THE UNITED REPUBLIC OF TANZANIA

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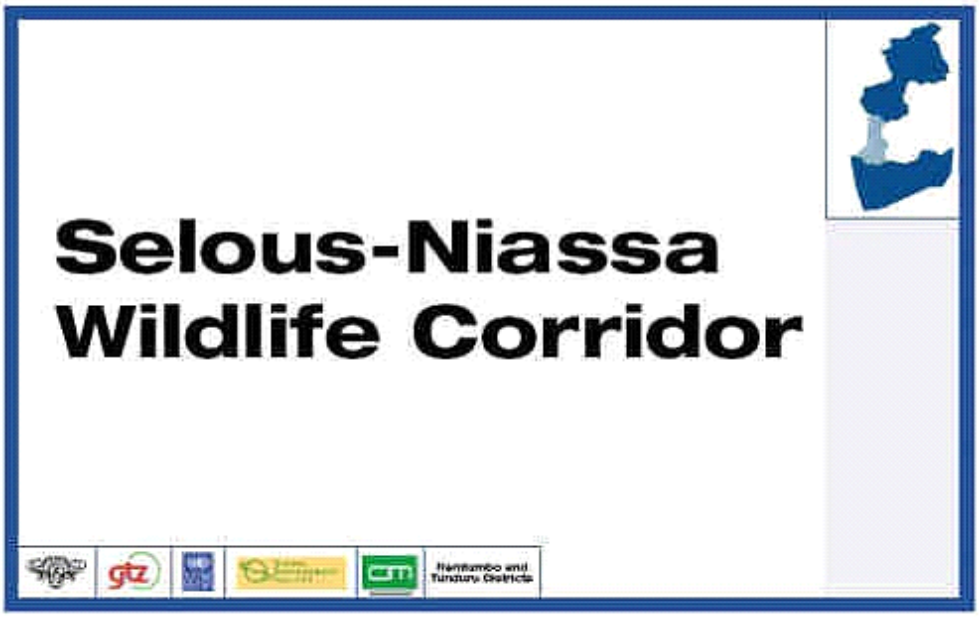
WILDLIFE DIVISION



VEGETATION STUDY

BIODIVERSITY, CONSERVATION VALUES AND MANAGEMENT STRATEGIES

NOVEMBER 2006

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THE DEVELOPMENT AND MANAGEMENT OF THE SELOUS – NIASSA WILDLIFE CORRIDOR

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Contents

Acknowledgements

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Summary

A first vegetation study has been carried out in the Selous-Niassa Wildlife Corridor from 12 to 26 September 2006 focussing on potential plant biodiversity hotspots, i.e. vegetation formations along watercourses, in swampy areas, on rock outcrops or other arid areas. Two major ecosystems occur within the Corridor: the miombo woodland and the savanna landscape along the Ruvuma River where the rainfall is lowest. Dry evergreen forest patches of various shapes and sizes are scattered within the two major ecosystems including different types of riverine forests, thickets on termite hills and vegetation associated with rock outcrops.

In total, 371 species have been recorded in the Corridor including three threatened species from the IUCN Red List, six from the CITES list and three species are endemic for Tanzania. The small-sized dry evergreen forest formations include several species with a high conservation value.

Considering that the whole Corridor will be used and protected by Wildlife Management Areas excluding any agricultural activities, several threats for the vegetation exist. Current timber harvesting of the highly searched woodland species *Afzelia quanzensis* and *Pterocarpus angolensis* and the riverine species *Breonadia salicina* and African Mahogany is unsustainable and may lead to their economical extinction. Hot late dry season fires provoke a regress of the species-rich dry evergreen patches of forest mainly composed of fire sensitive species. In addition, frequent hot fires lead to a more open and uniform structure of miombo woodlands and savannas, thereby reducing the species number. Moreover, the increasing spread of paddy fields and tobacco plantations in the southern part of the Corridor require urgently the establishment and functioning of WMA's in order to ensure a rational development of the area.

Further vegetation studies are needed especially along Ruvuma River and in the dry evergreen forest formations including also the not yet surveyed inselbergs. This will not only allow to complete the checklist but also to better define the different vegetation types. Regarding the establishment of a fire management plan we propose to start with controlled early dry season fires in some well defined areas in order to reduce devastative late dry season fires. A more intensive exchange of information, including vegetation data, with the Niassa Game Reserve in Mozambique would be in profit for the sustainable management of both areas.

1. Introduction

The Selous-Niassa Miombo woodlands of southern Tanzania and northern Mozambique are one of the largest and for the global biodiversity most significant, trans-boundary natural ecosystem in Africa, covering over 154,000 km^2. Through a network of various protected areas about 111,000 km^2 of this ecosystem are conserved including the Selous GR in Tanzania, which covers about 47,000 km^2 making it the largest protected area in eastern and central Africa, and the Niassa GR in Mozambique covering about 42,000 km^2 (see map in Annex C). The Selous-Niassa Wildlife Corridor provides a significant biological link (migratory route) between the two game reserves hosting the world's largest elephant (*Loxodonta africana*), buffalo (*Syncerus caffer*) and sable populations (*Hippotragus niger roosevelti*). In addition, the Corridor supports a large number of globally threatened animals cited in the IUCN Red List and CITES (mammals like e.g. wild dogs (*Lycaon pictus*)). However, uncontrolled and unplanned conversion of land for agricultural purposes, ribbon development along the major roads, unsustainable and often illegal use of natural resources including the high value poaching of ivory across the national boundaries and uncontrolled fires are severe threats to its continued existence.

The overall objective of the project "The development and management of the Selous-Niassa Wildlife Corridor" is the long-term integral conservation of the Miombo woodland ecosystems within the Corridor. The project is executed by GTZ-IS under the Wildlife Division of the Ministry of Natural Resources and Tourism and financed by GEF with its implementing agency UNDP.

The Selous-Niassa Wildlife Corridor will be protected with a network of WMA's under the management of CBO's excluding any agricultural activity. During a participatory land-use planning process with the local communities, the future natural resources use will be defined along with a zoning plan of these areas. Economically most important activities in the Corridor will be related to wildlife i.e., substantial extra income from hunting companies and/or own consumption. Other activities may include the domestic use and/or commercialisation of wood products like fuel wood, poles or timber or non-wood forest products like honey, fruits, ropes, medicinal plants or mushrooms by community-based projects.

This study focuses on the description of the main ecosystems within the SNWC and the assessment of the biodiversity and conservation values of the different vegetation types (see TOR, Annex B). Current and potential threats to the sustainable management of the Corridor will be described and additional research activities proposed if necessary. The results of this study will contribute to the management of the Mbarangandu (Namtumbo District) and Nalika (Tunduru District) WMAs under establishment and the identification and land-use planning of new WMAs.

The field survey has been carried out in the second half of the dry season from 12 to 26 September 2006 (see Annex D) focussing on potential plant biodiversity hotspots, i.e. vegetation formations along watercourses, in swampy areas, on rock outcrops or other arid areas. The itinerary of the field trip has been carefully prepared by the SNWC project staff. Most vegetation surveys could be accomplished before general burning started although burning was quite widespread towards the south, mainly near the Ruvuma River.

A provisional plant list with full names (including author) is given in Annex G. Additional vegetation studies will complete the plant list. A more detailed analysis of the extensive data

will be done once all species have been identified and the results will be presented in a scientific journal.

2. The Selous-Niassa Wildlife Corridor

The proposed wildlife corridor (*Ushoroba*) in Ruvuma Region of Southern Tanzania has an area of about 10,000 km^2 (see Annex C) extending approximately from 10° S to 11°40' S. The larger part of the Corridor lies in Namtumbo District while a smaller part in the east lies in Tunduru District. The Corridor borders the Selous GR (North East Undendeule FR) in the north and the Niassa GR in Mozambique along the Ruvuma River in the south. Bio geographical baseline data are very scarce for this very remote area.

The northern part is generally more hilly while the area towards the Ruvuma mostly is slightly undulated to flat with isolated hills, some of them having prominent rock outcrops (inselbergs). Mtungwe Hill (1284m a.s.l.) in the centre of the Corridor is the highest elevation. The plateau slightly slopes to the Ruvuma River which reaches its lowest level of about 460m a.s.l. in the south-eastern corner of the Corridor. The soils are generally very sandy and washed-out. Two drainage basins exist in the SNWC. North of the watershed, located roughly along the main Road Namtumbo-Tunduru, the rivers run into the Rufiji River while south of the watershed the area is part of the Ruvuma drainage basin. Some of the major tributaries like Mbarangandu, Lukimwa, Luchulukurun, Luego or Msanjesi are usually permanent watercourses.

The mean annual rainfall at Soluti Agricultural Sub-research Station (about 8 km from Namtumbo town) is about 1220 mm (1993-2005, see Annex E), what is slightly higher than that at Songea town with about 1130 mm (White 1983). It is expected that the northern part of the Corridor receives about 1200 mm rainfall per year. The rainfall generally decreases towards the south and the mean annual rainfall may be about 800 mm along the Ruvuma River. The aridity of the sites towards the Ruvuma River is further enhanced by the higher evapotranspiration due to the lower altitude and due to the high sand content of the soils.

The Corridor has the typical unimodal rainfall system of the Miombo woodland ecosystem (Bloesch 2002). The southeast monsoons, bearing moisture from the Indian Ocean, are responsible for the rainy season chiefly occurring from mid-November to mid-May, however inter-annual variations are important. Northeast winds prevail in the dry season and there is usually no measurable rain for at last five months but fog may sporadically occur at higher elevations. The variability of mean annual rainfall is quite high with 24.1% using the coefficient of variation defined as standard deviation expressed as % of the mean (Norton-Griffiths et al. 1975). The coefficient of variation is an indicator for the predictability of rainfall and therefore an important factor for crop production. The mean annual temperature is about 21°C and the climate type following the Köppen system is Aw (Köppen 1931).

Freely drained soils are prevalent at different topographic positions in the Corridor, mainly covered with miombo woodlands and partially by savannas. Dry evergreen riverine forests of limited extent occur along perennial or intermittent watercourses. Vast areas are annually burnt and late dry season fires are severe due to the prolonged dry drought.

Namtumbo District is sparsely populated having only 11 people per km^2 according to the population census 2002. The economy depends on agriculture crop production while livestock

(mostly goats) is very poorly developed. Maize, beans and rice are mainly cultivated for subsistence while in some areas coffee, cashew nuts and increasingly tobacco are grown as cash crops. In contrast to other miombo woodlands, the Corridor area is not used for cattle ranching.

