the Aldabra turtles as a shade site; *Cordia subcordata* and *Sterculia rhynchocharpa* are conspicuous on the lawn in front of the restaurant. In the courtyard of the prison there are some huge *Tamarindus indica* as well as frangipani and *Lannea schweinfurthii*, and on the walls of the prison several figs have taken hold, such as *Ficus lutea*.

On the beach crest there are trees of *Casuarina equisetifolia*; more inland *Adansonia digitata* and *Cocos nucifera* are conspicuous. Common trees here are *Sideroxylon inerme*, *Lannea schweinfurthii*, *Sclerocarya birrea*, with an understorey of *Euclea racemosa*, *Psiadia arabica* and *Lantana camara* (exotic).

In the area near the pools the purple-leaved herb *Rhoeo spathacea* (an exotic) is common. I also found the herbs *Phymatodes scolopendria* (fern), *Zamioculcas zamiifolia*, the shrubs *Dalbergia vacciniifolia*, *Euclea racemosa*, *Flueggia virosa*, *Ochna thomasi*, *Pemphis acidula*, *Polyspharia multiflora*, *Sophora tomentosa*, the climbers *Euphorbia tirucalli*, *Ludia mauritiana*, *Tinospora oblongifolia* and the exotic succulent *Yucca*.

Near the sea on the western side there is some good-looking forest with much *Sideroxylon inerme*, *Suregada zanzibarensis* and *Euphorbia nyikae*.

BAWI ISLAND

An island off Zanzibar town, 1150 by 400-500m. Steep-sloped and overhanging coral on the northern and western sides, sandy on the southern and eastern sides.

The coral has a dense, almost impenetrable vegetation of *Commiphora zimmermannii*, *Euclea racemosa*, *Euphorbia nyikae*, *Euphorbia tirucalli*, *Ficus ?lutea*, *Flueggia virosa*, *Guettarda speciosa*, *Pandanus kirkii*, *Pemphis acidula*, *Rhoicissus revouillii*, *Sideroxylon inerme*, *Stylocheiton salaamicus*.

The southern end used to be occupied by a military encampment, of which the buildings are still standing. The vegetation here is ruderal, with some large *casuarina*, *Terminalia catappa*, *Psiadia arabica*, papaya, *Flacourtia indica*, *Sophora tomentosa*, *Adansonia digitata*, *Azima tetracantha*, *Cynanchum sp.* the eastern side is very low and bushy, the general aspect being of a scrub some 1.5m high with *Psiadia*, *Bourreria petiolaris*, *Suregada zanzibariensis*, *Cissus quadrangularis*, *Colubrina asiatica*, *Euclea racemosa*, *Lantana camara*, *Vanilla roscheri*, *Yucca sp.*, *Synaptolepis kirkii*, *Polysphaeria sp.*, *Psychotria punctata*, *Rhus spp.*, *Maytenus mossambicensis*. There are some "sinkholes" where seawater can penetrate, where *Bruguiera* occurs.

PONGWE

Location: east coast of Unguja. The vegetation is coastal evergreen bushland on thin soil over coral, with outcrops of coral. The size of this vegetation type could not be established, due to its patchy nature; the map indicates some 1300 hectare (field data 1978).

Animals said to occur in this area: possibly Chui (leopard) but the informants did not agree on this; Paa (antelope), 1 species; Nguruwe (pig); Sykes monkey, observed by me, several troops.

The preferred wood for firewood, charcoal and poles is *Diospyros consolatae*. There are signs of cutting for poles and firewood almost everywhere, but the most undisturbed patches have a closed canopy of some 6m high with very little undergrowth, and a few emergent trees.

Where the vegetation is disturbed by over-cutting, *Dichrostachys cinerea* and *Rhus sp.* occur.

Common trees - *Diospyros consolatae*, *Macphersonia gracilis*, *Myroxylon aethiopicum*, *Sideroxylon inerme*, *Terminalia boivinii*

Other trees - *Apodytes dimidiata* (occ.), *Encephalartos hildebrandtii* (occ.), *Lannea schweinfurthii* (occ.), *Maytenus mossambicensis* (freq.), *Mimusops obtusifolia* (occ.), *Ozoroa obovata* (occ.), *Strychnos madagascariensis*, *Ziziphus mucronata* (occ.)

Shrubs - *Bourreria petiolaris*, *Clausena anisata* (freq.), *Cordia subcordata*, *Dalbergia vacciniifolia*, *Deinbollia borbonica*, *Eugenia sp. nov.* (comm.), *Flueggia virosa*, *Hoslundia opposita*, *Mallotus oppositifolius* (comm.), *Polysphaeria parvifolia* (freq.), *Psychotria riparia*, *Senna petersiana*, *Tricalysia ovalifolia*

Climbers - *Allophylus pervillei*, *Ancylobotrys petersiana*, *Canavalia rosea*, *Harrisonia abyssinica*, *Rhoicissus revouillii*, *Synaptolepis kirkii*

Herbs - none seen.

More inland the vegetation is similar, but with a higher canopy; there is much cutting for firewood by a nearby National Youth Service Camp, I saw no *Mallotus*, *Bourreria*, *Ozoroa* or *Clausena*; there was more *Encephalartos*, *Terminalia*; and additional species seen were *Suregada zanzibariensis*, *Rapanea melanophloeos*, *Cussonia zimmermannii*, *Adansonia digitata*.

MAKUNDUCHI

On the track to Bwejuu there are vast areas of secondary scrub with mainly ruderal species on thin soil over coral: *Psiadia arabica*, *Dodonaea viscosa*, *Euclea racemosa*, *Mundulea sericea*. Near the sea there is some *Pandanus kirkii* and *Guettarda speciosa*, *Ozoroa obovata*, *Ziziphus mauritiana*.

On 6.12.1989 I saw a fisherman who had caught a large green turtle (*Chelonia mydas*).

JOZANI

Location 25 km southeast of Zanzibar town, in a narrow neck of land between Chwaka bay (north) and Uzi Bay (south). Area of high forest in total some 300 hectare, of swamp forest some 200 hectare, of dense evergreen thicket some 500 hectare.

eastern side

The area was reconnoitered from the Charaawe road, which is also the boundary between Government land (to the west of the road) and wanainchi. Before the revolution the area between the road and the forest margin was private land.

The soil is "coral rag": thin soil over coral, with coral outcrops. Vegetation is evergreen bushland grading into forest, with generally a canopy of some 4-5m; the bushland is fairly dense,

in places dense with almost no disturbance, but there are several tracks with many signs of pole-cutting and firewood-cutting, there are some bare patches, and even some large trees cut down recently.

Access is no problem; from the Charaawe road there are forestry tracks, and from these tracks small paths have been cut by poachers to get poles.

In the disturbed areas the common shrub species are *Dichrostachys cinerea*, *Euclea racemosa*, *Myroxylon aethiopicum*, *Psiadia arabica*, *Rhus spp.*, *Trema orientalis*.

In the denser, less disturbed areas common woody species are: *Bridelia micrantha*, *Encephalartos hildebrandtii*, *Euclea racemosa*, *Ficus sur*, *Macphersonia gracilis*, *Maytenus mossambicensis*, *Myroxylon aethiopicum*, *Polysphaeria parvifolia*, *Rapanea melanophloeos*, *Sideroxylon inerme*, *Terminalia boivinii*.

Other species found were: Trees - *Azelia quanzensis*, *Deinbollia borbonica*, *Mimusops obtusifolia*, *Olea woodiana* Shrubs - *Allophylus sp. near pervillei*, *Psychotria leucopoda* Climbers - *Synaptolepis kirkii*

Nearer to the high forest the bushland gets a higher canopy, at some 8m, and near the forest the ground slopes downwards and becomes swampier with large ferns, *Eugenia sp. nov.* and planted *Calophyllum*. However, close to the forest edge I found some burnt areas with bracken, *Pteridium aquilinum*, and some sites which had been recently cut over for poles.

The favourite wood for firewood and poles in this area is the olive, *Olea woodiana*.

Animals reported to occur here are Nguruwe (bush pig)

Jozani - western side

The forest edge on this side is sharply defined in most places. Not only in that the ground drops quite sharply from level ground on the west side to the swamp forest, but also most of the ground on the west side is either almost bare, or recently planted, or low and bushy.

In the south the boundary between Government land and wanainchi-land is close to the forest edge. There is a small zone of evergreen bushland on coral rag, some 4-6m high, on the edges with much *Rhus*, *Psiadia* (both secondary species) and inside with *Polysphaeria parvifolia*, *Sideroxylon inerme*, *Rapanea melanophloeos*, *Maytenus mossambicensis*. Where the bushland is somewhat higher the following species are found, in addition to the ones already mentioned - *Terminalia boivinii*, *Apodytes dimidiata*, *Macphersonia gracilis*, *Rhoicissus revoilii*, *Rhoicissus tridentata*, *Dalbergia vacciniifolia*, *Ozoroa sp.*, *Eugenia sp. nov.*, *Mimusops fruticosa*, *Myroxylon aethiopicum*.

More to the north there are large areas which have been burnt in the recent past, with *Annona senegalensis* and some planted Eucalypts, and fields of bracken (*Pteridium aquilinum*). Here I saw a Kirodo, the giant elephant shrew. These clearings continue when one goes north along the forest edge, and are called Kwampopo (recently planted by Forest Dept. with *Casuarina* and an Australian *Acacia*) and Mapopwe (north of Kwampopo; planted with Australian *Acacia*). There is a thin belt of quite high forest here, running from southwest to northeast, where it almost joins with Jozani Forest proper; I did not investigate this belt. Near the point where this belt comes closest to the forest, there are old boundary walls of coral inside the forest (running east-west).

Jozani northwest

In this part of the forest, which is rather thickety and difficult to penetrate due to many lianas, I saw an East Coast Akalat.

The forest here is some 6-8m high, canopy cover is 60%. The commonest species is *Macphersonia gracilis* (diameter up to 9cm). Also present: *Clausena anisata*, *Cussonia zimmermannii*, *Diospyros consolatae*, *Drypetes natalensis*, *Eugenia sp. nov.*, *Grewia sp.*, *Mallotus oppositifolius*, *Rhoicissus tridentata*, *Sorindeia madagascariensis*, *Turraea floribunda*.

In this area I saw some signs of firewood collecting and pole-cutting; I also found a shotgun cartridge, indicating poaching.

Jozani north

The northern edge of Jozani seems to be the site of old settlements: old coral walls on the NW edge, reportedly the site of an old village on the N edge. The canopy (60% cover) is at 8-10m, with emergents to 20 m.

Here we found the skin of a 3m long snake called "chatu", which reportedly is burnt, and the smoke inhaled as a remedy for headaches.

Common trees - *Albizia adiantifolia*, *Albizia glaberrima*, *Cussonia zimmermannii*, *Drypetes natalensis*, *Grewia* sp. (*plagiophylla*?), *Lannea schwinfurthii*, *Macphersonia gracilis*, *Rapanea melanophloeos*; a few large *Syzygium cuminii*

Shrubs - *Deinbollia borbonica*, *Encephalartos hildebrandtii* (young only), *Eugenia* sp. nov., *Ficus ingens*, *Hoslundia opposita*, *Mallotus oppositifolius*, *Rinorea ferruginea*, *Senna petersiana*, *Turraea floribunda*, *Mgude* (Rubiaceae.)