3. Methods

The vegetation was surveyed using both quantitative and qualitative criteria. Quantitative data for all types were obtained from standard-sized sampling plots following the method of Braun-Blanquet (1932). In total, 15 vegetation plots have been surveyed in the following vegetation types (see Annex F):

Miombo woodland on plateaus:	3
Miombo woodland on rocky ridges (summits):	3
Miombo woodland on slopes:	3
Savannah woodland:	2
Groundwater forest:	2
Gully forest:	2

At each plot, the tree and shrub layer was studied in an area of 25x25m where possible (some vegetation communities were of smaller size) and the herb layer was studied using a subplot of 5x5m in the centre of the plot, following consideration of the appropriate minimal area for these vegetation types as defined by Bloesch (2002). Cover value and height of each layer and other habitat notes including the coordinates of the site were taken for each plot. The cover-abundance value of all species was recorded, separately for each layer of the reference area using the following scale:

5: Any number, with cover more than ¾ of the reference area (> 75 %)
4: Any number, with cover ½ - ¾ cover (50-75 %)
3: Any number, with cover ¼ - ½ cover (25-50 %)
2: Any number, with cover 1/20 - ¼ cover (5-25 %)
1: Numerous, but less than 1/20 cover, or scattered, with cover up to 1/20 (5 %)
+: Few, with small cover

Additionally, boundary values were noted by recording both cover-abundance values, putting the higher value in brackets, e.g., 1(2).

Qualitative assessment is based on opportunistic collection and observations of tree, shrub and ground floras throughout the fieldwork either along the road to the next destiny or during the investigation tour on foot. We focused on a) vegetation communities of restricted distribution, either unique assemblages or highly localized in extent and b) taxa of restricted distribution which are either endemic to a small area or are highly disjunctive. Vegetation communities of limited extent such as woody plants fringing in patches Korongos, thickets on termitaria or vegetation patches on rock outcrops were surveyed opportunistically since their size did not allow a full sampling by a vegetation plot. Opportunistic sampling allowed to supplement the data from the vegetation plots and to collect extra plant specimens in order to facilitate taxonomic identification of species.

All flowering plants and ferns have been recorded and at least one specimen per species has been collected, and when possible, flowers and fruits were taken to help identification of

individuals (occasionally, also conspicuous mosses and lichens were collected). Trees were identified a) using slash and bark characters, b) observing canopy leaves with binoculars and/or c) taking coppices, low branches and fallen leaves. In addition, a catapult was used for breaking off small branches with leaves, where needed. All specimens were pressed and dried in the field. The "Field Guide to the Trees and Shrubs of the Miombo Woodlands" (Smith & Allen 2004) was very helpful for woody species identification in the field. Uncertain or not known taxa were identified at the University of Dar es Salaam's Herbarium. Flowering plants and ferns have been named following the nomenclature of the Flora of Tropical East Africa. A list of all recorded flowering plants and ferns is given in Annex G, including scientific names, vernacular names (*ndendeule*), if possible, and some information regarding the habitat and the uses of the species (phenology of melliferous woody species see Mwangulango 2004). Endemism and extinction threat were determined for all vascular species recorded within the Corridor. The endemism of a species was determined by looking at their geographical distribution, and the extinction threat by looking at their conservation status as defined by CITES (2006) and IUCN (2006).

4. Vegetation types

Two major ecosystems occur in the Corridor: the miombo ecosystem covering by far the largest part of the Corridor and a drier savannah ecosystem bordering the Ruvuma River. Within the two ecosystems different types of miombo and savannah respectively occur. In addition, several vegetation types mainly of small size are scattered: riverine forest, gully forest (mainly in the miombo ecosystem), termitophyllous vegetation, vegetation on rock outcrops) and grasslands (Mbuga).

Miombo woodlands (vegetation plots 1, 4, 6, 8, 9, 10, 11, 14, 15)

Vegetation structure and floristic composition of miombo is fairly homogeneous over large areas and only slightly influenced by the topographic position (see also Rodgers 1996). The canopy cover usually oscillates between 30-40%. Most of the miombo dominants are widely distributed and have wide ecological amplitudes. Since they combine kaleidoscopically a classification of different vegetation types within the miombo woodland is of limited value. Vegetation structure and floristic composition of miombo woodland are very different from other vegetation types. In species composition the miombo is distinct from savannas at the generic level for trees and, therefore, in many aspects of its ecology (Rodgers 1996).

Miombo is characterized by trees of the *Caesalpiniaceae* family, and nearly always dominated by species of *Brachystegia*, either alone or with *Julbernardia* species. These typical miombo species do not occur in other vegetation types like the adjacent savannah formations or riverine forests. In total we have identified 8 species of *Brachystegia*, namely: *B. boehmii*, *B. bussei*, *B. floribunda*, *B. longifolia*, *B. microphylla*, *B. spiciformis*, *B. stipulata* and *B. utilis*. Most *Brachystegia* are ubiquitous species, i.e. having wide ecological amplitude but some species show clear site preferences. *B. floribunda* is more frequent in the higher rainfall area of the northern Corridor. *B. bussei* and *B. microphylla* are virtually confined to rocky hills whereby the latter only occurs on rocky summits or ridge tops. On the other hand, *B. spiciformis* prefers deeper plateau soils which are traditionally used by shifting cultivation. Because the dominants of miombo are extremely gregarious, few other species enter the

canopy. The principal canopy associates are *Parinari curatellifolia*, *Pericopsis angolensis* and *Pterocarpus angolensis*.

The under storey tree and shrub layer is variable in density and species composition. Several species of small trees less than 8m occur scattered in miombo. *Pseudolachnostylis maprouneifolia* is a ubiquitous species and is commonly found in escarpment and plateau miombo woodland. *Diplorhynchus condylocarpon* is often associated with thin, rocky soils such as *Dalbergia nitidula* and *Monotes katangensis*, but it is also a ubiquitous species found in most woodland types. Other ubiquitous species are *Terminalia sericea* and *Uapaca nitida*. *Uapaca kirkiana* and *U. sansibarica* are frequently dominant on shallow soils, especially on bare areas where surface soil erosion is abundant (see Fig. 3). Several species of *Strychnos* and *Flacourtia indica* occur scattered in miombo on deeper plateau soils, whereby the latter is also frequent in riverine forests. *Faurea* spp. and *Protea angolensis* are common in more open miombo types. In addition different species of *Combretum* are widespread in the miombo.

Landolphia parvifolia is a scandent shrub or liana often associated with rock outcrops. Lianas are generally sparse in miombo woodland. The epiphytic lichen *Usnea barbata* and vascular epiphytes like the orchids *Angraecum stolzii*, *Bulbophyllum mahonii* or *Microcoelia exilis* are more frequent in the moister miombo type. Many *Brachystegia* species are host to the hemi-parasitic mistletoes of the family *Loranthaceae* like e.g., *Phragmanthera dschallensis*, *P. usuiensis* or *Agelanthus sansibarensis*.

As many tropical grasses, also most of the miombo grasses are typical pan-tropical. *Themeda triandra* is widespread and occur at different *topographic* positions. On deeper plateau soils tall grasses of *Hyparthelia dissoluta* and *Andropogon gayanus* having a height of about 2m dominate. On hill slopes, *Hyparrhenia newtonii* and *Andropogon schirensis* having a height of 1.2-1.4m, are very frequently present. On leached soils grasses are mostly 0.6-0.8m, *Aristida adscensionis* being mostly dominant.

White (1983) distinguishes two types of miombo woodland: wetter miombo, usually having more than 1,000 mm of rainfall per year and drier miombo, usually having less than 1,000 mm of rainfall per year, respectively. The very high sand content of the soil increases the dryness of the habitat all over the Corridor. Therefore, also the structure and floristic composition of the woodland in the northern part of the Corridor with slightly more than 1,000 mm of mean annual rainfall resemble White's drier miombo type. In the higher-rainfall areas of the north, some trees are evergreen but most are deciduous for a short time. Towards the south most trees are deciduous for at least some weeks. The old leaves are shed as the new leaves unfold some weeks or even months before the end of the dry season (see Fig. 1). Some trees like *Parinari curatellifolia* or *Boscia angustifolia* or several shrubs like *Protea angolensis* or *Memecylon flavovirens* are strictly evergreen all over the Corridor. On the other hand, *Pterocarpus angolensis* is strongly deciduous and is tightly synchronized with precipitation: flowering and leaf flush occur during August – December and leaves are shed in May and June. Leaf fall begins early in the dry season and is more complete and prolonged than most other species (Schwartz et al. 2002).

Fig. 1. New flush of leaves of *Brachystegia*, nearby Sasawara FR.

Most miombo tree species are quiet resistant to fire at adult stage (*Brachystegia* species however are quite sensitive to fire, see Rodgers 1996) contrary to their seedlings and saplings which are vulnerable to intense fire since they are lacking the protection of a thick bark. Therefore, regular late burning has favoured miombo stands with a very open under storey. Frequent cultivation and excessive burning may transform miombo woodland into a savannah landscape with species tolerating drier conditions.

On rock outcrops and on stony slopes the miombo woodland has most probably not been modified by agricultural activities. Miombo on deeper plateau soils has been subjected to agricultural practices although, due to the actual low population density, the fallow period at a same stand lasts certainly more than a decade. Once the cultivated land becomes again fallow, the cut miombo trees sprout vigorously, and the trees recover if left untouched for 10-15 years (see Fig. 2). These secondary miombo woodlands are often uniform in age and size as a result from sprouting trees after mutilation during the previous cycle of cultivation. As a consequence of fire, browsing and agricultural activities around the villages the structure and floristic composition have been altered and probably simplified favouring generally savannah species.

Fig. 2. Stand of sprouting *Brachystegia spiciformis* at a formerly cultivated site about 3 km from the village of Mtelawamwahj.

Two particular miombo woodland types were identified:

Stunted miombo with *Uapaca* spp. (4)

On shallow, mostly bare soils open stunted miombo with a canopy cover of 10-20% occur. This vegetation type is largely dominated by *Uapaca kirkiana* and *U. sansibarica*. Few other stunted trees such as *Brachystegia utilis* or shrubs such as *Ximenia caffra* or *Garcinia* livingstonei are associated (see Fig. 3) The soil of these sites are almost exclusively composed of quartzite sand without nearly any finer soil particles which are important for the cohesion of the soil. As a consequence these sites are highly eroded.

Fig. 3. Stunted *Uapaca kirkiana* and U. *sansibarica* on gravelled soil near Mburukasese.

Tall miombo woodland with *Burkea africana* and *Erythrophleum africanum*

A particular woodland dominated by tall *Burkea africana* and *Erythrophleum africanum* occurs inland of a narrow fringing forest along Ruvuma at Namakungwa fishing camp on alluvial soil (see Fig. 4). The tree canopy cover is about 40%. The dominants reach tree heights of over 20m on this fertile site (most probably a former floodplain). Other *Caesalpiniaceae* trees such as *Tamarindus indica* and *Piliostigma thonningii* also occur but none of the dominating miombo species *Brachystegia* and *Julbernardia* are present.