Climbers - *Allophylus pervillei*, *Culcasia orientalis*, *Paullinia pinnata*, *Rhoicissus revoilii*, *Synaptolepis kirkii*, *Tiliacora funifera*, *Uvaria lucida*

Just north of Jozani Forest proper there is an area of grassland with scattered trees, called Wangwani. The trees are *Annona senegalensis* (common), *Vitex doniana*, *Bridelia micrantha*, *Maytenus mossambicensis*, *Lannea schweinfurthii*, *Strychnos spinosa*. This area is burned every year by antelope hunters, according to my informant (a forest guard) and the vegetation certainly looks like that - an assembly of pioneer species and fire-resistant woody species. The edges of this site have species such as *Pluchea*, *Lantana trifolia*, *Psiadia arabica*, *Ozoroa*, *Ficus sur*, *Bridelia micrantha*, *Grewia* sp., *Sterculia rhynchocarpa*, *Commelina* sp., *Clematis viridiflora*

North of this area there is some rather open thicket forest, presumably close to the Chwaka mangroves on the northern side, and connected to Mapopwe area (see Jozani west). The canopy is at some 8-10m, and *Diospyros consolatae*, *Diospyros natalensis*, *Drypetes natalensis*, *Encephalartos hildebrandtii* (old), *Euclea racemosa*, *Eugenia* sp. nov., *Macphersonia gracilis*, *Maytenus mossambicensis*, *Mystroxydon aethiopicum*, *Ozoroa obovata*, *Polysphaeria parvifolia*, *Rhoicissus revoilii*, *Strychnos angolensis*, *Synaptolepis kirkii*, *Terminalia boivinii* are all common species; there is little undergrowth, and many signs of pole-cutting.

North of Jozani Forest Reserve there are various open areas, which I believe to be fire-induced; supporting evidence is the occurrence of bracken. In one such patch I saw a red duiker, either *Cephalopus adersi* or *C. natalensis*.

More to the east there is a patch of forest with much *Diospyros consolatae*, almost no ground cover, some *Croton pseudopulchellus*; further northeast there is a patch of high forest with little undergrowth, the canopy rather patchy but generally at 15-20m, with emergent *Syzygium cuminii* to 25-30m; trees encountered were *Drypetes natalensis* (very common), *Pandanus rabaiensis*, *Casaeria gladiiformis*, *Diospyros consolatae*, *Lannea schweinfurthii*, the shrub *Ochna thomasiana*

The area between Jozani forest and the main road (Zanzibar town-Makinduchi) is cultivated: banana, coconut, mango, breadfruit.

Jozani Forest

I only visited the southeastern part, on my last field day, since there are several publications on Jozani Forest already. However, after this visit, I believe that a more thorough visit would be useful; my findings were different from those of Robbins.

The high forest of Jozani lies in a trough between higher land to the east and the west. The soil is swampy and in places rich in humus. Access is fairly easy through the network of boundary paths of the various compartments.

In the canopy in the southeastern part *Calophyllum inophyllum* is dominant, most trees being fairly young (30-40 years?) with some old individuals scattered through the forest; these, however, are still being harvested (Mtondoo is the favourite timber for boat building) and I saw seven (7) large trees of this species (> 1m across) that had been recently cut and sawn. *Calophyllum* reaches some 20-25m. Under this rather open canopy there are dense stands of *Pandanus rabaiensis* (to 12m) and *Elaeis guineensis* (to 15m). Trees occurring frequently are *Anthocleista grandiflora*, *Ficus lutea*, *F. natalensis*, *F. sur*, *F. sycomorus*, *Vitex doniana*; less common are *Albizia glaberrima*, *Macaranga capensis*, *Phoenix reclinata*, *Raphia farinifera*, *Rauvolfia mombasana*, with shrubs of *Eugenia* sp. nov. common and (at least in this area) *polysphaeria parvifolia* occasional. Climbers: *Uncaria africana*. Robbins reports *Syzygium cumini* as one of the dominant trees, but I only saw it once in the swamp forest; on the rising ground to the west it becomes more common, together with *Polysphaeria parvifolia* and *Macphersonia gracilis*.

I believe that most *Calophyllum* is planted. Greenway, who visited Jozani in the late 1920's, states that the main vegetation is *Elaeis-Pandanus* forest, and I cannot believe that he would miss a common species; therefore I think that the majority of *Calophyllum* was planted after his visit. It is quite likely that a few *Calophyllum* were present at the time, but certainly not as one of the common species.

UZI ISLAND

Location: south of Unguja Island, close to Unguja Ukuu; the island can be reached over a causeway through the mangrove (low tide only).

The southern part of the island has evergreen coastal bushland: extent some 650 hectare.

The northern edge of this bushland is secondary, and subject to clearing, burning and cultivation at intervals; this disturbed belt is, by my estimate, at least 500m thick, and furthermore subject to cutting for firewood, charcoal and poles. The favourite tree for this purpose is *Macphersonia gracilis*.

The evergreen coastal bushland has a canopy at 5-8m, with emergents to 15m.

Common trees - *Ficus sur*, *Lanea schweinfurthii*, *Macphersonia gracilis*, *Maytenus mossambicensis*, *Monodora grandidieri*, *Terminalia boivinii*

Other trees - *Allophylus pervillei* (occ.), *Bridelia micrantha* (rare), *Drypetes natalensis* (occ.), *Grewia holstii* (occ.), *Mallotus oppositifolius* (fre.), *Manilkara sansibarensis* (occ.), *Ozoroa obovata* (occ.), *Rauvolfia mombasiana* (occ.), *Sorindeia madagascariensis* (occ.), *Syzygium cumini* (occ.); *Diospyros consolatae* is said to occur here but I did not see it myself.

Shrubs - *Bequaertiodendron natalense* (occ.), *Eugenia* sp. nov. (fre.), *Mildbraedia carpinifolia* (com.), *Ochna thomasi* (occ.), *Polysphaeria parvifolia* (fre.), *Senna petersiana*, *Tricalysia ovalifolia* (fre.)

Lianas - *Capparis fascicularis*, *Monanthotaxis fornicata*, *Rhoicissus revoilii*, *R. tridentata*, *Synaptolepis kirkii*

Herbs - *Gonatopus boivinii*, *Haemanthus multiflorus* (occ.), *Stylocheiton salaamicus*

Survey A: a tree count of 50 trees over 10 cm diameter at breast height (larger trees) gave the following result:

Macphersonia gracilis 13, *Grewia holstii* 10, *Lanea schweinfurthii* 9, *Ficus sur* 6, *Maytenus mossambicensis* 2, *?Lecaniodiscus* 2, *Sorindeia madagascariensis* 1, *Drypetes natalensis* 1, *Terminalia boivinii* 1, *Mildbraedia carpinifolia* 1, *Senna petersiana* 1, *Manilkara sansibarensis* 1, unknown 2 different trees.

Near the beach the following species were found in addition to the ones already enumerated: *Erythroxylum emarginatum*, *Cussonia zimmermannii*, *Sideroxylon inerme*, *Euphorbia tirucalli*, *Ficus lutea*, *Mystroxydon aethiopicum*, *Sophora inhambanensis*, *Pandanus kirkii*.

Nianembe island, about 80 hectare, to the west, and Ng'ambwa island, about 110 hectare, to the south, should have similar vegetation but were not visited.

UNGUJA UKUU northeast, and PETE west

Formerly a good forest area, by the look of it, but now much cutting and burning for agriculture has changed the area to one of much secondary bush of less than 4m high and quite open and thickety. Many signs of cutting for firewood and poles; the favourite species for this are *Macphersonia gracilis*, and *Rapanea melanophloeos*, but the last species is now hard to find in this area. *Macphersonia* however is growing in both original forest and secondary bush. I did see *Albizia* trees of 80-100 cm DBH felled; my informant said they were used in dhow building.

Soils are thin, over coral, with much outcropping of coral.

Animals said to occur here: Nguruwe (pig), Paa (small antelope, 1 kind only), "black" monkey (seen by me), "red" monkey (colobus, heard by me).

Disturbed or secondary bush contains *Albizia adiantifolia*, *A. glaberrima*, *Euclea racemosa*, *Macphersonia gracilis*, *Mystroxydon aethiopicum*, *Rauvolfia mombasana*, *Rhus longipes*, *R. natalensis*.

On the margin of the forest there is much *Bridelia micrantha*, young *Macphersonia*, both kinds of *Albizia*, *Allophylus pervillei*, *Mgude* (Rubiaceae), *Mallotus oppositifolius*, *Mezoneuron angolense*

Forest: extent less than 50 hectare; canopy 8-10m high, with emergents to 16-20m, giving the impression that there used to be a canopy at 16-20m. Emergents are the two spp. of *Albizia*, *Syzygium cumini*, *Ficus exasperata*.

Common trees - *Albizia adiantifolia*, *A. glaberrima*, *Ficus sur*, *Monodora grandidieri*, *Syzygium cumini*

Other trees - *Drypetes natalensis* (occ.), *Encephalartos hildebrandtii*, *Grewia* sp. (fre.), *Mallotus oppositifolius*, *Mildbraedia carpinifolia*, *Mystroxydon aethiopicum* (occ.), *Phoenix reclinata* (occ.), *Rauvolfia mombasana* (occ.)

Shrubs - A *Deinbollia borbonica*, *Eugenia* sp. nov., *Flacourtia indica*, *Schizogygia coffaeoides*

Lianas - *Cissus integrifolia*, *Rhoicissus tridentata*, *Synaptolepis kirkii*, *Toddalia asiatica*.

MUYUNI

Location: southeast of Unguja Island. Extent of inland thicket/dry forest: some 2800 hectare.

Muyuni-B. - the area to the east of here is cultivated with cassava, rice, coconut, banana and breadfruit. Some 2.5 km to the east of the main road there is a ridge covered in bush and, east of the ridge, fallow land: bushland with secondary bush some 3-5m high, fallow for 4-5 years. east of this there is a grassy area with Mtopetope (*Annona senegalensis*) and Mfuu (*Vitex doniana*).

On the second ridge, east of this grassy area, the "natural forest" begins, consisting of rather disturbed, low (8-12m high canopy) evergreen forest on thin soil over coral, with many coral outcrops. Nearly all parts of the forest are used for the collecting of firewood and the cutting of poles, but since the area is very large the cutting seems to be on a more or less sustainable basis. There are coral rock walls in the forest indicating individual properties, and it is clear that people have different policies towards their bits of forest. Favourite wood for both kuni and fito is Mkonge (*Polysphaeria parvifolia*) and second favourite is Msiliza (*Euclea racemosa*) but almost every other kind of wood is used as well. The collecting is done almost exclusively from the Muyuni side; on the Jambiani side, I was told, the people have cut their bush/forest and cultivated it.

Access is no problem, there are numerous paths to the forest.

Muyuni people sell as much firewood as they do charcoal. The sale of these products is increasing, according to Muyuni informants.

The population of Muyuni has decreased in recent years (CCM official, pers. comm.) as people are drawn to Zanzibar town, although in the harvesting season they still come back for a while.

Animals reported to occur here are Nguruwe (bush pig), Chui (leopard), "black" monkey, and Paa (small antelope; middens seen). "Red" monkey (colobus) does not occur here, according to informants.

Trees - frequent to occasional: *Diospyros consolatae*, *Drypetes natalensis*, *Encephalartos hildebrandtii*, *Euclea racemosa*, *Euphorbia nyikae*, *Ficus sur*, *Ficus lutea*, *Macphersonia gracilis*, *Manilkara sansibarensis*, *Maytenus mossambicensis*, *Mystroxydon aethiopicum*, *Rapanea melanophloeos*, *Rawsonia lucida*, *Terminalia boivinii*,

rare: *Azelia quanzensis*, *Albizia adiantifolia*, *Olea woodiana*, *Trema guineensis*, *Trichilia emetica*

Shrubs - common: *Eugenia* sp. nov., *Polysphaeria parvifolia*, Occasional: *Ochna thomasiana*, *Rhus* spp., *Suregada zanzibariensis*

Lianas - *Allophylus pervillei*, *Rhoicissus revoilii*, *Uvaria lucida*

Herbs - *Phymatodes scolopendria*, *Haemanthus multiflora*

Epiphytes - *Microcoelia* sp.

Muyuni-A

Quite close to the forests there are walled plots which look as if they have been recently cleared and burnt. They had only just been planted (December). Muyuni informants report a cycle of 3-5 years on the same fields, with rotation between cassava and peas/beans/maize, but this is not confirmed by my observations: I saw fallow land with bracken and secondary bush, and what looked like fields newly cut from the forest.

Access is no problem; there are numerous paths.

Animals reported from the forest: Nguruwe (pig), "black" monkey, antelope "mchesi" or red cross (?). No Chui (leopard) or red colobus according to my informants.

The forest here looks quite like that of Muyuni-B (see above). This is said to be the original site of Muyuni village some 100-200 years ago. Many coral walls delimiting peoples forest plots, like at Muyuni-B. The plots seem to be long and narrow, mainly running east-west.

Common trees: *Diospyros consolatae*, *Drypetes natalensis*, *Macphersonia gracilis*, *Sorindeia madagascariensis*, *Terminalia boivinii*

Less frequent trees: *Bourreria petiolaris*, *Cola clavata*, *Euclea natalensis*, *Flacourtia indica*, *Maytenus mossambicensis*, *Mimusops fruticosa*, *Rapanea melanophloeos*
 Shrubs: *Psychotria lauracea*, *Psychotria leucopoda*, *Polysphaeria parvifolia*, *Eugenia sp.*

nov.

Lianas: *Rhoicissus revoilii*, *Allophylus pervillei*

Survey A: canopy 8-14m high, canopy cover 70-90%; understorey sparse, of *Ficus sur*, *Synaptolepis kirkii*, *Phymatodes scolopendria*, *Polysphaeria parvifolia*. Signs of firewood-collecting.

TREE species	diameter 2.5-10cm	10-20cm
<i>Diospyros consolatae</i>	11 trees	3 (to 20 cm across)
<i>Sorindeia madagascariensis</i>	5	
<i>Macphersonia gracilis</i>	5	
<i>Polysphaeria parvifolia</i>	5	
<i>Maytenus mossambicensis</i>	4	
<i>Rapanea melanophloeos</i>	1	1 (to 15 cm across)
<i>Euclea natalensis</i>	2	
<i>Flacourtia indica</i>	1	

Survey B: canopy 14-16m high, canopy cover 80%; understorey medium dense, with *Rhoicissus revoilii* a canopy liana.

<i>Diospyros consolatae</i>	1	5 (to 24 cm across)
<i>Macphersonia gracilis</i>	6	-
<i>Maytenus mossambicensis</i>	2	2 (to 15 cm across)
<i>Terminalia boivinii</i>	2	1 (to 16 cm across)
<i>Sorindeia madagascariensis</i>	2	-
<i>Mgude</i> (Rubiaceae)	2	-
<i>Rapanea melanophloeos</i>	-	1 (25 cm across)

Survey C: tree count of 50 trees over 10 cm across at breast height. Canopy 12-15m high, canopy cover 80%; understorey medium dense; some signs of cutting for poles.

Diospyros consolatae 32, *Terminalia boivinii* 7, *Maytenus mossambicensis* 4, *Mimusops fruticosa* 2, "Mutukutu" 2, *Drypetes natalensis* 1, *Rapanea melanophloeos* 1, *Euclea racemosa* 1.

Muyuni - coastal area

Near the sea at Ngomeni there is a thin inland strip of mangrove (*Avicennia*), separated from the beach by a zone of *Pemphis acidula*, *Guettarda speciosa*, *Pandanus kirkii*, *Sideroxylon inerme*, *Euphorbia nyikae*.

Vegetation is coastal evergreen bushland near the sea, more inland grading into forest. There are signs of cutting of firewood, charcoal and poles, but not for timber.

Animals reported to occur: Nguruwe (pig), "black" monkey, "red" monkey (red colobus, 1 seen), Chui (leopard), puffadder, crowned hornbill seen. The CCM official accompanying us almost shot the red colobus we saw, possibly because he thought we were collecting all those plants, and so why not collect the monkeys as well? I managed to stop him just in time... I do not think these monkeys are normally hunted, as they are not eaten; but in cases of crop-raiding they might be shot.

Evergreen coastal bushland: common trees - *Macphersonia gracilis*, *Terminalia boivinii*

Other trees - *Drypetes natalensis*, *Mystroxydon aethiopicum*

Shrubs - *Croton pseudopulchellus*, *Deinbollia borbonica*, *Dalbergia vacciniifolia*, *Encephalartos hildebrandtii* (young only), *Erythroxylon emarginatum*, *Eugenia sp. nov.*, *Flacourtia indica*, *Ludia maritima*, *Ochna thomasi*, *Teclea trichocarpa*, *Tricalysia ovalifolia*

Lianas - *Allophylus pervillei*, *Capparis erythrocarya*, *Curreria volubilis*, *Landolphia sp.*, *Rhoicissus revoilii*, *Synaptolepis kirkii*.

Forest: extent difficult to estimate, due to its patchy nature; possibly 700 hectare, from studying the 1979 and 1989 aerial photographs. Generally the canopy is at 10-15m with emergents to 20-30m, and a relatively dense understorey of 5-8m. This patchy aspect is probably due to cutting in the past. At present the signs of major cutting are absent, at least in the parts where I did my survey.

Common trees - *Albizia glaberrima*, *Albizia adiantifolia*, *Mallotus oppositifolius*, *Manilkara sulcata*, *Sorindeia madagascariensis*, *Tamarindus indica*,

Other trees - *Celtis cf. philippensis*, *Diospyros ?mespiliformis*, *Ficus cf. benghalensis*, *Ficus lutea*, *Ficus sansibarica*, *Grewia micrantha*, *Haplocoelum trigonocarpum*, *Mimusops obtusifolia*, *Rauvolfia mombasiana*, *Teclea trichocarpa*

Shrubs - *Croton pseudopulchellus*, *Deinbollia borbonica*, *Dovyalis macrocalyx*, *Dracaena steudneri*, *Malacantha alnifolia*, *Psychotria leucopoda*, *Suregada zanzibariensis*, *Turraea mombasana*, *Mgude* (Rubiaceae) -

Lianas - *Monanthes fornicata*, *Rhoicissus revoilii*, *Tiliacora funifera*, *Uvaria lucida*

Herbs - *Stylocheiton salaamicus*

Survey A. Canopy 10-12m high, canopy cover 70%. Understory medium dense, herb layer almost absent.

	2.5-10cm Ø	10-20cm Ø
<i>Mystroxydon aethiopicum</i>	1	6
<i>Macphersonia gracilis</i>	7	
<i>Drypetes natalensis</i>		4
<i>Erythroxylon emarginatum</i>	2	1
<i>Ficus sur</i>	1	1
<i>Diospyros consolatae</i>	1	
<i>Maytenus mossambicensis</i>	1	

PEMBA: RAS KIUYU

A small forest at the extremity of this peninsula. The vegetation is dry forest; the margin to the south is very abrupt; to the south the area consists of thin grass with *Dodonaea* and *Psiadia*. Extent of the forest about 210 hectare.

Inside the forest there is much cutting, mainly for firewood but also for poles.

The forest has a canopy at 10-15m high, the canopy cover 80 % but in disturbed sites < 70 %; there is very little undergrowth; most trees are less than 10 cm across. Soils are thin, with much outcropping of coral.

A count of 30 trees with a diameter of 20 cm and more gave the following results: *Manikara sansibarensis*/M. *sulcata* 18, *Mimusops obtusifolia* 8, *Diospyros consolatae* 1, *Maytenus undata* 1, *Psydrax schimperanum* 1, *Terminalia boivinii* 1. A second count in the northern part gave: *Manikara sansibarensis* 14, *Mimusops obtusifolia* 11, *Diospyros consolatae* 2, *Ficus lutea* 1, *Lannea stuhlmannii* 1, *Psydrax schimperanum* 1

Smaller trees: common - *Diospyros consolatae*, *Haplocoelum inoploeum*, *Zanthoxylum holtzianum*

Shrubs, lianas, less common trees: *Asparagus falcatus*, *Canthium mombazense*, *Capparis erythrocarpus*, *Cissus rotundifolia*, *Cissus quinquangularis*, *Clausena anisata*, *Commiphora lindensis*, *Deinbollia borbonica*, *Ehretia petiolaris*, *Ficus lutea*, *Hoslundia opposita*, *Ludia*, *Maytenus mossambicensis*, *M. heterophylla*, "Mlapaa" (not identified), *Ochna thomasiana*, *Phyllanthus* sp., *Polysphaeria parvifolia*, *Rhoicissus revoilii*, *Suregada zanzibarensis*, *Synaptolepis kirkii*, *Tarennia supra-axillaris*, *Terminalia boivinii*, *Triainolepis africana*, *Uvaria acuminata*

Herbs: *Gonatopus boivinii*, *Sansevieria conspicua*

On the northeastern side, closer to the bush near the sea, *Clausena anisata* becomes very common, and *Eugenia* sp. nov. and *Flagellaria* appear in the vegetation. Nearer the sea the forest becomes lower and bushier, with *Pandanus kirkii*, *Sideroxylon*, *Grewia* spp., *Dodonaea*, *Mystroxydon*, *Guettarda*, *Ehretia*, *Ficus scassellattii*, *F. lutea*. Near the beach *Casuarina*, *Adansonia*, *Scaevola*, *Pemphis*.

On the northeastern side there is a sharp coral scarp some 6-10 m higher than the beach area here. This is unclimbable, and was the reason I did not visit the northern parts of the forest. Coming from the South, however, should make the northernmost part of the forest easily accessible.

The study of aerial photographs of 1979 and 1989 gave me cause for surprise. I had fully expected a regression of the forest margin over a period of ten years, because of the amount of cutting I saw inside the forest; however, apart from some minor adjustments, the forest margin was in the same place as before. I have to say that I believe that the forest itself is being depleted way above its growth increase, but this is not visible on aerial photographs.

MSITU MKUU

This forest is adjacent to the Wingwi road on the NW side, by a COGEFAR quarry on the NE side, by mangrove on the SE side, and by bushland on the W side. Extent of the forest about 130 hectare. Soils are thin and sandy over coral, with coral outcrops getting very frequent towards the eastern (seaward) side.

There is one forester. The forest has never been exploited in a commercial way, but there is disturbance by local people who harvest minor forest products (licensed by the Forest Department), or who poach firewood and poles (to my belief in a minor way).