Savannas (12, 13)

With increasing aridity towards the south the proportion of more drought tolerant species typical for savannah ecosystems gradually increases: *Acacia* spp., *Adansonia digitata, Annona senegalensis, Combretum* spp., *Dalbergia melanoxylon, Dichrostachys cinerea, Euphorbia candelabrum, Oxytenanthera abyssinica, Piliostigma thonningii, Sclerorcarya birrea* and *Stereospermum kunthianum*. Finally the miombo dominants *Brachystegia* and *Julbernardia* disappear and miombo woodlands are replaced by savannah formations.

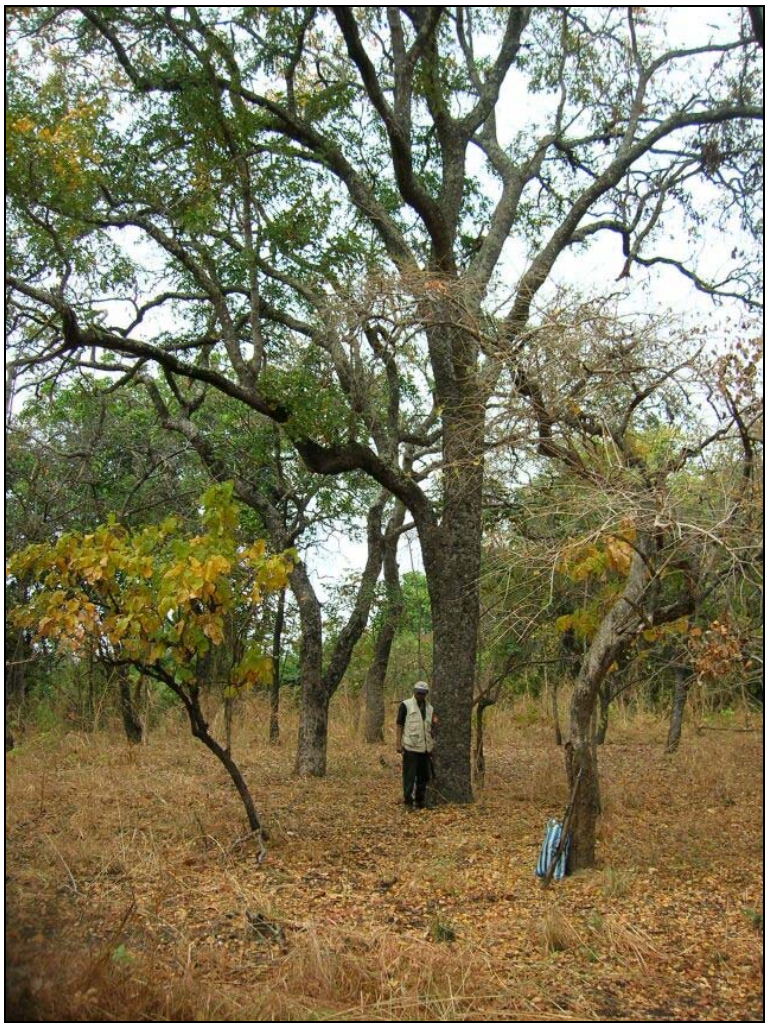

Fig. 4. Tall miombo woodland with *Erythrophleum africanum* and *Burkea africana* at Namakungwa fishing camp, Ruvuma River.

Different species of *Acacia* and locally also of *Combretum* spp. dominate the savannas in the drier area along the Ruvuma River. Stands with tall *A. clavigera*, *A. nigrescens* and *A. xanthophloea* and with small A. *goetzeii* ssp. *goetzei* are widespread. These acacias as most other savannah trees are absent from the miombo woodlands. Most of the pan-tropical grasses, however, occur in both biomes. Patches of a particular savannah woodland are found adjacent to the fringing forests along the Ruvuma River. The canopy is an open nearly monospecific stand composed of emergent *Acacia clavigera* having a height of about 18m (see Fig. 5). A very thick almost impenetrable understorey consists of mainly deciduous much-branched coppice-like shrubs of *Boscia angustifolia*, *Maerua kirkii*, *Combretum paniculatum*, *Combretum* sp., *Croton pseudopulchellus*, *Garcinia livingstonei* and *Grewia mollis*. Open shrub savannas with a canopy cover of less than 10% are frequent and locally almost completely composed of *Combretum fragrans* (see Fig. 6). Additional surveys in the savannah part are necessary for distinguishing further savannah types. It is noteworthy that south of the GFT camp at Mbarangandu River and south-west of Kilimasera transition zones between dry miombo woodland and savannah exist.

Fig. 5. Savannah woodland with *Acacia clavigera* with dense understorey at Makaloye nearby Magazini, Ruvuma River.

Riverine forests (2,3,5,7)

Riverine forests are mostly of limited extent. They occupy a transitional zone, or ecotone between aquatic and terrestrial ecosystems. Not only do species adapted to upland-terrestrial and aquatic environments meet within the zone, but the ecotonal environment allows for species not suited for either of the adjacent ecosystems (Medley & Hughes 1996). This vegetation is often rich in species. The riverine ecosystem is linear and narrow in form as it parallels the stream channel, has either diffuse or sharp edges attributable to the nature of species interactions across the ecotone and disturbances. Furthermore, the riverine forests are often broken or fragmented in response to the dynamic nature of the aquatic stream system.

Fig. 6. Open shrub savannah with *Combretum fragrans* at Namakungwa fishing camp, Ruvuma River.

The levees of perennial and intermittent watercourses and small drainage channels on flat areas (Korongos) in the Corridor are usually covered with woody plants occurring as thicket, fringing forest or woodland. Dry evergreen riverine forests occur also in areas with a high water table. It is rare to find undisturbed example of riverine forests since this vegetation has been kept open by the movements and browsing of large mammals. According to the topographic position and the water supply, riverine forests are quite heterogeneous regarding species composition. Dry evergreen riverine forests have a distinct floristic composition and only a few species in common with miombo woodlands and savannas. Species with wider ecological amplitude are the timber species *Breonadia salicina* and African Mahogany (*Khaya anthotheca*), *Polysphaeria braunii*, *Sorindeia madagascariensis*, *Syzygium guineense* subsp. *guineense* and the giant liana *Entada gigas* (see Fig. 7).

Discontinuous fringing forests of about 15(20)m height occur along the Ruvuma River mainly composed of species like e.g., *Antidesma venosum*, *Dalbergia armata*, *Deinbollia borbonica*, *Ficus sycomorus*, *Kigelia africana*, *Polysphaeria braunii*, *Sorindeia madagascariensis*, *Syzygium guineense* subsp. *guineense*, *Treculia africana*, *Voacanga africana* and the liana *Saba comorensis*. Moreover, we found a new *Annonaceae*, *Xylopia* sp. nov. which is quite frequent in these riverine forests.

At Mkolesya, several islands occur side by side in the Ruvuma River (Fig. 8). Due to the meandering of the river, size and location of sandbanks and levees are constantly changing. Therefore the islands are mostly colonised by pioneer species. Woody plants such as *Dalbergia armata*, *Mimosa pigra*, *Phyllanthus reticulatus*, *Syzygium guineense* subsp. *guineense* and *Trichilia dregeana* are usually covering the levees bordering the sandbanks. Older sandbanks are vegetated in patches mainly with *Phragmites mauritianus* and other

grasses and sedges. Additional islands in the Ruvuma River exist but could not be visited during this mission due to time constraints.

Fig. 7. Giant liana (*Entada gigas*) in the forest fringing Lukimwa River.

Fig. 8. Mkolesya islands, Ruvuma River.

Dry evergreen forests may occur also as dense narrow ribbons along deeply dissected erosion gullies in steep side valleys with heterogeneous species composition. Characteristic species of these gully forests are e.g., *Albizia amara*, *Millettia dura*, *Xylopia parviflora* and the scandent shrubs *Combretum pentagonum* and *Smilax anceps*. These sites are an important refuge for leopards (*Panthera pardus*).

A semi-evergreen groundwater forest occurs on a floodplain along Mbarangandu River close to the GFT camp (see Fig. 9). The tallest trees reach height of up to 20m with a canopy cover of more than 50% locally. The dominating trees are *Afzelia quanzensis*, *Lettowianthus stellatus*, *Rauvolfia caffra*, *R. mombasiana* and *Trichilia emetica*. Common species of the rich under storey are *Kigelia africana*, *Polysphaeria braunii*, *Syzygium guineense* subsp. *guineense* and *Xeroderris stuhlmannii*.

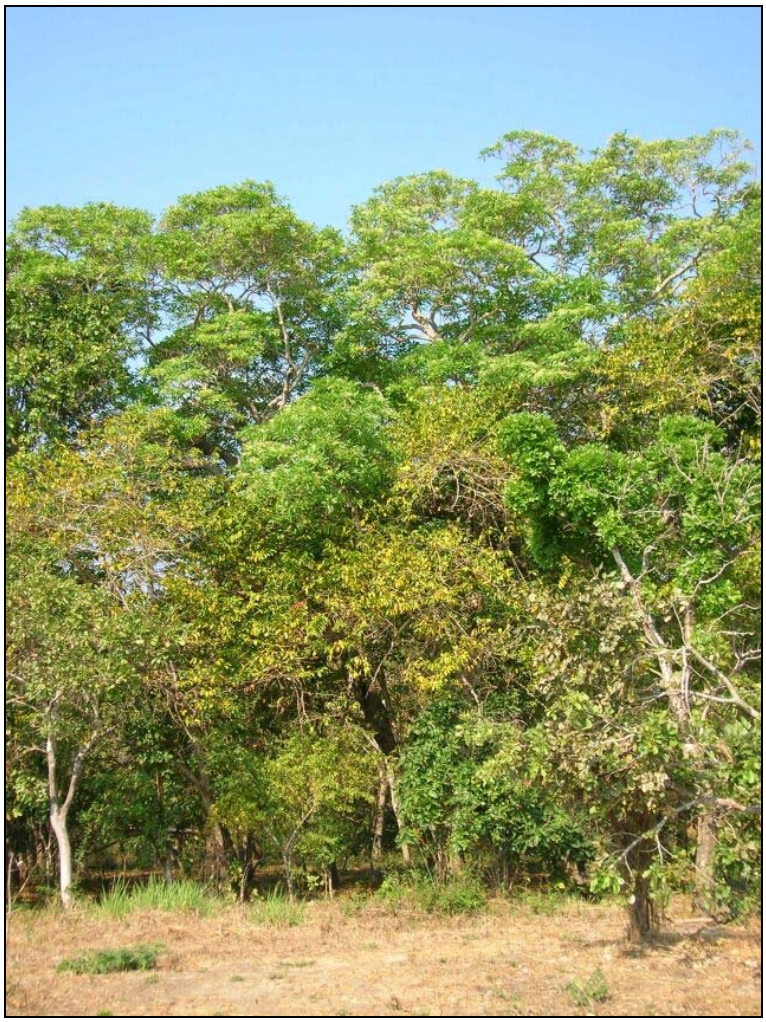

Fig. 9. Semi-evergreen forest on floodplain along Mbarangandu River.