Animals reported (by old forester): antelope (1 kind), monkeys (1 kind).

inland, western part

Common tree species: *Croton sylvaticus*, *Diospyros consolatae*, *Ficus lutea*, *F. sur*, *F. sycomorus*, *Haplocoelum inoploeum*, *Rawsonia lucida*, *Sorindeia madagascariensis*

Common shrubs: *Canthium mombazense*, *Clausena anisata*, *Macphersonia gracilis*, *Teclea trichocarpa*

Common lianas: *Uvaria acuminata*

Other trees: *Albizia glaberrima*, *Blighia unijugata*, *Cussonia zimmermannii*, *Drypetes natalensis*, *Ficus exasperata*, *F. scassellattii*, *Lannea schweinfurthii*, *Mangifera indica* (nango), *Manilkara* sp., *Milicia excelsa* (1 seen), *Mimusops fruticosa*, *Synadenium pereskiiifolium*, *Tamarindus indica*, *Terminalia boivinii*, *Zanthoxylum holtzii*

Other shrubs: *Acridocarpus zanzibarica*, *Cremaspora triflora*, *Flacourtia indica*, *Flueggia virosa*, *Leptactina platyphylla*, *Phyllanthus* sp., *Polysphaeria parvifolia*, *Suregada zanzibarensis*, *Vepris ngamensis*

Other lianas: *Adenia* sp., *Allophylus pervillei*, *Dioscorea zanzibarica*, *Flagellaria guineensis*, *Grewia* sp., *Opilia amentacea*, *Rhoicissus revoilii*, *Saba florida*, *Synaptolepis kirkii*,

Herbs: *Gonatopus boivinii*, *Sansevieria conspicua*, *Zamioculcas zamiifolia*

Survey/ 30 TREE COUNT of trees > 20 cm DBH: canopy 10-12m high, canopy cover 80-90 %, with emergents to 20m (cover 20 %), most trees < 20cm DBH.

Sorindeia 11, *Albizia glaberrima* 5, *Ficus lutea* 4, *Ficus sur* 3, *Diospyros* 2, *Lannea* 2, *Croton* 1, *Cussonia* 1, *Mango* 1

seaward, eastern part

Common trees: *Diospyros consolatae*, *Haplocoelum inoploeum*, *Manilkara sansibarensis*

Common shrubs: *Canthium mombazense*, *Macphersonia gracilis*, *Suregada zanzibarensis*, *Synadenium pereskiiifolium*

Common lianas: *Saba/Ancylobotrys* sp., *Strychnos angolensis*

Other trees: *Cassia afrofistula*, *Cussonia zimmermannii*, *Hunteria zeylanica*, *Lannea schweinfurthii*, *Sideroxylon inerme*, *Stadmannia oppositifolia*, *Tamarindus indica*, *Terminalia boivinii*, *Zanthoxylum holtzii*

Other shrubs: *Acalypha neptunica*, *Clausena anisata*, *Maytenus mossambicensis*, *Polysphaeria multiflora*, *Teclea trichocarpa*, *Vepris ngamensis*

Other lianas: *Asparagus falcatus*, *Uvaria acuminata*, *Vanilla roscheri*

Herbs: *Gonatopus boivinii*, *Phymatodes scolopendria*, *Sansevieria conspicua*, *Scilla* sp. (restricted to coral), *Zamioculcas zamiifolia*

SURVEY/30 TREE COUNT of trees > 20 cm DBH; canopy 5m high, canopy cover 80 %, emergent to 20m high, cover < 10 %.

Lannea 7, *Diospyros* 4, *Manilkara* 4, *Haplocoelum* 3, *Mimusops* 3, *Stadmannia* 3, *Cussonia* 2, *Tamarindus* 2, *Cassia* 1, *Sideroxylon* 1

NGEZI FOREST

Location northwest Pemba. Extent of high, moist forest about 550 hectare; of coastal evergreen thicket/dry forest about 200 hectare; of giant heath area about 200 hectare. A separate report, to the Forest Department, deals with this Forest Reserve.

MISALI ISLAND

The island is most easily reached by boat from Mkoani (about 1 hour). Extent about 0.9 square km. Soil thin and sandy over coral, with many coral outcrops. No water on the island; a well of some 18m deep was dry.

The northern end of the island has dense coastal thicket with a canopy some 6m high and a canopy cover of 80-90 %; emergents to 12m high; rather disturbed at the northern edge, where dense lianas make penetration difficult; inside two tracks to areas where pole-cutting seems to occur frequently.

3 green monkeys were seen.

30 TREE COUNT: *Manilkara* 9, *Mimusops obtusifolia* 3, *Terminalia boivinii* 3, *Diospyros consolatae* 2, *Haplocoelum* 2, *Lannea* 2, *Mystroxydon* 2, *Psydrax schimperiana* 2, *Sideroxylon* 2, *Euclea* 1, *Ficus scassellattii* 1

Trees - common- *Diospyros consolatae*, *Grandidiera*, *Haplocoelum*, *Manilkara*, *Sideroxylon*, *Terminalia boivinii*

occasional - *Adansonia*, *Casuarina* (beach), *Euclea racemosa*, *Euphorbia nyikae*, *Ficus scasselattii*, *Ficus lutea*, *Flacourtia*, *Grewia* sp., *Guettarda* (beach), *Inhambanella*, *Mimusops*, *Olea*, *Pandanus kirkii* (beach), *Phoenix*, *Xylocarpus moluccensis* (beach),

Shrubs- *Acalypha neptunica* (oc), *Aloe* sp. (beach, occ.), *Cremaspora triflora* (oc), *Erythroxylum emarginatum* (oc), *Eugenia* sp. nov (oc), *Excoecaria madagascariensis* (co), *Hibiscus* (ra), *Peraphis* (beach), *Phyllanthus* (ra), *Polysphaeria parvifolia* (co), *Suregada zanzibarensis*, *Synaptolepis* (fr), *Teclea trichocarpa* (fr)

Lianas- *Adenia* ? *gummifera*, *Allobophylus pervillei*, *Ancylodotrys*, *Asparagus falcatus*, *Caesalpinia bonduc*, *Dioscorea* sp., *Monanthe* sp. *sericea*, *Rhoicissus roo'lli*, *Sarcostemma*, *Uvaria acuminata*, *Vanilla roscheri*

Herbs- *Gonatopus* (ra), *Scadoxus* (fr), *Tragia* (ra)

2. DESIRABLE CONSTRAINTS ON DEVELOPMENT: VERANI, MISALI ISLAND, ZANZIBAR TOWN ISLANDS

At several sites on Unguja Island (Prison Island, Grave Island) and Pemba (Misali Island, Verani beach) tourism developments are planned for the immediate future. In some cases the impact on the environment seems to have been completely overlooked, or neglected.

2.1 - Verani

Along the western edge of Ngezi Forest Reserve, in northwest Pemba, lies the Verani beach. Here a plot has been demarcated, and the "Archers" company is planning to build a hotel here for the benefit of sport fishermen. In demarcating the plot, a cutline has been made to indicate the boundaries of the plot, some 900 m long and 300 m wide; the clearing of this cutline has caused the destruction of some 30 Mpapindi palms, a palm which only occurs in Ngezi forest, and nowhere else on Earth.

The fact that this palm is not uncommon in the rest of Ngezi was, I believe, unknown to the company; as was, presumably, the fact that there were any special plants growing near this plot. This illustrates my point that when a development in a nature area is to take place, there should be a quick survey of such a site before the start of the work, and not afterwards, or at the halfway stage, when the damage has already been done. If these 30 palms had been the only ones in Ngezi, and in the world, a crime against creation would have been committed through ignorance - and that would have been no excuse, since one look by some botanist (and there are many botanists, in Tanzania and elsewhere) would have made the situation clear.

I would advise strict guidelines for this hotel - absolutely no disturbance outside their boundaries, no cutting of paths or roads inside the Forest Reserve, no firewood-collecting cutting or dumping of rubbish. If any of their sport-fishing tourists are interested in forest (as the company seems to believe, otherwise why build a hotel inside a Forest Reserve?) an undisturbed forest will presumably be more interesting to them than a disturbed one. No exotic species should be introduced for planting around the hotel.

The use of the bay at the southeast of the peninsula to keep fishing boats is not recommended. Such use would inevitably cause the cutting of paths from the hotel to the southeast of the peninsula, and this would open up the way for disturbance to the forest here, with firewood gathering, cutting of trees, etcetera. There should be no paths at all to this part of the peninsula.

The forest here is the only intact example of the rare coral rag dry evergreen forest of Pemba, the site of several rare plant species (*Eugenia* sp. nov., *Chrysalidocarpus pembeanus*, *Allophylus vestitus*), probably a prime habitat for the rare endemic Pemba Blue Duiker; it is a site recommended by both Rodgers, Homewood, Mwasumbi, Swai and Vollesen and by me as a core zone for full protection. The compartments 82, 83 and 84 should be completely undisturbed, and the compartments 80 and 81 should serve as a buffer zone to this area, and disturbance in this buffer zone should be kept to a minimum. This kind of forest does not occur anywhere else on Pemba - if it is disturbed here, it will be gone forever.

2.2 Misali Island

The coral rag thicket on this island is fairly disturbed by firewood- and pole-cutting on the northern side, where I believe the proposed hotel might be built. Speaking from a conservation point of view, this hotel would be undesirable - although the coral rag thicket of Misali is not in such a good state as that of Ngezi Forest Reserve, it still is a rare vegetation type.

If such a hotel is built, the same rules as for Verani might be applied: no planting of imported herbs, shrubs or trees; careful siting and strong restrictions on the cutting of vegetation for the building site; no disturbance to the vegetation after the hotel is built - but is such a thing possible? what would they do for firewood - import it from Pemba? The fact that there is no water at all on the Island might be a reason for not building a hotel at all.

If Misali is to be a site for tourist day trips, the construction of a nature trail would be an excellent possibility to enhance both the tourists' enjoyment and the conservation of this vegetation. Contrary to Verani, this would not open up an undisturbed area; rather, it would safeguard an already slightly disturbed habitat, and provide a source of income to local people (trail guides). A scenic trail is definitely a possibility here.

2.3 The Islets off Zanzibar town

effected anywhere in East Africa. Prime sites would be the Chwaka bay/northern Jozani area, and the Kigomasha/Ngezi area.

A silvicultural study of indigenous species, for the purpose of providing local people with quick-growing alternatives to forest wood, might try out some of the species found to be the preferred firewood/pole species.

Macphersonia gracilis (Mjoma on Unguja) and *Diospyros consolatae* (Mkururu on Unguja, Mjengo on Pemba) grow on coral rag soils. Many people regard these as the best trees for poles. Nothing is known about the possibility of growing these in woodlots, about their growth rate, and coppicing powers. I believe that at least Mjoma would be a prime candidate for trials; the local people know and like its wood; it seems to grow in both shady conditions in forest, and in open sites in disturbed bushland; I believe, from my fieldwork, that its coppicing powers are good; and it grows on coral rag soils, which cover a large part of east and south Unguja and Pemba. Other species liked for their wood are *Olea woodiana* and *Raphanea melanophloeos*, and they would be good back-up candidates in silvicultural studies.

4. RECOMMENDATIONS FOR MONITORING BOTANICAL/BIOLOGICAL DIVERSITY

The general monitoring of selected sites needs the following steps:

1. marking and inventarization of selected sites within a single forest system, with at least one undisturbed site as a control;
2. establishment of growth rate in undisturbed plots, in cycles (e.g. 1 year, 5 year);
3. establishment of rate of exploitation of utilized plots in similar cycles;
4. inventory of the balance between growth rate and utilization, to ensure that there is no depletion of standing stock.