A particular groundwater forest of about 2 ha exists near Mkundi River (see Fig. 10). This evergreen forest consists exclusively of African Mahogany up to 40m tall, forming a dense canopy cover of about 70%. The under storey is mainly composed of African Mahogany recruitment, *Catunaregam spinosa*, *Polysphaeria braunii* and the scandent shrub *Combretum pentagonum*. The swampy area is frequently visited by elephants.

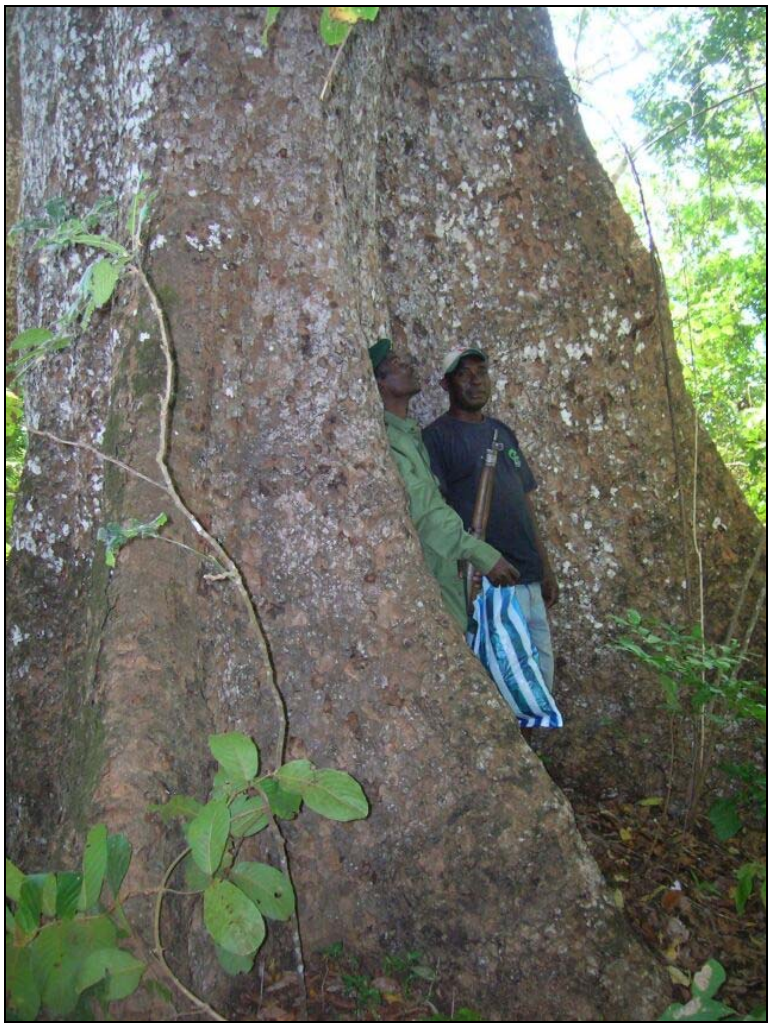

Fig. 10. African Mahogany (*Khaya anthotheca*) groundwater forest near Mkundi River.

Mbugas

Mbugas are irregularly scattered all over the miombo ecosystems occupying flat areas often in small depressions (called dambo in Zambia). These seasonally waterlogged grasslands on black cotton soils are usually treeless and only their fringes are colonised with *Syzygium cordatum* (see Fig. 11). The vegetation is usually dominated by tall tussock grasses of over 2m height, mainly *Hyparrhenia variabilis*, *Miscanthus violaceus*, *Panicum maximum*, *Pennisetum purpureum* and some conspicuous herbs like *Pycnostachys dewildemaniana*. Mbugas are frequently burnt.

Fig. 11. Mbuga near GFT camp at Kilimatembo (Kutulika area).

Thickets on termite hills

Termite hills are widespread in the Corridor (see Figs. 12, 13). In the centre and towards the Ruvuma River conspicuous active termitaria built by *Macrotermitinae* are plentiful (see Fig. 14). Both moribund and occupied termite hills may be protected from erosion by a dense thicket (Pullan 1979; Bloesch 2002), often with one or more emergent trees such as *Acacia clavigera*, *Boscia angustifolia*, *Euphorbia candelabrum*, *Manilkara mochisia*, *Pappea capensis* and *Tamarindus indica*. Small trees, scandent shrubs and lianas are commonly found but grasses, mainly *Panicum trichocladum*, occur only sporadically when the thicket is dense. *Aloe* sp. and *Sansevieria ehrenbergii* occasionally form a ground cover beneath trees on the summits of the hills. Elephants may cause important damage to termite hills by excavating the mounds using their tusks for eating the mineral rich soil (see Fig. 12).

The composition of the thickets varies considerably and the flora is distinct from that of the surroundings (see also White 1983; Bloesch 2002). The termitophilous vegetation shows xeromorphic tendencies. Many plants have prickles such as *Commiphora* spp. or *Ziziphus mucronata*, sclerophyllous leaves such as *Boscia angustifolia, B. coriacea*, *Cadaba kirkii*, *Maerua kirkii*, *Ritchiea capparoides* (all *Capparaceae*) and *Vepris glomerata* or a fleshiness structure (e.g. *Euphorbia candelabrum* or *Sansevieria ehrenbergii*).

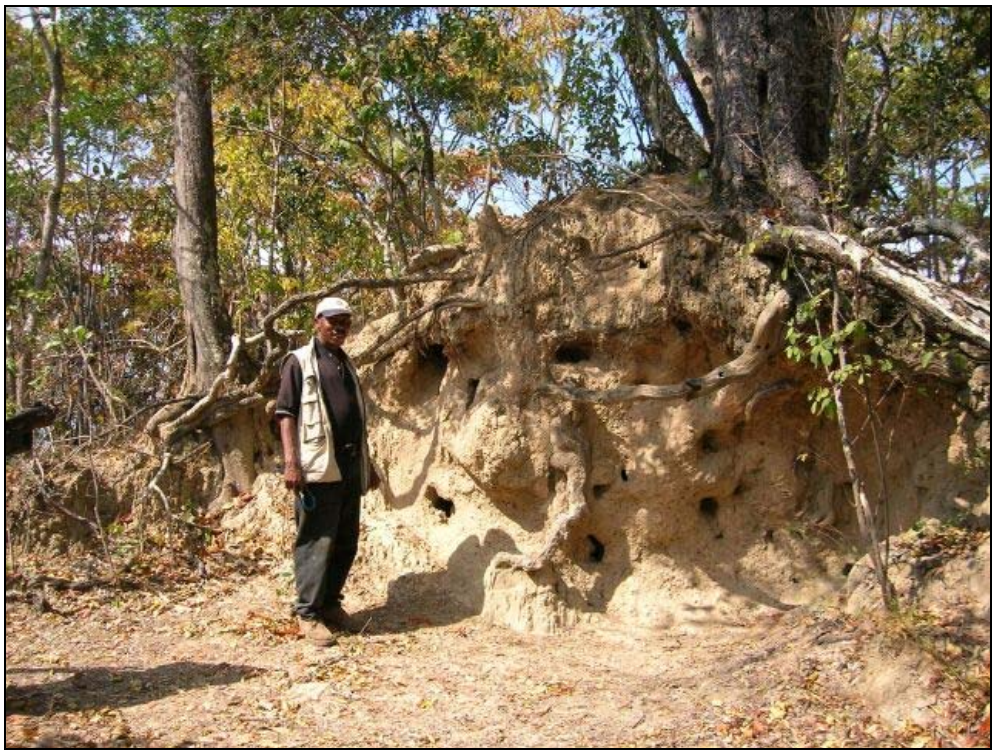

Fig. 12. Excavated termitaria by elephants for eating the mineral rich soil, Mtungwe Hill.

Fig. 13. Termite hills on which the thicket has been replaced by grasses following interferences ether by man (cultivation) or large animals (mainly elephants) and regular fires. This hill erodes rapidly at the beginning of each rainy season before the grass grows, whilst the fire prevents recolonisation by woody plants.

Fig. 14. Active *Macrotermitinae* mound at Mkolesya area, Ruvuma River.

Large mound-building termites are fungus growers living in symbioses with *Termitomyces* fungi (Bloesch 2002) which are specific for each termite species. The fungi further digest the faeces of the termites which can be re-ingested by termites. The fungus-combs, rich in proteins and vitamins, act as a reserve and are consumed in periods of food shortage. By eating on the fungus-comb termites include in their gut cellulose necessary to digest cellulose. Once the termites have abandoned the nest *termitomyces* may produce edible fruit bodies emerging on or near the mounds mainly early in the rainy season (see below).

The alates, the winged reproductives of the termites are an important source of protein. When they leave the mound en masse at the onset of the rainy season they are collected and eaten by the local population.

Rock outcrops

Formations of granite boulders of different sizes are scattered mainly in the southern part of the Corridor (see Figs. 15-18). Formations of the size of a hill or a small mountain are called inselbergs (or kopje). They abruptly rise from a gently sloping or virtually level surrounding plain of hard bedrock. The genesis of inselbergs is intimately connected with weathering and erosion in a humid climate (for more details about the complex geomorphological process see Bremer & Sander 2000).

Rock outcrops are extreme habitats due to dry microclimate and scarce soil cover. A number of plants show vegetative adaptations (succulence, poikilohydric plants, and carnivorous plants) that may be advantageous in coping with these adverse conditions (Barthlott & Porembski 2000; Seine & Becker 2000). The grey, brown or colourful (orange, yellow) appearance of inselbergs results from a dense cover of cryptogams. Rock surfaces are mainly vegetated by lichens with cyanobacteria as the phytobiont. Lichens with chlorophytic algae as phytobiont are restricted to small areas along drainage channels, rock pools (see Fig. 15), or of elevated microrelief (Seine & Becker 2000). Mats of grasses and sedges are well represented on rock outcrops (see Fig. 16). Typical inselberg species belong, e.g., to the genus *Xerophyta* (*Velloziaceae*, see Fig. 17). Woody vegetation is confined to crevices in the rocks, clefts or around boulder bases where water and soil may accumulate (see Seine & Becker 2000).