This is obviously a time-consuming method, but such in-depth monitoring is essential if there is an interest in conservation of utilized systems such as the Muyuni and Uzi thicket/forest which, at present, is heavily utilized. A problem could be the ownership of the land, as it is all private land.

A much quicker method, useful in monitoring botanical diversity, is the establishment of permanent transects within selected habitats (forest, coral rag thicket), an initial careful inventory of such transects as regards woody and herbaceous species, and the yearly checking of such transects. The one problem is the marking of such transects in a way that is truly permanent.

Sites recommended for monitoring:

UNGUJA

Muyuni dry forest/thicket
Muyuni coastal forest
Uzi Island thicket/forest
Jozani, selected sites in forest and evergreen bushland

PEMBA

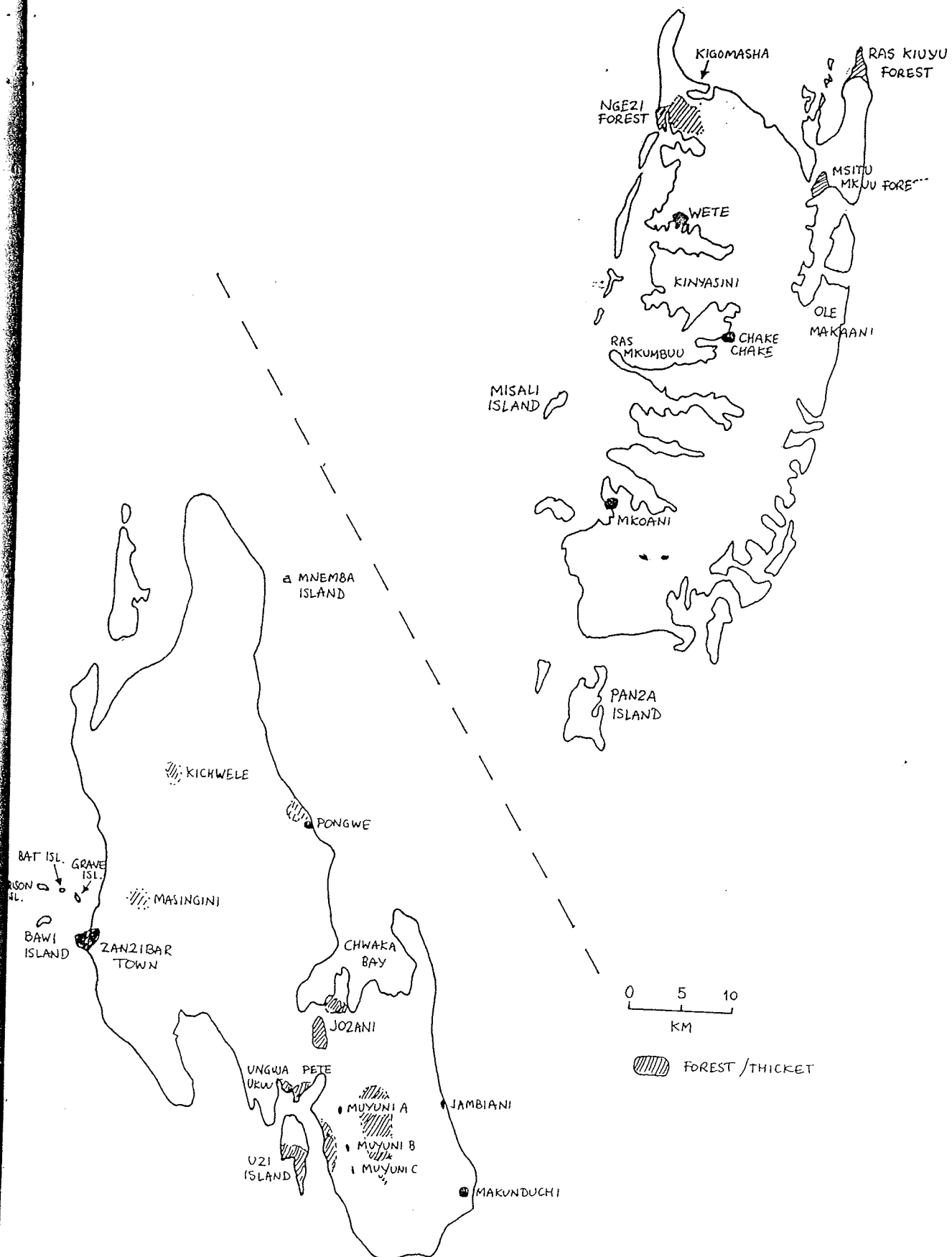
Ras Kiuyu forest
Msitu Mkuu forest

5. ACKNOWLEDGEMENTS

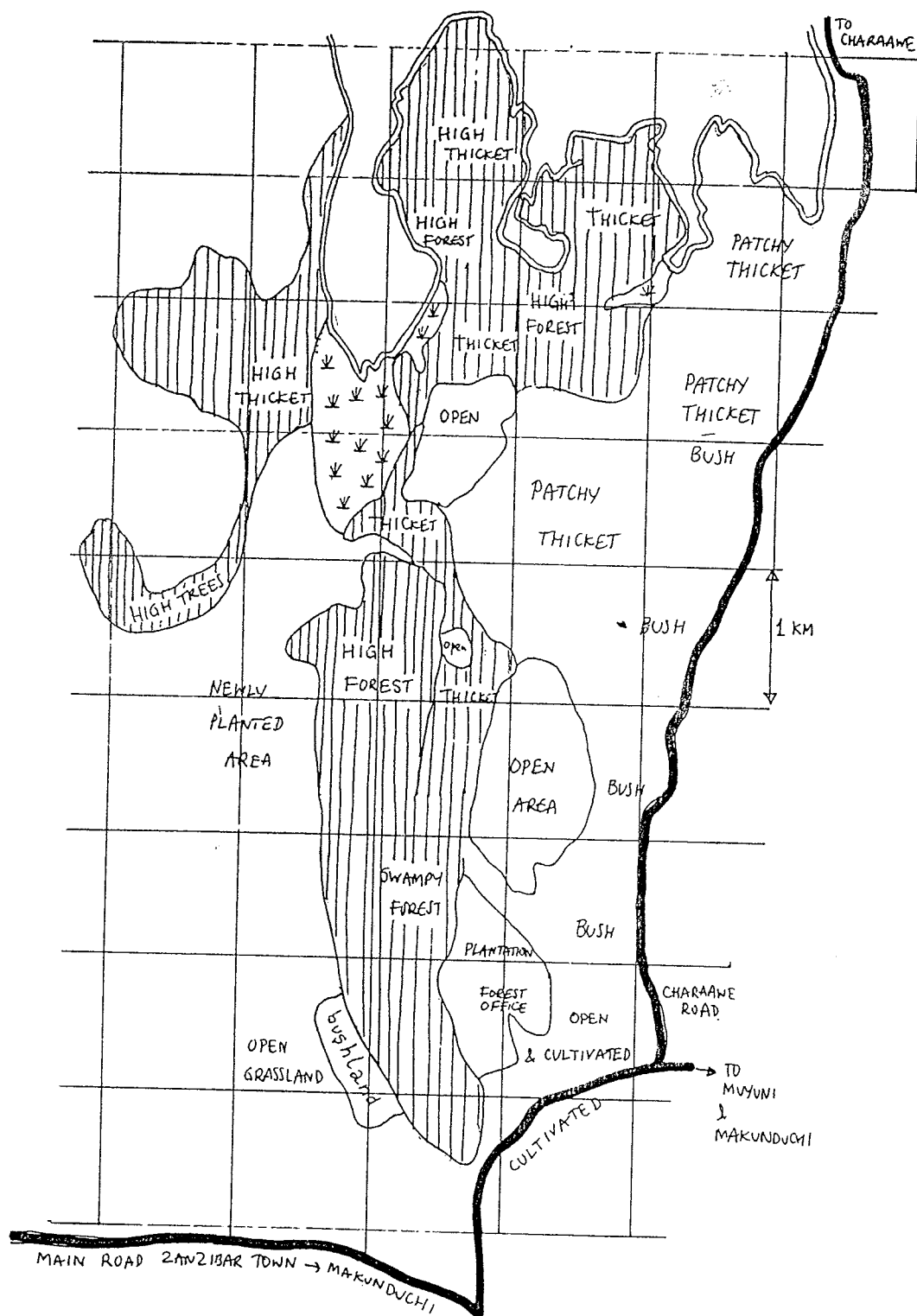
I would like to thank the Head of the Department of the Environment, Ndugu Abdulrahman Issa, and the deputy head of the Department, Ndugu Salim Rashid Abdallah, for the support they gave me during my work in Zanzibar; Ndugu Robert Bensted-Smith, for profitable discussions and background information; Ndugu Alawi Haji Hija and Ndugu Sheha M. Juma, the field assistants who accompanied me during all my fieldwork, for companionship, many introductions, hospitality at Makunduchi, and information on local names.

6. MAPS

- 6.1 Unguja and Pemba Islands, sites visited.
- 6.2.1 Jozani area vegetation
- 6.2.2 Muyuni coastal vegetation



Map 6.1



Map 6.2.1

Mtondoo	<i>Calophyllum inophyllum</i>
Mtongo	<i>Rhoicissus revoilii</i> , <i>R. tridentata</i>
Mtopetope	<i>Annona senegalensis</i>
Mtowe	<i>Ancylobotrys petersiana</i>
Mtukutu	<i>Ehretia petiolaris</i>
Mtumbika	<i>Mallotus oppositifolius</i>
Mugolegole (unidentified)	
Mugombe	<i>Manilkara sansibarica</i>
Mugunga	<i>Dichrostachys cinerea</i> (at Pongwe)
Mukungu	<i>Terminalia catappa</i>
Mukunguni	<i>Terminalia boivinii</i>
Mukuvuu	<i>Mimusops obtusifolia</i>
Mutukutu (unidentified)	
Muumbusi	<i>Lannea schweinfurthii</i>
Mvuje	<i>Clausena anisata</i>
Mvumo	<i>Borassus aethiopium</i>
Mwambanti	<i>Culcasia orientalis</i>
Mwango	<i>Rauvolfia mombassana</i>
Mzima-kilio	<i>Dracaena</i> sp.
Ngelenge	<i>Albizia adiantifolia</i> , <i>A. glaberrima</i>
Ngombe	<i>Ozoroa obovata</i>
Sisi	<i>Tiliacora funifera</i>

8. - SCIENTIFIC NAMES/LOCAL NAMES DICTIONARY (UNGUJA ISLAND ONLY)

<i>Albizia adiantifolia</i>	Ngelenge
<i>Albizia glaberrima</i>	Ngelenge
<i>Ancylobotrys petersiana</i>	Mtowe
<i>Annona senegalensis</i>	Mtopetope
<i>Borassus aethiopium</i>	Mvumo
<i>Bridelia micrantha</i>	Mkarati
<i>Calophyllum inophyllum</i>	Mtondoo
<i>Canavalia rosea</i>	Mfiumwitu-mkobwa
<i>Clausena anisata</i>	Mvuje
<i>Croton pseudopulchellus</i>	Mfusho
<i>Culcasia orientalis</i>	Mwambanti
<i>Dichrostachys cinerea</i>	Msiginu, or Mugunga (at Pongwe)
<i>Diospyros consolatae</i>	Mkururu, or Mkuyu (at Pongwe)
<i>Dracaena</i> sp.	Mzima-kilio
<i>Ehretia petiolaris</i>	Mtukutu
<i>Encephalartos hildebrandtii</i>	Mgwede (Pongwe only?)
<i>Euclea racemosa</i>	Mdaa
<i>Eugenia</i> sp. nov.	Mkaaga
<i>Euphorbia tirucalli</i>	Mchakazi
<i>Ficus sansibarica</i>	Mparamisi
<i>Ficus exasperata</i>	Msasa
<i>Flacourtia indica</i>	Mgoo
<i>Flueggia virosa</i>	Mkwamba
<i>Grewia</i> spp.	Mkoke / Mkole
<i>Guettarda speciosa</i>	Mkungukwa
<i>Hoslundia opposita</i>	Mlashone
<i>Lannea schweinfurthii</i>	Muumbusi
<i>Macphersonia gracilis</i>	Mjoma
<i>Mallotus oppositifolius</i>	Mtumbika
<i>Manilkara sansibarica</i>	Mugombe
<i>Maytenus mossambicensis</i>	Mnusi
<i>Mildbraedia carpinifolia</i>	Mchokoo (-chore)
<i>Mimusops fruticosa</i>	Mkuvuu, or Mnyumbo

9. SPECIES LIST - UNGUJA ISLAND FOREST AND EVERGREEN THICKET/BUSHLAND

GYMNOSPERMAE

CYCADACEAE

Encephalartos hildebrandtii A. Br. & Bouché - palm-like tree to 6m in coastal thicket

DICOTYLEDONS

ANACARDIACEAE

Lannea schweinfurthii (Engl.) Engl. - large tree in coastal thicket, occasionally in forest

Ozoroa obovata (Oliv.) R & A Fernandes - small tree in bushland

Rhus spp. - shrubs in bushland (*R. natalensis*, *R. longipes*, *R. quartiniana* have been reported on Unguja)

Sorindeia madagascariensis DC. - large forest tree

ANNONACEAE

Annona senegalensis Pers. - medium tree, common in burnt grassland

Monanthotaxis fornicata (Baill.) Verdc. - climber or small tree of coastal thicket

Uvaria lucida Benth. - climber in forest or thicket

APOCYNACEAE

Ancylobotrys petersiana (Klotzsch) Pierre - climber in thicket and bush

Rauvolfia mombasiana Stapf - medium tree in forest

Schizogygia coffaeoides Baill. - shrub in forest

BORAGINACEAE

Cordia subcordata Lam. - seashore shrub or small tree.

Ehretia petiolaris Lam. - shrub in bushland

BREXACEAE

Brexia madagascariensis (Lam.) Ker-Gawl. - small tree of swamp forest

CELASTRACEAE

Maytenus mossambicensis (Klotzsch) Blakelock - small spiny tree in dry forest

Mystroxydon aethiopicum (Thunb.) Loes. - common small or medium tree in evergreen thicket or dry forest

COMBRETACEAE

Terminalia boivinii Tul. - medium to large tree of evergreen thicket

Terminalia catappa L. - large, introduced tree

EBENACEAE

Diospyros consolatae Chiov. - medium-sized tree of coastal thicket and dry forest, very common

Diospyros natalensis (Harv.) Brenan - small tree of dry forest; new record for Zanzibar : BN 4240

Diospyros sp., possibly *mespiliformis*, seen at Muyuni

Euclea racemosa Murr. - small or medium tree of dry forest or thicket

EUPHORBIACEAE

Bridelia micrantha (Hochst.) Baill. - large tree in grassland edges

Croton pseudopulchellus Pax - small forest shrub

Drypetes natalensis (Harv.) Hutch. var. *leiogyna* Brenan - medium forest tree restricted to Kenya coast and Zanzibar : BN 4252

Euphorbia tirucalli L. - succulent shrub in bush, introduced species

Flueggia virosa Baill. - shrub in bushland

Mallotus oppositifolius (Geiseler) Müll. Arg. - shrub or small tree in forest

Mildbraedia carpinifolia (Pax) Hutch. - small forest tree

Suregada zanzibariensis Baill. - shrub in bushland

FLACOURTIACEAE

Casaeria gladiiformis Mast. - large forest tree

Flacourtia indica (Burm.f.) Merr. - small spiny tree of dry forest or bushland

GUTTIFERAE

Calophyllum inophyllum L. - large tree of Jozani swamp forest

ICACINACEAE

Apodytes dimidiata Arn. var. *acutifolia* - small to medium tree of coastal bushland

LABIATAE

- Hoslundia opposita* Vahl - woody herb in forest margin
- LEGUMINOSAE-CAESALPINIACEAE
- Afzelia quanzensis* Welw. - large tree in forest
- Cassia afrodistula* Brenan var. *afrodistula* - shrub in thicket
- Senna petersiana* (Bolle) Lock - shrub or small tree in forest edges and bushland
- Mezoneuron angolense* Oliv. - spiny liana in forest margins and bushland
- LEGUMINOSAE-MIMOSACEAE
- Albizia adianthifolia* (Schum.) WF Wight - large forest tree
- Albizia glaberrima* (Schum. & Thonn.) Benth. - large forest tree
- Dichrostachys cinerea* (L.) Wight & Arn. - spiny small tree of evergreen bushland
- Tamarindus indica* L. - large tree of coastal thicket
- LEGUMINOSAE-PAPILIONACEAE
- Canavalia rosea* (Sw.) DC. - coastal thicket climber, near the sea
- Dalbergia vacciniifolia* Vatke - shrub in coastal thicket and bushland
- Mundulea sericea* (Willd.) A. Chev. - small tree of coastal bushland
- LOGANIACEAE
- Strychnos angolensis* Gilg - forest liana
- MELIACEAE
- Trichilia emetica* Vahl - large tree of forest
- Turraea floribunda* Hochst. - forest shrub; new record for Zanzibar: BN 4232
- MENISPERMACEAE
- Tiliacora funifera* (Miers) Oliv. - forest liana; new record for Zanzibar: BN 4263
- MORACEAE
- Ficus ?benghalensis* L. - large forest tree; BN 4261; if true, New record for Zanzibar
- Ficus exasperata* Vahl - large forest tree
- Ficus sansibarica* Warb. ssp. *sansibarica* - large forest tree.
- MYRSINACEAE
- Rapanea melanophloeos* (L.) Mez - medium tree, common in coastal bushland, thicket and dry forest
- MYRTACEAE
- Eugenia* sp. nov. (=Vaughan 1676) - a new, undescribed species restricted to Zanzibar and Pemba. BN 4219
- Syzygium cumini* (L.) Skeels - large forest tree
- OLEACEAE
- Olea woodiana* Knobl. - medium tree of coastal thicket. New record for Zanzibar: BN 4229
- RANUNCULACEAE
- Clematis viridiflora* Bertol. - forest margin liana, near endemic, rare species: BN 4236
- RHAMNACEAE
- Lasiodiscus pervillei* Baill. - small tree of coastal bush, restricted to Zanzibar and Madagascar: BN 4205
- RUBIACEAE
- Guettarda speciosa* L. - beach shrub or tree
- Polysphaeria multiflora* Hiern - shrub in coastal thicket
- Polysphaeria parvifolia* Hiern - shrub in coastal thicket and forest
- Psychotria leucopoda* Petit - shrub in coastal thicket, restricted to Kenya S coast, Tanzania N coast and Zanzibar: BN 4257
- Tricalysia ovalifolia* Hiern var. *ovalifolia* - shrub in coastal evergreen thicket
- RUTACEAE
- Clausena anisata* (Willd.) Benth. - shrub in forest
- Teclea trichocarpa* (Engl.) Engl. - forest shrub or small tree
- Citrus medica* L. - lemon (introduced)
- SAPINDACEAE
- Allophylus* cf. *pervillei* vergens ad *A. congolanus* : BN 4228, climber at Jozani
- Deinbollia borbonica* Scheff. - shrub in coastal thicket
- Haplocoelum trigonocarpum* Radlk. - thicket shrub, a globally rare species (coastal Kenya and Tanzania, Zanzibar): BN 4272
- Macphersonia gracilis* O. Hoffm. - tree of thicket, bush and forest, restricted to the coasts of Kenya, Tanzania and Mozambique
- SAPOTACEAE

- Pseuderanthemum tunicatum* (Afz.) Milne-Redh. - woody herb of forest
Ruspolia sp. - woody herb of forest
Whitfieldia elongata (Beauv.) CB.Cl. - shrub of forest margins
- ALANGIACEAE**
Alangium salviifolium (L.f.) Wangerin - forest canopy tree
- AMARANTHACEAE**
Achyranthes aspera L. - forest herb
Cyathula prostrata (L.) Bl. - forest herb
Pupalia lappacea (L.) Juss. - forest herb
- ANACARDIACEAE**
Lannea schweinfurthii (Engl.) Engl. var. *acutifoliolata* (Engl.) Kokw. - canopy tree, coastal Kenya and Tanzania, Zanzibar & Pemba
Mangifera indica L. - Mango tree; introduction from Asia, usually associated with human habitation
Rhus sp. - shrub; only found sterile.
Sorindeia madagascariensis DC. - medium-sized tree, especially in coastal bushland; East Africa and Madagascar.
- ANNONACEAE**
Uvaria sp. B of FTEA - forest climber, restricted to north coastal Tanzania: BN 4366. **Rare species**
Uvaria acuminata Oliv. - forest climber
- APOCYNACEAE**
Alafia caudata Stapf - large forest liana
Ancylobotrys petersiana (Kl.) Pierre - medium-sized liana in coastal bushland
Funtumia africana (Benth.) Stapf - medium to large forest tree.
Hunteria zeylanica Thw. var. *zeylanica* - tree of Msitu mkuu forest; BN 4381; **first record for Pemba and Africa**
Landolphia kirkii Dyer - large forest liana
Oncinotis tenuiloba Stapf - small forest climber; BN 4323; **new record for Pemba**
Rauvolfia mombasiana Stapf - small forest tree
Saba comorensis (Bojer) Pichon - large forest liana
Schizozygia coffaeoides (Bojer) Baill. - forest shrub
Strophanthus zimmermannii Monach. - Medium-sized liana; south coastal Kenya, coastal Tanzania; BN 4319, **new record for Pemba; rare species**
Tabernaemontana pachysiphon Stapf - medium-sized forest margin tree
Tabernaemontana ventricosa A.DC. - small forest tree
- ARALIACEAE**
Cussonia zimmermannii Harms - large forest tree, especially in coastal bushland
Polyscias fulva (Hiern) Harms - Medium-sized tree in Ngezi; a single even-aged population which I believe to be introduced
- ASCLEPIADACEAE**
Secamone retusa N.E. Br. - climber of forest / heath margin
- BALSAMINACEAE**
Impatiens wallerana Hook. f. - herb of moist forest sites
- BOMBACACEAE**
Adansonia digitata L. - the baobab, large tree in coastal bushland
Bombax rhodognaphalon K. Schum. var. *rhodognaphalon* - forest canopy tree; restricted to coastal Kenya to Mozambique
- BORAGINACEAE**
Borreria petiolaris (Lam.) Thulin - forest or thicket shrub or small tree
- BURSERACEAE**
Commiphora lindensis Engl. - small to medium dry forest tree
- CAPPARACEAE**
Capparis erythrocarpus Isert - small spiny dry forest climber
Cladostemon kirkii (Oliv.) Pax & Gilg RMH 2771 coastal climber
- CASUARINACEAE**
Casuarina equisetifolia L. - large tree on beach crest; usually said to be introduced, but possibly native; most individuals planted
- CELASTRACEAE**
Maytenus heterophylla (Eckl. & Zeyher) N. Robson - spiny dry thicket tree