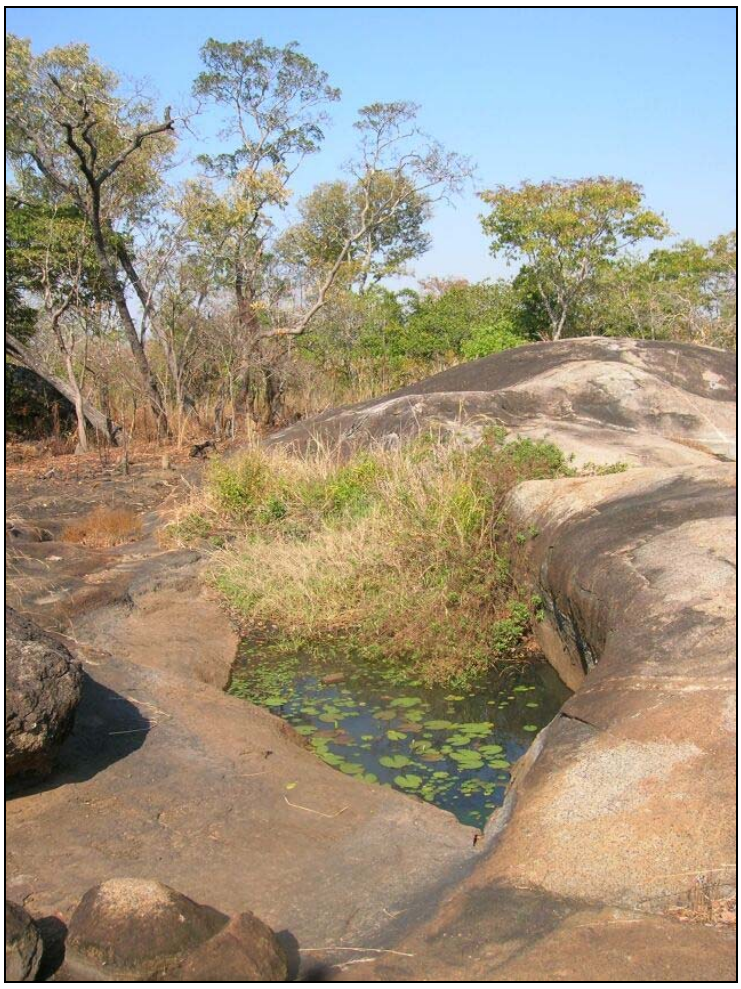

Fig. 15. Water-lily in pool on rock outcrop at Rutukira River.

Fig. 16. Partly burnt mat of *Coleochloa setifera* (orange spots on the rock surface are lichens) at Jiwe la Bwana.

Fig. 17. Partially burnt *Xerophyta spekei* on rock outcrop near Sasawala River.

Rock outcrops, especially inselbergs, support a specious and distinctive vegetation (Porembski & Barthlott 2000), which is usually different from that occurring on nearby normal soils and has much in common with the vegetation on termite mounds (White 1983).

Due to time constraint the inselbergs of Chuma Mbili (8.5 km west of Amani) could not be surveyed. The conspicuous inselberg of Kisungule with his typical dome (see Fig. 18). was "discovered" only after the mission ended. A full survey of the southern Corridor will probably find additional inselbergs worth to be surveyed.

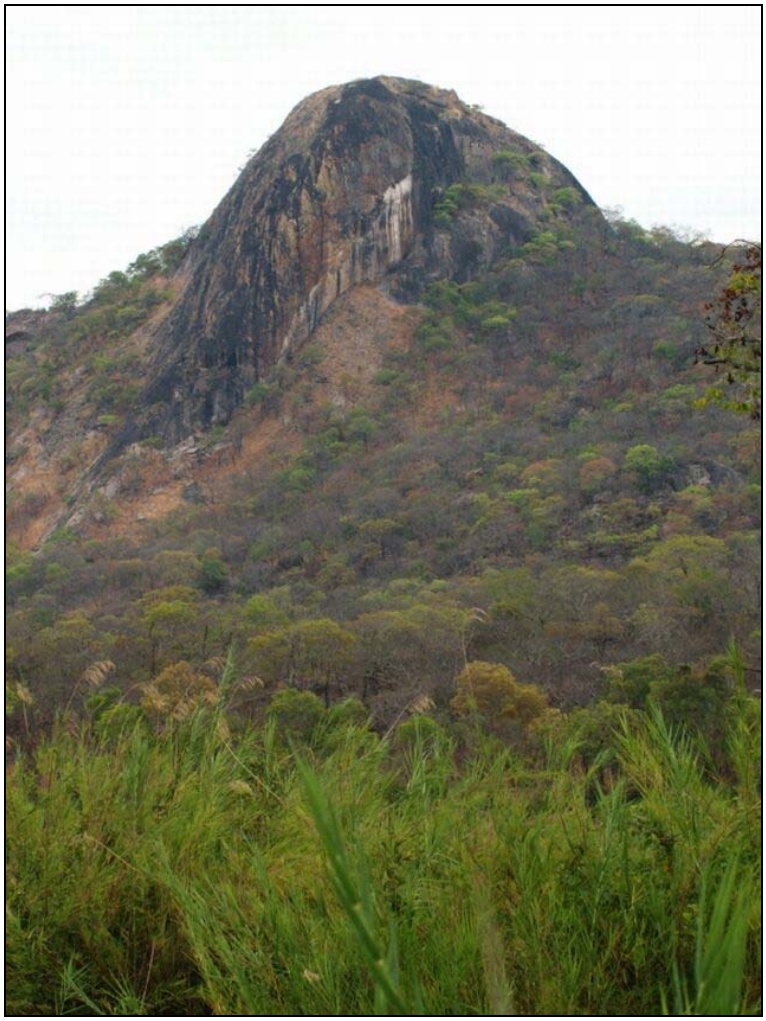

Fig. 18. Kisungule inselberg, near Ruvuma River.

5. Conservation values

The provisional plantlist (see annex G) includes 371 taxa in 268 genera and 76 families. The species richest families with more than 20 species are *Fabaceae*, *Poaceae*, *Rubiaceae*, *Caesalpiniaceae* and *Euphorbiaceae*. Additional surveys are necessary and will certainly result in a total species number within the Corridor of more than 500. The vegetation types with the highest species richness according to the vegetation plots are on mesic and less disturbed sites like those in Sasawara FR and in gully forests (see Annex F). Few species, mainly sterile ones, could only be identified at the general level.

One of the taxa, *Xylopia* sp. nov. (*Annonaceae*) found in the riverine forest along the Ruvuma River at the hippo pond and on Mkolesya Islands is supposed to be new to science (see Fig. 19) and will be fully described by an *Annonaceae* specialist and published in a scientific paper. *Khaya anthotheca*, *Lettowianthus stellatus* and *Millettia bussei* are all vulnerable according to the IUCN Red List of Threatened Species, all orchids (5) and *Aloe mawii* are included in the CITES list (Appendix II) and *Baphia massaiensis, Lettowianthus stellatus* and *Monanthotaxis discolor* are endemic.

Fig. 19. *Xylopia* sp. nov., a new tree of the *Annonaceae* family found in riverine forests along the Ruvuma River.

The following vegetation types are of particular conservation importance and should therefore receive high priority for their protection. Most of these sites have also a certain potential for eco-tourism:

Small-sized riverine forests have high species richness due to the overlap of habitat on gradients (Fjeldså & Lovett 1997). Their linear and variable ecotone with adjacent woodlands or savannas is vital for preserving biodiversity (Smith et al. 2005). From a biogeographic perspective, riverine forests are an important refuge for a diverse range of species which are confined to this vegetation of limited extent (Medley & Hughes 1996). Cover from intense heat, protection from predators, access to water, and a variety of food resources make riverine forest areas important for animals. Moreover, they serve as seasonal migration routes for large mammals, especially elephants. In addition, riverine forests fulfil an important function for soil protection by reducing erosion. Riverine forest edges are fragile toward severe late dry season fires.

The African Mahogany groundwater forest at Mbarangandu River is of special interest. The stand may not only be important as seed reservoir but also as tourist attraction (in addition game is abundant in this swampy area). According to Ndomondo a similar African Mahogany stand exist in this area.

Rock outcrops and inselbergs in general may have a relatively high percentage of endemic species (Seine & Becker 2000). In this context, it is noteworthy to mention the Mtungwe Hills which have rock outcrops and huge boulders along their ridges. Severe late dry season fire may destroy the scarce vegetation on rock outcrops.

In addition to the above mentioned sites also Raphia palm groves (*Raphia farinifera*) should get a high priority protection status. Their extent is dependent on specific site conditions and outside the Corridor they are often replaced by cultivation. Within the Corridor they occur sporadically along permanent watercourses and at the source of the Mbarangandu River nearby Kilimasera. The Raphia palm is also a keystone species upon which many other species depend (Lovett et al. 1997).

The petrified wood at Mburukasese (see Fig. 20) is of particular interest also in view of developing any eco-tourism in the Corridor. Petrified wood is a type of fossil (see Wikipedia 2007): it consists of fossil wood where all the organic materials have been replaced with minerals (most often a silicate, such as quartz), while retaining the original structure of the wood. The petrifaction process occurs underground, when wood becomes buried under sediment. Mineral-rich water flowing through the sediment deposits minerals in the plant's cells and as the plant's lignin and cellulose decay away, a stone forms in its place. The wood is preserved due to a lack of oxygen.

Fig. 20. Petrified wood at Mburukasese.

6. Threats

Considering that the whole Corridor will be used and protected by Wildlife Management Areas excluding any agricultural activities, several threats for the vegetation remain:

Logging of specific timber trees is widespread within the Corridor and mostly illegal, including mainly the woodland species *Afzelia quanzensis* and *Pterocarpus angolensis* and the riverine species *Breonadia salicina* and African Mahogany (see Fig. 21). All boards are hand sawn on location and transported on foot to the nearest accessible track.

In Tanzania, *Pterocarpus angolensis* (see Fig. 22) is highly in demand as timber, mainly for furniture, veneer and carving (Monela et al. 1993; Rodgers 1996). Trees having a dbh >25cm become very rare due to high logging pressure in a attempt to satisfy an expanding market demand. Most of the few remaining trees of harvestable size have bent or hollow trunks such that boards could not be cut from the trunk. The natural regeneration capacity of *Pterocarpus angolensis* is low due to a low and not well understood recruitment success and slow growth rates (Schwartz et al. 2002; Schwartz & Caro 2003). The paucity of small trees (not only of *Pterocarpus angolensis*) in many mature stands is apparent. The low abundance of saplings may be due to intense late dry season fires and/or browsing pressure preventing their recruitment into the adult population (see Schwartz et al. 2002; Schwartz & Caro 2003).