- Maytenus mossambicensis* (Klotzsch) Blakelock - spiny tree in coastal thicket
Maytenus senegalensis (Lam.) Exell - small spiny tree in coastal thicket
Maytenus undata (Thunb.) Blakelock - large tree in dry forest
Mystroxydon aethiopicum (Thunb.) Loes. - medium-sized tree in coastal thicket
Salacia elegans Oliv. - forest climber
Salacia madagascariensis (Lam.) DC. - forest liana
CHRYSOBALANACEAE
Hirtella zanzibarica Oliv. - large forest tree not seen by me (Rodgers record)
Parinari curatellifolia Benth. ssp. *curatellifolia* - large tree of heathland margin
COMBRETACEAE
Combretum paniculatum Vent. - large forest liana. BN 4375 new record for Pemba
Terminalia boivinii Tul. - medium to large tree of coastal thicket
Terminalia catappa L. - large tree; introduced
Terminalia sambesiaca Engl. & Diels - Rodgers sight record, large tree - not seen by me
COMPOSITAE
Vernonia zanzibarensis Less - shrub of heathland margin
Pluchea sordida (Vatke) Oliv. & Hiern - herb of moist sites - not seen by me
CONNARACEAE
Connarus sp. nov. - Rodgers record of forest liana - not seen by me
Cnestis corniculata Lam. - forest liana
DICHPETALACEAE
Tapura fischeri Engl. - medium forest tree
DELLENACEAE
Tetracera litoralis Gilg - coastal thicket shrub; only in coastal Kenya and Tanzania, Pemba
EBENACEAE
Diospyros consolatae Chiov. - medium-sized tree of coastal thicket
ERICACEAE
Philippia mafiensis Engl. - Giant heath, a medium-sized shrub or tree; restricted to Mafia and Pemba; a rare/vulnerable species
ERYTHROXYLACEAE
Erythroxylum emarginatum Thonn. - shrub or tree of coastal thicket
EUPHORBIACEAE
Acalypha neptunica Müll. Arg. var. *neptunica* - forest shrub
Antidesma venosum Tul. - forest shrub or small tree near heath area
Bridelia micrantha (Hochst.) Baill. - large forest tree
Croton scheffleri Pax - forest shrub - not seen by me (record of Rodgers)
Croton sylvaticus Krauss - forest canopy tree
Drypetes natalensis (Harv.) Hutch var. *leiogyna* Brenan - forest, medium tree; restricted to coastal Kenya, NE and W Tanzania, Zanzibar and Pemba
Drypetes reticulata Pax - forest, small tree - not seen by me
Erythrococca kirkii (Müll. Arg.) Prain - forest, shrub - not seen by me
Flueggia virosa (Willd.) Voigt - coastal thicket shrub
Macaranga capensis (Baill.) Sim. - forest canopy tree
Margaritaria discoidea (Baill.) Webster var. *nitida* (or *triplosphaera*) - forest tree
Phyllanthus nummulariifolius Poir. - forest shrublet
Suregada zanzibariensis Baill. - forest edge shrub or small tree
Synadenium pereskiaefolium (Baill.) Guill. - medium forest margin tree
Tragia furialis Bojer - small stinging nettle in disturbed forest
Upaca guineensis Müll. Arg. - large forest tree
Upaca sansibarica Pax - (Rodgers record) large tree - not seen by me; if true, a new record for Pemba
FLACOURTIACEAE
Casaeria gladiiformis Mast. - forest tree (Rodgers record)
Flacourtia indica (Burm.f.) Merr. - small coastal thicket tree
Ludia mauritiana Gmelin - coastal shrub
Rawsonia lucida Harv. & Sond. - small forest tree
GOODENIACEAE
Scaevola taccada (Gaertn.) Roxb. - beach crest shrub or tree
GUTTIFERAE
Calophyllum inophyllum L. - large tree; most individuals planted

- Garcinia livingstonei* T. Anders - small tree - not seen by me (Rodgers record)
Harungana madagascariensis Poir. - forest margin shrub
- ICACINACEAE
Apodytes dimidiata Arn. var. *acutifolia* (A.Rich.) Boutique - medium tree in Philippia area - not seen by me (at least not alive)
- LABIATAE
Hoslundia opposita Vahl - woody herb of forest margins
- LECYTHIDACEAE
Barringtonia racemosa (L.) Spreng - medium tree in swamp forest
- LEGUMINOSAE-CAESALPINIACEAE
Afzelia quanzensis Welw. - large tree in coastal thicket
Cassia afrodistula Brenan - small tree in forest margin
Caesalpinia volkensii Harms - coastal bush liana; restricted to Uganda, Kenya, Tanzania
Erythrophloeum suaveolens (Guill. & Perr.) Brenan - forest canopy tree
Tamarindus indica L. - canopy tree/emergent in coastal thicket
- LEGUMINOSAE-MIMOSACEAE
Albizia adianthifolia (Schum.) WF Wight - forest canopy tree
Albizia glaberrima (Schum. & Thonn.) Benth. - large forest tree
Dichrostachys cinerea (L.) Wight & Arn. ssp. *cinerea* - spiny small tree at forest margin
Entada pursaetha DC. - large forest liana
- LEGUMINOSAE-PAPILIONACEAE
Dalbergia melanoxylon Guill. & Perr. - BN 4348 Small to medium tree in coastal thicket.
New record for Pemba.
Indigofera sp. - small shrub in coastal thicket
Millettia oblata Dunn ssp. *intermedia* Gillett - (Rodgers record) medium tree - not seen by me
Mucuna gigantea (Willd.) DC. - large forest liana
- LENTIBULARIACEAE
Utricularia gibba L. - submerged aquatic in pools
- LOBELIACEAE
Lobelia fervens Thunb. ssp. *fervens* - herb of forest margin
- LOGANIACEAE
Anthocleista grandiflora Gilg - small tree of swamp forest
Strychnos angolensis Gilg - forest edge liana
- LYTHRACEAE
Pemphis acidula Forst. - shrub on beach crest- usually on coral
- MALPHIGIACEAE
Acridocarpus zanzibaricus (Loud.) A. Juss. - shrub in coastal thicket; restricted to coast from Somalia to central Tanzania.
- MALVACEAE
Gossypioides kirkii (Mast.) JB Hutch. - small forest shrub
Hibiscus tiliaceus L. - Shrub on beach
- MELASTOMATACEAE
Dissotis rotundifolia (Sw.) Triana - creeping herb of forest margins
Melastomastrum segregatum (Benth.) A & R Fernandes - shrub of swamps
Tristemma mauritianum JF Gmel. - shrubby herb of swampy sites
- MELIACEAE
Trichilia emetica Vahl - forest tree
Xylocarpus granatum Koen - mangrove tree
- MENISPERMACEAE
Dioscoreophyllum volkensii Engl. var. *volkensii* - forest liana seen by Rodgers - **rare species**
Triclisia sacleuxii (Pierre) Diels var. *sacleuxii* - forest liana
Tinospora oblongifolia (Engl.) Troupin - forest liana seen by me- if true, a new record for **Pemba**
- MENYANTHACEAE
Nymphoides cf. *kirkii* (NE Br.) ined.- floating aquatic in ponds. **New record for Pemba**
- MORACEAE
Antiaris toxicaria Lesch. - forest canopy tree.
Dorstenia tayloriana Rendle - forest herb, restricted to coastal Kenya and -Tanzania; **a rare species**
Ficus exasperata Vahl - forest canopy tree

- Ficus lutea* Vahl - forest canopy tree
Ficus natalensis Hochst. - forest canopy tree
Ficus nekbudu Warb. - sight record by Rodgers
Ficus scasselatii Pamp. - large forest tree
Ficus sur Forssk. [F. capensis] - forest canopy tree
Ficus sycomorus L. - forest canopy tree
Milicia excelsa (Welw.) CC Berg [Chlorophora excelsa] - forest canopy tree
- MYRICACEAE**
Myrica sp. - Philippia zone shrub; not seen by me.
- MYRTACEAE**
Eugenia sp nov = Vaughan 1676 - shrub; new, undescribed species restricted to **Unguja and Pemba**
Syzygium cordatum Krauss - medium tree in Philippia area
Syzygium cumini (L.) Skeels - forest canopy tree
- NYMPHAEACEAE**
Nymphaea nouchali Burm. var. *zanzibarensis* (Casp.) Verdc. - aquatic in ponds
- OCHNACEAE**
Ochna thomasiana Engl. & Gilg - small shrub in dry forest
Sauvagesia erecta L. - forest herb
- OLEACEAE**
Olea woodiana Knobl. - large tree in coastal thicket; **new record for Pemba**
- OPILIACEAE**
Opilia amentacea Roxb. - parasitic climber; BN 4384, **new record for Pemba**
- PASSIFLORACEAE**
Adenia gummifera (Harv.) Harms var. *gummifera* - Climber in forest margins or disturbed forest.
Adenia rumicifolia Engl. - climber in forest margins
- PIPERACEAE**
Piper betle L. - small forest climber, possibly introduced
- RHAMNACEAE**
Colubrina asiatica (L.) Brongn. - climbing shrub in coastal thicket
Scutia myrtina (Burm.f.) Kurz - coastal bush, climbing shrub with thorns; **new record for Pemba**
- RHIZOPHORACEAE**
Bruguiera gymnorrhiza (L.) Lam. - mangrove tree
Cassipourea gummiflua Tul. var. *verticillata* (NE Br.) J Lewis - Medium-sized forest tree; south coastal Tanzania to south; **usual altitude above 1800m**
Ceriops tagal (Perr.) CB Robinson - mangrove tree
Rhizophora mucronata L. - mangrove tree
- RUBIACEAE**
Agathisanthemum bojeri Klotzsch - forest herb
Canthium mombazense Baill. - forest shrub
Chassalia umbraticola Vatke - forest and coastal thicket shrub
Craterispermum schweinfurthii Hiern - small forest tree
Cremaspora triflora (Thonn.) K. Schum. ssp. *confluens* (K. Schum.) Verdc. - forest Shrub or small tree. Kenya and Tanzania.
Geophila repens (L.) IM Johnston - forest herb
Guettarda speciosa L. - beach tree
Keetia gueinzii (Sond.) Bridson - forest shrub
Keetia zanzibarica (Klotzsch) Bridson - forest shrub or climber
Kraussia speciosa Bullock - forest shrub
Lagynias pallidiflora Bullock - forest shrub or small tree
Leptactina platyphylla (Hiern) Wernh. - Small forest tree; **new record for Pemba**
Polysphaeria parvifolia Hiern - forest shrub
Psychotria holtzii (K. Schum.) Petit var. *holtzii* - Small shrub of giant heath/forest margins. Restricted to coastal south Kenya and central Tanzania.
Psychotria lauracea (K. Schum.) Petit - forest shrub
Psychotria schliebenii Petit var. *schliebenii* - forest shrub
Psychotria tanganyicensis Verdc. var. *ferruginea* Verdc. - forest shrub
Psydrax kaessneri (S. Moore) Bridson - forest shrub

Psydrax livida (Hiern) Bridson - forest shrub or small tree
Psydrax recurvifolia (Bullock) Bridson - forest shrub
Psydrax schimperanum A. Rich. - dry forest tree; BN 4351. **New record for Pemba**
Pyrostria bibracteata (Bak.) Cavaco - forest shrub
Tarennia supra-axillaris (Hemsl.) Brem. ssp. *supra-axillaris* - small dry forest tree
Triainolepis africana Hook.f. ssp. *hildebrandtii* (Vatke) Verdc. - small dry forest tree
Tarennia pavettoides (Harv.) Sim ssp. *affinis* (K. Schum.) Bridson - forest shrub or small tree, restricted to coastal East Africa
Uncaria africana G. Don var. *orientalis* Verdc. - forest climber to canopy

RUTACEAE

Clausena anisata (Willd.) Benth. - shrub or small tree in dry forest
Teclea trichocarpa Verdoorn - shrub or small tree in dry forest
Vepris eugeniifolia (Engl.) Verdoorn - coastal forest shrub; BN 4336; **new record for Pemba**
Vepris ngamensis Verdoorn - small shrub of dry forest, restricted to coast of S Kenya and N Tanzania; BN 4358. **New record for Pemba; rare species**
Zanthoxylum holtzianum (Engl.) Waterm. - medium tree in coastal thicket

SAPINDACEAE

Allophylus griseo-tomentosum Gilg - sight record by Rodgers- not seen by me
Allophylus pervillei Bl. - forest liana
Allophylus vestitus FG Davies ined. - forest shrub; BN 4339 only known from central Tanzania before; **new record for Pemba; rare species**
Allophylus sp. near *grotei* - BN 4330 -forest shrub
Blighia unijugata Bak. - forest tree
Deinbollia borbonica Scheff. - small tree of drier forest
Dodonaea viscosa Jacq. - shrub of forest margin
Haplocoelum inoploeum Radlk. - medium tree in coastal thicket
Macphersonia gracilis O. Hoffm. - forest tree, restricted to the coasts of Kenya, Tanzania and Mozambique; **new record for Pemba**
Majidea zanguebarica Oliv. - forest canopy tree
Paullinia pinnata L. - forest climber
Stadmannia oppositifolia Lam. ssp. *oppositifolia* - large coastal forest tree; BN 4379. Restricted to Kenya and Tanzania coasts, Madagascar, Mauritius. **New record for Pemba**

SAPOTACEAE

Bequaertiodendron magalismontanum (Sond.) Heine & JH Hemsl. - medium forest tree
Chrysophyllum cf. lanceolatum (Bl.) DC. ver. *stellatocarpum* van Royen - forest tree only seen as shrub; BN 4304,4376 -**only African site**, otherwise known from Asia
Inhambanella henriquesii (Engl. & Warb.) Dubard - BN 4389 Medium-sized tree; coastal East Africa; **new record for Pemba**
Manilkara sansibarensis (Engl.) Dubard - medium dry forest tree
Manilkara sulcata (Engl.) Dubard - small tree of coastal thicket
Mimusops obtusifolia Lam. - dry forest tree
Pachystela brevipes (Baker) Engl. - forest canopy tree
Pachystela msolo (Engl.) Engl. - forest canopy tree
Sideroxylon inerme L. ssp. *diospyroides* (Baker) JH Hemsl. - small tree in coastal thicket

SCROPHULARIACEAE

Bacopa crenata (P. Beauv.) Hepper - RMH 2700 herb
Limnophila indica (L.) Druce - RMH 2699 herb

SIMAROUBACEAE

Quassia undulata (Guill. & Perr.) D. Dietr. [*Odyndea zimmermannii* Engl.] - forest canopy tree
Quassia indica (Gaertn.) Nooteboom [*Samadera indica* Gaertn.] - Medium-sized tree of swamp forest; an eastern species; **Pemba only African site**

SONNERATIACEAE

Sonneratia alba Sm. - mangrove tree

STERCULIACEAE

Heritiera littoralis Ait. - mangrove tree

THYMELEACEAE

Synaptolepis kirkii Oliv. - small shrub or climber in forest

TILIACEAE

Grewia stuhlmannii K. Schum. - climbing shrub of coastal bush

ULMACEAE

Trema orientalis (L.) Bl. - small forest tree

VERBENACEAE

Avicennia marina (Forssk.) Vierh. - mangrove tree

Premna obtusifolia R. Br. - RMH 2728 shrub - not seen by me

Vitex doniana Sweet - medium tree in open areas

VIOLACEAE

Rinorea arborea (Thou.) Baill. - small forest tree; coastal Kenya to Mozambique, Madagascar

VITACEAE

Cissus integrifolia (Bak.) Planch. - Climber in forest margins. **New record for Pemba.**

Cissus oliveri Gilg - forest climber

Cissus quinquangularis L. - dry forest/thicket climber

Cissus rotundifolia (Forssk.) Vahl - dry thicket climber

Rhoicissus revoilii Planch. - forest climber

Rhoicissus tridentata (L.f.) Wild & Drum. - forest liana

MONOCOTYLEDONS

AMARYLLIDACEAE

Scadoxus multiflorus (Martyn) Raf. - coastal thicket and forest herb

ARACEAE

Culcasia orientalis Mayo - forest climber

Gonatopus boivinii (Decne.) Engl. - coral bush herb

Typhonodorum lindleyanum Schott - large swamp herb; restricted to Madagascar and Pemba, Unguja

Zamioculcas zamiifolia (Lodd.) Engl. - coral thicket herb

COMMELINACEAE

Commelina diffusa Burm. f. - forest herb

Murdannia axillaris Brenan - forest herb

CYPERACEAE - the sedges: all Rodgers records from Ngezi

Cyperus prolifer Lam. ssp. *isoclados* Kukenth.

Cyperus tenax Boeck. var. *tenax*

Eleocharis acutangula (Roxb.) Schult.

Eleocharis geniculata (L.) Roem. & Schult.

Fimbristylis longiculmis Steud.

Fuirena claviseta Poir.

Fuirena umbellata Rottb.

Pycnus lanceolatus (Poir.) CB.Cl.

Pycnus mundtii Nees

Rhynchospora candida (Nees) Boeck.

DIOSCOREACEAE

Dioscorea sansibarensis Pax - BN 4314 wild yam; forest or bushland climber; **new record for Pemba**

FLAGELLARIACEAE

Flagellaria guineensis Schum. - forest climbing grass

GRAMINEAE - the grasses: all Rodgers records for Ngezi

Olyra latifolia L.

Oplismenus sp.

Panicum laticomum Nees

Panicum parvifolium L.

Panicum subflabellatum Stapf

Paspalum vaginatum Sw.

Pseudoechinolaena polystachya (Kunth.) Stapf

Schizachyrium rupestre (K. Schum.) Stapf

Setaria megaphylla (Steud.) Th. Dur. & Schinz

Vetiveria nigritiana (Benth.) Stapf

LILIACEAE

Asparagus falcatus L. - forest and thicket climber

Dracaena sp. (*fragrans/deremensis* complex) - BN 4363; shrub of high forest; **new record for Pemba; rare species**

Dracaena laxissima Engl. - sarmentose forest shrub
Sansevieria conspicua N.E. Br. - succulent herb in coastal thicket
Scilla sp. (restricted to coral at Msitu Mkuu, sight record only))

MUSACEAE

Ensete sp. near *proboscideum* - Wild banana; endemic to Ngezi Forest; vulnerable species

ORCHIDACEAE - the orchids

Acampe sp.
Aerangis hologlottis (Schltr.) Schltr.
Aerangis kirkii (Reichb.f.) Schltr.
Bulbophyllum sp.
Disperis johnstonii Rolfe - BN 4367 Small terrestrial orchid. new record for Pemba.
Eulophia sp.
Nervilia umbrosa (Reichb.f.) Schltr. - small terrestrial orchid
Vanilla roscheri Reichb.- leafless liana in coastal thicket

PALMAE

Chrysalidocarpus pmbanus Moore - Medium-sized palm tree. Endemic to Ngezi Forest. A vulnerable species
Elaeis guineensis Jacq. - the oil palm (occurs wild), common in moist forest
Phoenix reclinata Jacq. - the wild date palm, occasional in coastal thicket
Raphia farinifera (Gaertn.) Hyland - the Raffia palm; forms stands in swamps.

PANDANACEAE

Pandanus kirkii Rendle - the beach screw pine

SMILACACEAE

Smilax anceps Willd. - spiny climber

XYRIDACEAE

Xyris anceps Lam. - Small aquatic or swamp species

ZINGIBERACEAE

Aframomum angustifolium (Sonn.) K. Schum. - herb in moist sites
Costus sarmentosus Bojer - forest herb

11. RARE SPECIES OF CONSERVATION INTEREST

"not found" indicates that the species has been collected on Zanzibar (Unguja or Pemba) in the past, but not during my fieldwork.

ANNONACEAE

Uvariadendron kirkii - forest and bushland; not found

Uvaria sp. B (found at Ngezi)

Asteranthe asterias - forest; not found

Mkilua fragrans - forest ; not found

APOCYNACEAE

Strophanthus zimmermannianus (found at Ngezi)

CAPPARACEAE

Capparis fascicularis var. *scheffleri* (found at Uzi)

CONNARACEAE

Connarus sp. nov. (found at Ngezi)

ERICACEAE

Philippia mafiensis (found at Ngezi and ndamba areas of Pemba)

LILIACEAE

Dracaena fragrans - (found at Ngezi)

Dracaena aletiformis (found at Muyuni coast)

LINACEAE

Hugonia castaneifolia - forest and bushland; not found

MIMOSACEAE

Mimosa suffruticosa - only known from Zanzibar and Madagascar; not found on Unguja since 1833

MENISPERMACEAE

Dioscoreophyllum volkensii (found at Ngezi)

MORACEAE



Dorstenia tayloriana (found at Ngezi)
 MUSACEAE
 Ensete proboscideum - (only at Ngezi)
 PALMAE
 Chrysalidocarpus pembeanus (only at Ngezi)
 PANDANACEAE
 Pandanus rabaiensis (found at Jozani)
 RHAMNACEAE
 Lasiodiscus pervillei (found on Grave Island)
 RANUNCULACEAE
 Clematis viridiflora (found Jozani north)
 RUTACEAE
 Vepris ngamensis (found at Msitu Mkuu)
 SAPINDACEAE
 Allophylus vestitus (found at Ngezi)
 Chytranthus prieurianus - **endemic to Zanzibar, "rocky plains"**; not found
 Haplocoelum trigonocarpum (found at Grave Island and Muyuni)
 Macphersonia gracilis (common on S Unguja, rare at Msitu Mkuu)
 Stadmannia oppositifolia (found at Msitu mkuu)
 ZINGIBERACEAE
 Costus sarmentosus (found at Ngezi)

MADAGASCAR LINKS

Typhonodorum lindleyanum - swampy sites on Unguja and Pemba

ASIAN LINKS

Chrysophyllum lanceolatum, otherwise only known from Asia: Ngezi only African site
Quassia indica, otherwise only known from Asia; Ngezi only African site
Hunteria zeylanica var. *zeylanica*, otherwise only known from Asia; Msitu mkuu only African site

HIGHLAND LINKS

Cassipourea gummiflua - usually found above 1800 meters
Quassia zimmermannii, *Trichoscypha ulugurensis*, *Millettia oblata*, *Polyscias fulva* usually found above 900 meters

ENDEMICS

Chrysalidocarpus pembeanus - Ngezi
Ensete sp near *proboscideum* - Ngezi
Eugenia sp. nov. - Unguja and Paemba coral rag thicket
Malacantha alnifolia var. *sacleuxii* - Muyuni coastal forest

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