Fig. 21. Sawn boards of African Mahogany, riverine forest, Mtungwe Hill.

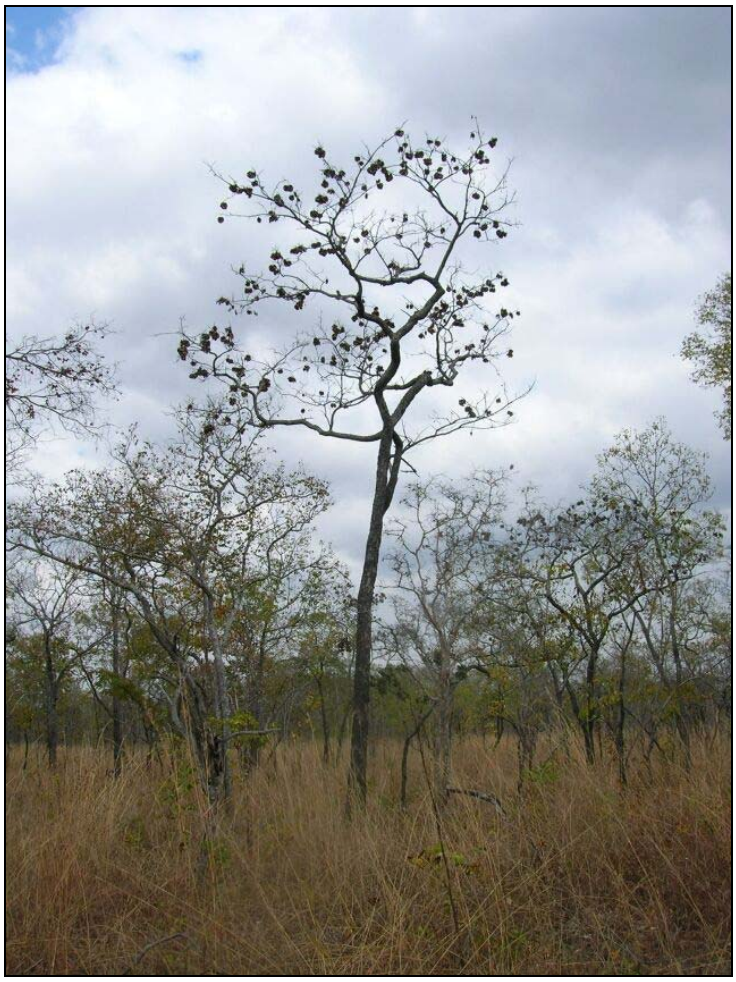

Fig. 22. Small trunk of *Pterocarpus angolensis* not yet harvested near Magazini.

Despite a very low population density, the current harvest is unsustainable raising serious concerns about the long-term viability of this important hardwood species in miombo woodland (see also Schwartz et al. 2002) and probably also for the other timber species. Due to increasing scarcity of the traditional timber species loggers may shift harvest practice to other species, such as *Albizia glaberrima*, *Burkea africana*, *Erythrophleum africanum*, *Pericopsis angolensis*, *Sterculia quinqueloba* or *Trichilia emetica*. A better community-based control of timber harvesting is highly needed.

At Mkolesya Island ruby mining has started recently. The excavation of soil will disturb the vegetation. At the time of the field visit, at least 50 people were at Mkolesya and more will arrive, especially if the ongoing exploration is promising. The cutting of building materials for their huts and the need of firewood for cooking will most probably have an even greater impact on the riverine forests (including the new *Xylopia* species) than the direct mining activities.

In addition, the petrified wood at Mburukasese (see Fig. 19) should be protected from freely collecting samples by passing people. Moreover, it would be interested to investigate a study for identifying the age of the petrified trees and their species name.

Another threat to the Corridor is the paddy (rice) cultivation on alluvial soils along seasonal or intermittent streams which usually goes together with the cutting of parts of the riverine

forests. Furthermore, the cultivation of tobacco is increasing rapidly in the area having a high impact on the ecosystems due to its excessive demand for fuel. These reasons further stress the urgent need for a proper land-use planning of the area.

Fire management plan

A more controlled fire regime is necessary within the Corridor. Frequent fierce late dry season fires provoke a regress of the species-rich dry evergreen patches of forest mainly composed of fire sensitive species and may badly damage the scarce and vulnerable vegetation cover on rock outcrops. In addition, late burning reduces tree, shrub, and herb diversity (Rodgers 1996). Frequent hot fires keep the Miombo woodlands open by suppressing the woody regeneration and thereby leading to a more uniform structure with lower species richness. Many miombo species get a new flush of leaves well before the starting of the rainy season and are therefore particularly vulnerable towards fire at the end of the dry season. Moreover, late dry season fires negatively affect the production of honey (Yves Hausser, personal communication). Less intensive early dry season fires do less harm the woody plants due to lower fire temperature and more resistant woody plants at this season. The type of fire regime should be defined according to the condition of a vegetation stand and the management goal. More open vegetation types with a more continuous grass layer favour herbivores while browsers would benefit from stands with a denser woody cover.

In order to avoid widespread late dry season fires, we suggest using controlled early burning at the very beginning of the dry season. However, to install a controlled fire regime is a very complex task especially in a vast area like the Corridor. Fires are routinely set in the Corridor especially by poachers who are better able to spot and track herbivores after a fire. Therefore we propose to start with a controlled early burning around a few villages whose inhabitants are motivated and well organised. The fire should be set by the locals around their villages at the very beginning of the dry season in order to facilitate the control of the fire. Additional controlled early burning could be done along dry evergreen forest formations by the DNRO in order to protect their ecotone from fierce late dry season fires. According to the experiences made during this pilot phase other village adjacent areas and dry evergreen patches of forest could be include in the fire management plan.

7. Importance of forest products for the livelihood of the local communities

Agricultural activities will be prohibited in WMA's but numerous forest products will continue to play an important role for the livelihood of the local communities either for domestic use or commercialisation. In this context, we highly support the initiative from ADAP to assist and develop beekeeping activities by CBO's in the Mbarangandu and Nalika WMA's. We believe that other forest products like mushrooms (see below), wild fruits or possibly medicinal plants have a market potential as well which might offer further income opportunities to the local communities.

Miombo woodlands are rich in edible mushrooms because almost all of the trees are ectomycorrhizal: their roots live in symbioses with mushroom mycelia. It is a general character of mycorrhizal fungi that they are highly specific to their hosts: usually a certain tree species (or genus) co-occurs with a few mycrorrhizal mushroom species only (Härkönen et al.

2003). The mushrooms species are indigenous, although they belong to widely distributed genera, such as *Amanita*, *Boletus*, *Cantharellus*, *Lactarius* or *Russula*.

In addition, *termitomyces* living in symbiotic life together with termites are very tasty. All of them are edible and most are considered superior to all other mushrooms and also their nutritive value is very good (Härkönen et al. 2003; Smith & Allen 2004). Mushrooms are frequently collected in Tanzania by the local population mainly for own consumption. Fresh, but also dried mushrooms are sold at market places and along roadsides (Härkönen et al. 2003).

8. Recommendations

Vegetation data

- Carry out additional vegetation surveys, especially on the inselbergs of Kisungule and Chuma Mbili (and possibly on other existing inselbergs within the Corridor), Mtungwe Hills, not yet surveyed riverine forests (e.g. along Mburukasese River) and Mbugas. This will allow to refine the vegetation types and to complete the species list (scientific and vernacular names). Preferably vegetation surveys should be conducted at the beginning of the dry season before burning starts. At this time the grasses and many herbs are flowering what facilitates species identification.

- Elaborate a vegetation map of the Corridor with the defined vegetation types using satellite images.

Forestry

- Assess the current diameter-class distribution of the dominant miombo trees (including the prominent timber species) and the condition of their recruitment in some selected sites in order to appraise the stability of these stands under current fire regime, browsing and logging.

- Develop a community-based and sustainable timber exploitation which allows an effective benefit sharing between loggers and local communities.

- Investigate another African Mahogany stand announced by Ndomondo within Mbarangandu area.

Socio-economic aspects

- Further analyse socio-economic aspects regarding the land-use pattern and the uses of the plants (including their melliferous potential) by the local population.

- Carry out an inventory of the edible mushrooms in the Corridor area and assess their commercialisation potential at regional, national and international level.

Authorities

- Protect the islands within the Ruvuma River from uncontrolled exploitation of minerals. The establishment of WMAs including a clear zoning plan is highly needed along the Ruvuma River.

- Develop a strategy together with the local authorities which allow the use of controlled use of fire in order to reduce devastative late dry season fires.

- Enhance the exchange of information, including vegetation data, with the Niassa GR in Mozambique in profit of the sustainable management of both areas.

Research

- Assess possible vegetation shifts in the Corridor using soil carbon methods. The reconstruction of the vegetation history allows a better understanding of the miombo and savannah ecosystem dynamics.

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ANNEX A: Acronyms & Abbreviations

ADAP	Association pour le Développement des Aires Protégées
CBO	Community Based Organisation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
dbh	Diameter at breast height
DC	District Commissioner, Namtumbo
DED	District Executive Director, Namtumbo
DFO	District Forest Officer
DNRO	District Natural Resources Officer
FR	Forest Reserve
GEF	Global Environment Facility
GFT	Game Frontiers of Tanzania
GR	Game Reserve
GTZ-IS	Deutsche Gesellschaft für Technische Zusammenarbeit, International Services
IUCN	The World Conservation Union
RNRA	Regional Natural Resources Advisor
SNWC	Selous-Niassa Wildlife Corridor
TOR	Terms of Reference
UNDP	United Nations Development Programme
WMA	Wildlife Management Area

ANNEX B: Mission Terms of Reference

The Development and Management of the Selous – Niassa Wildlife Corridor in Tanzania
Project No.55.3024.1 – 001.00

Consultant: Dr. Urs Bloesch
Mittelstr. 26
2502 Biel
Schweiz

Timeframe: 20 days of field work in September 2006

The consultant will carry out the fieldwork together with Mr. Frank Mbago, Herbarium, Botany Department of the University Dar es Salaam, Tanzania

Reporting requirement:
Short verbal debriefing in the project and District Natural Resources Office in Namtumbo after accomplishing the field work.
The consultant will present the findings, conclusions and recommendations in a preliminary report in English language until the 31.10.2006
The final report will be produced until 30.11.2006
Copyright of the study will be with GTZ-IS and UNDP GEF, who may publish it in total or shortened. The name of the author will be mentioned.

The project will assist with logistics and transport in the field after the arrival of the team in Songea town.

Background
The Selous-Niassa Miombo woodland eco-system of southern Tanzania and northern Mozambique is one of the largest and for the global biodiversity most significant, trans-boundary natural ecosystems in Africa, covering over 154,000 km2. Through a network of protected areas of various categories of protection, an area of 110,685km2 of this ecosystem is conserved. Two Game Reserves are critical for the protection of this globally important area; the Selous Game Reserve, which covers 47,000km2 making it the largest protected area in eastern and central Africa, and the Niassa Game Reserve of Mozambique, one of Mozambique's largest protected area covering 42.400 km2. The Selous-Niassa Wildlife Corridor provides a significant biological link between the two reserves and consequently for the Miombo woodland eco-system. But there are severe threats to its continued existence, which if left unattended, will block this important link.
The Selous-Niassa Wildlife Corridor will be protected with a network of village Wildlife Management Areas. The planning and design will be carried out during a participatory land-use planning process with the communities. A zoning plan of these areas will identify the future natural resource utilisation within these areas.

Purpose of the study

This study should describe the main ecosystem of the Selous - Niassa Wildlife Corridor and the different types of vegetation and their conservation and biodiversity values. The impact of shifting cultivation or farming on different types of vegetation formations and their biodiversity values will be identified. The human-wildlife conflicts resulting from farming activities in areas important for wildlife will be described.

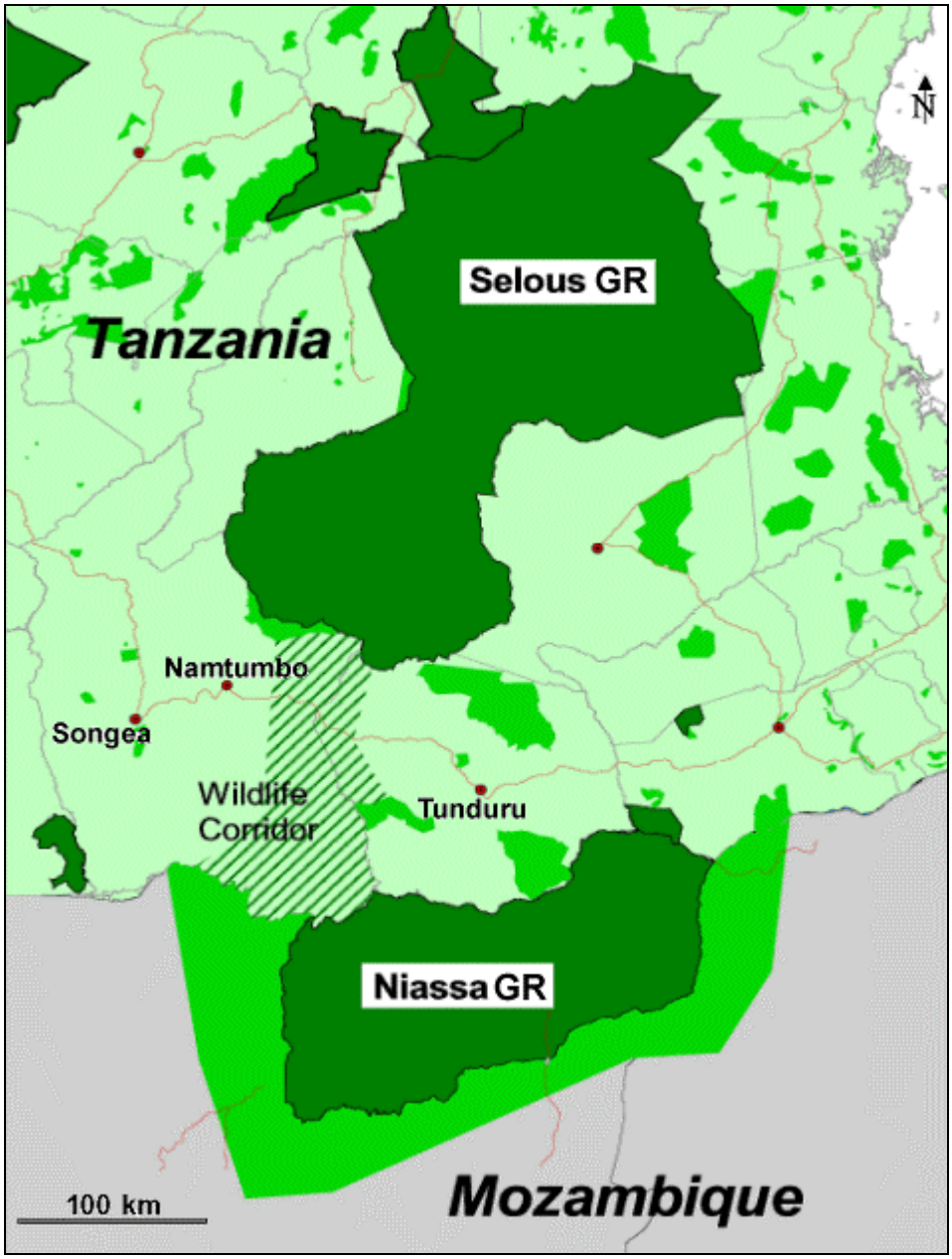
Fire as a management tool for the corridor will be elaborated. Additional research activities on this field, which would be necessary for the management of the corridor, will be proposed.

The results of this study will be essential for the planning and design of the new WMAs and will be used for their future management.

Structure of the study

- Elaborate an ecological description of the main SNWC ecosystems, including the specification of different vegetation types and their plant composition. Because of the size of the area this will be done along selected transects focussing on areas of particular importance for conservation.
- Identify those ecosystems and vegetation formations with a particular conservation value, biodiversity hotspots (species richness, rare, endangered or endemic species) and outline their threats. Text will be accompanied by digital photos and GPS position and/or sketch map.
- Characterise habitat patterns, which are most beneficial to high wildlife diversity and identify, whether these areas are already threatened by human activities, causing human wildlife conflicts.
- Assess the impact of harvesting of forest products and farming on the different ecosystems and in particular on the vegetation.
- Elaborate on the use of fire as a management tool in conservation in particular in the Miombo forest ecosystem
- Identify existing lack of knowledge and propose additional research activities necessary for the management and long-term conservation of the corridor.

ANNEX C: Map of the Selous – Niassa Miombo woodland ecosystem



ANNEX D: Itinerary and people met

Date	Itinerary and people met
8/9/06	Travelling Morogoro-Songea
9/9/06	Briefing RNRA Songea and DNRO/DFO Songea; travelling to Namtumbo
10/9/06	Briefing SNWC Project staff; planning and preparation of field trip; visit of Mgwinjima Inselberg at Namtumbo
11/9/06	Briefing DC, DED in Namtumbo
12/9/06	Namtumbo-Msawati-Mburukasese-Mbarangandu GFT camp
13/9/06	Mbarangandu GFT camp-African Mahogany stand-Kilimatembo GFT camp (Kutulika area)
14/9/06	Kutulika area
15/9/06	Kutulika area
16/9/06	Kilimatembo GFT camp-Kilimasera-Kihowera Hill
17/9/06	Kihowera Hill-Kilimasera-Mtelamwahi
18/9/06	Mtelamwahi-Ligunga-foothill Mtungwe Hill
19/9/06	Mtungwe Hill
20/9/06	Mtungwe Hill-Lusewa-Namakungwa fishing camp at Ruvuma
21/9/06	Namakungwa fishing camp at Ruvuma area, Mkolesya island (ruby mining)
22/9/06	Namakungwa fishing camp-Lusewa- Makaloye (Ruvuma crossing point at Magazini)
23/9/06	Makaloye area, Hippo pond
24/9/06	Makaloye -Marumba-Jiwe la Bwana-Sasawara FR
25/9/06	Sasawara FR-Machemba-Tunduru
26/9/06	Tunduru-Namtumbo
27/9/06	Debriefing with acting DED and all technical services from Namtumbo; SNWC project staff; selection of plant species to be identified at the university of Dar es Salaam (herbarium of the Botany Department); travelling to Songea
28/9/06	Songea-Morogoro

ANNEX E: Rainfall Data at Soluti Agricultural Research Sub-station, Namtumbo District

Soluti	Monthly rainfall (mm)												Annual total (mm)
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1993	146.6	286.9	294.4	298.4	71.8	1.2	0.0	0.0	0.0	0.0	51.2	108.2	**1258.7**
1994	285.9	177.4	402.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	159.8	**1030.1**
1995	338.7	215.0	414.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	158.9	**1171.8**
1996	193.7	258.8	251.2	50.1	46.3	0.0	0.0	0.0	0.0	0.4	0.0	133.3	**933.8**
1997	314.1	846.7	153.7	13.5	6.2	14.9	0.0	0.0	0.0	0.0	0.0	320.6	**1669.7**
1998	332.0	494.0	336.0	111.9	113.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1386.9**
1999	280.0	181.0	494.0	299.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	32.5	**1295.5**
2000	301.8	148.5	398.5	184.0	13.9	0.0	0.0	0.0	0.0	0.0	185.6	237.2	**1469.5**
2001	445.1	237.5	267.8	33.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	34.3	**1044.7**
2002	433.3	333.8	397.6	262.8	0.0	0.0	0.0	0.0	0.0	20.6	153.7	189.8	**1791.6**
2003	263.8	196.8	165.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	257.0	**883.3**
2004	209.8	99.8	276.6	171.8	0.0	0.0	0.0	0.0	0.0	15.6	11.2	212.7	**997.5**
2005	196.8	217.8	305.7	127.5	15.4	2.3	0.0	0.0	0.0	0.0	0.0	46.3	**911.8**
Mean	287.8	284.2	319.8	119.4	23.3	1.4	0.0	0.0	0.0	2.8	34.7	145.4	**1218.8**
Minimum	146.6	99.8	153.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**883.3**
Maximum	445.1	846.7	494.0	299.0	113.0	14.9	0.0	0.0	0.0	20.6	185.6	320.6	**1669.7**
Standard dev.	89.0	195.2	100.0	114.8	34.5	4.1	0.0	0.0	0.0	6.9	62.7	98.3	**293.7**
Variability (%)	**30.9**	**68.7**	**31.3**	**96.2**	**148.3**	**290.4**	–	–	–	**243.7**	**180.7**	**67.6**	**24.1**

ANNEX F: Vegetation plots

Author: Bloesch/Mbago	**Location:** Escarpment Msawati	**Survey:** SN 1	**Date:** 12.9.2006
Elevation: 800m a.s.l.	**Landform:** mid-slope	**Aspect:** 170°	**Slope:** 45%
Community: Miombo woodland		**Coordinates:** S 10°13'57.2"/E 36°22"58.1"	
Petrography: -	**Soil texture:** sandy	**Species richness: 27**	
Remarks: Photo SN06 031; potential cover considered			

Tree layer: **Height:** 15(18)m **Cover:** 40%		**Tree/shrub layer:** **Height:** 2-6m **Cover:** 10%		**Herb layer (dry):** **Height:** -2m **Cover:** 50%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Brachystegia spiciformis	3	*Flacourtia indica*	1	cf. *Hemarthria*	3
Brachystegia boehmii	1	*Protea madiensis*	1	*Aristiada adscensions*	1(2)
Brachystegia floribunda	1	*Uapaca kirkiana*	1	*Aspilia pluriseta*	1
Faurea saligna	1	*Uapaca sansibarica*	1	*Becium obovatum?*	1
		Monotes katangensis	1	*cf. Brachiaria*	1
		Pseudolachnostylis maprouneifolia	1	*Digitaria sp.*	1
				Panicum sp.	1
				Themeda triandra	1
				Andropogon canaliculatus	+
				Brachystegia spiciformis	+
				Bridelia duvigneaudii	+
				Dalbergia nitidula	+
				Helichrysum foetidum	+
				Hyparrhenia newtonii	+
				Panicaceae	+
				Pericopsis angolensis	+
				Spermacoce dibrachiata	+
				Vernonia galamensis	+

Author: Bloesch/Mbago	**Location:** Mbarangandu	**Survey:** SN 2	**Date:** 13.9.2006
Elevation: 630m a.s.l.	**Landform:** slightly undulated	**Aspect:** 140°	**Slope:** 0-2%
Community: Groundwater forest		**Coordinates:** S 10°16'44.0"/E 36°45"50.8"	
Petrography: -	**Soil texture:** sandy-clay	**Species richness: 24**	

Remarks: Photo SN06 053, 054; potential cover indicated

Tree layer: **Height:** 18(20)m **Cover:** 55%		**Tree/shrub layer:** **Height:** 2-6m **Cover:** 35%		**Herb layer:** **Height:** -2m **Cover:** 20%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Lettowianthus stellatus	2(3)	*Kigelia africana*	2	*Catunaregam spinosa*	2
Afzelia quanzensis	2	*Polysphaeria braunii*	2	*Combretum pentagonum*	1
Rauvolfia caffra	1	*Syzygium guineense*	2	*Dombeya* sp.	1
Trichilia emetica	1	*Psychotria riparia*	1	*Hypoestes verticilarris*	1
Xeroderris stuhlmannii	1	*Ochna* sp.	+	*Paullinia pinnata*	1
		Catunaregam spinosa	+	*Polysphaeria braunii*	1
		Combretum pentagonum	+	*Achyranthes aspera*	+
		Trichilia emetica	+	*Plumbago zeylanica*	+
				Blighia unijugata	+
				Flacourtia indica	+
				Jasminum sp.	+
				Psychotria riparia	+
				Tamarindus indica	+
				Trichilia emetica	+
				Vernonia glabra	+
				Outside plot	
				Ipomoa sp. (liana)	
				Passiflora foetida	

Author: Bloesch/Mbago	**Location:** 200m from Mkundi River	**Survey:** SN 3	**Date:** 13.9.2006
Elevation: 655m a.s.l.	**Landform:** undulated	**Aspect:** 340°	**Slope:** 5-8%
Community: Groundwater forest; surface about 2ha		**Coordinates:** S 10°15'13.9"/E 36°41"57.9"	
Petrography: -	**Soil texture:** sandy-clay	**Species richness: 22**	

Remarks: Photo SN06 061, 062; many seasonal water channels

Tree layer: **Height:** 35(40)m **Cover:** 70%		**Tree/shrub layer:** **Height:** 2-10m **Cover:** 30%		**Herb layer:** **Height:** -2m **Cover:** 40%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Khaya anthotheca	4	*Catunaregam spinosa*	2	*Combretum pentagonum*	2
		Combretum pentagonum	2	*Pseudoranthemum hildebrandtii*	2
		Polysphaeria braunii	2	*Diospyros* sp.	1
Outside plot		*Khaya anthotheca*	2	*Hypoestes verticilaris*	1
Ficus lutea	1	*Diospyros* sp.	1	*Monanthotaxis buchananii*	1
		Flacourtia indica	1	*Ochna holstii*	1
		Flueggea virosa	1	*Parkia filicoidea*	1
		Monanthotaxis buchananii	1	*Strychnos potatorum*	1
		Rauvolfia caffra	1	*Synaptolepis kirkii*	1
		Strychnos potatorum	1	*Khaya anthotheca*	+
		Trichilia emetica	1	*Tamarindus indica*	+
		Trichilia dregeana	1		
				Liana	
				Saba comorensis	+
				Uvaria lucida	1
				Outside plot	
				Macrotyloma africanum	
				Melanthera albinervia	
				Tricalysia ruandensi	

Author: Bloesch/Mbago	**Location:** near Kilimatembo camp	**Survey:** SN 4	**Date:** 14.9.2006
Elevation: 900m a.s.l.	**Landform:** mid-slope	**Aspect:** 80°	**Slope:** 15%
Community: Miombo woodland		**Coordinates:** S 10°25'54.0"/E 36°29"17.9"	
Petrography: -	**Soil texture:** very sandy	**Species richness: 22**	

Remarks: Photo SN06 079, 080, 081; erosion in progress; 1 emergent *Brachystegia bussei* (14m); potential cover considered

Tree/shrub layer:		**Shrub layer:**		**Herb layer (dry):**	
Height: 7(14)m **Cover:** 25%		**Height:** **Cover:**		**Height:** -1.5m **Cover:** 45%	
Size of relevé: 25x25m		**Size of relevé:**		**Size of relevé:** 5x5m	
Uapaca kirkiana	2			*Themeda triandra*	2
Uapaca sansibarica	2			*Aristida adscensionis*	1
Brachystegia bussei	1			cf. *Andropogon*	1
Brachystegia floribunda	1			*Gnidia mollis*	1
Brachystegia utiis	1			*Hyperthelia dissoluta*	1
Garcinia livingstonei?	+			*Panicum* sp.	1
Ochna mossambicensis	+			*Peucedanum winkleri*	1
Pseudolachnostylis maprouneifolia	+			*Spremacoce dibrachiata*	1
Ximenia caffra	+			*Becium obovatum?*	+
				Brachystegia boehmii	+
				Multidentia crassa	+
				Phacelurus huillensis	+
				Scleria melanomphala	+
				Uapaca kirkiana	+
				Uapaca sansibarica	+
				Outside plot	
				Loudetia simplex	

Author: Bloesch/Mbago	**Location:** Kilimatembo-Likuyu	**Survey:** SN 5	**Date:** 15.9.2006
Elevation: 930m a.s.l.	**Landform:** gully ridge	**Aspect:** 60°	**Slope:** 40%
Community: Gully forest (mainly miombo species along ecotone)		**Coordinates:** S 10°24'57.0"/E 36°28"55.6"	
Petrography: -	**Soil texture:** sandy	**Species richness: 27**	
Remarks: Photo SN06 093-096; 1 emergent *Pterocarpus tinctorius* (30m); E=ecotone species; potential cover considered			

Tree layer: **Height:** 22(30)m **Cover:** 55%		**Trre/shrub layer:** **Height:** 2-10m **Cover:** 25%		**Herb layer (partially dry):** **Height:** -2m **Cover:** 20%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Brachystegia microphylla	3	*Bridelia duvigneaudii* (E)	1	*Panicum trichocladum*	2
Brachystegia longifolia (E)	1	*Combretum molle* (E)	1	*Acalypha fruticosa*	1
Pterocarpus tinctorius	1	*Diplorhynchus condylocarpon* (E)	1	*Acanthaceae*	1
		Garcinia huillensis (E)	1	*Brachystegia microphylla*	1
		Ixora narcissodora (E)	1	*Hypoestes verticillaris*	1
		Rhus natalensis (E)	1	*Kalanchoe lanceolata*	1
		Apodytes dimidiata	+	*Pellaea doniana*	1
		Cassia sp. (E)	+	*Euclea natalensis*	1
		Dalbergia obovata	+	*Pterocarpus tinctorius*	+
		Euclea natalensis (E)	+	*Triumfetta rhomboidea*	+
		Margaritaria discoidea (E)	+		
		Rhynchosis micrantha	+		
		Xylopia parviflora	+	**Liana**	
				Landolphia parvifolia	2
		Liana			
		Uvaria lucida (E)	1(2)	**Outside plot**	
		Macrotyloma axillare	1	*Plectranthus*	1
		Epiphyte			
		Microcoelia exilis	+		

Author: Bloesch/Mbago	**Location:** near junction to Kilimatembo camp	**Survey:** SN 6	**Date:** 15.9.2006
Elevation: 940m a.s.l.	**Landform:** upper slope	**Aspect:** 80°	**Slope:** 30-50%
Community: Miombo woodland		**Coordinates:** S 10°26'04.5"/E 36°30"02.6"	
Petrography: -	**Soil texture:** sandy	**Species richness: 23**	

Remarks: Photo SN06 097-099; ajacent to S7; potential cover considered

Tree layer: **Height:**15m **Cover:** 55%		**Trre/shrub layer:** **Height:** 2-8m **Cover:** 10%		**Herb layer (partially dry):** **Height:** -2m **Cover:** 40%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Brachystegia spiciforms	4	*Brachystegia boehmii*	2	*Themeda triandra*	2(3)
		Brachystegia spiciesformis	1	*Andropogon schirensis?*	1
		Combretum sp.	1	*Guizotia scabra*	1
		Faurea saligna	1	*Microchloa kunthii*	1
		Acacia goetzei subsp. Microphylla	+	*Phacelurus huillensis*	1
		Ximenia americana?	+	*Pavetta stenosepala*	1
				Leucas tettensis	1
				Spermacoce dibrachiata	1
				Vernonia sp.	1
				Compositae	+
				Fuerstia africana?	+
				cf. Schoenefeldia	+
				Kotschya strigosa	+
				"Socam"	+
				"Tristachis"	+
				Vernonia melleri	+
				Liana	
				Thunbergia sp.	+

Author: Bloesch/Mbago	**Location:** near junction to Kilimatembo camp	**Survey:** SN 7	**Date:** 15.9.2006
Elevation: 940m a.s.l.	**Landform:** gully	**Aspect:** 80°	**Slope:** 40%
Community: Gully forest		**Coordinates:** S 10°26'04.5"/E 36°30"02.6"	
Petrography: -	**Soil texture:** sandy	**Species richness: 26**	

Remarks: Photo SN06 100, 101, 103, 104; 1 emerent Millettia dura? (25m); adjacent to S6; potential cover considered

Tree/shrub layer: **Height:**15(25)m **Cover:** 65%		**Tree/shrub layer:** **Height:** **Cover:**	**Herb layer:** **Height:** -2m **Cover:** 35%	
Size of relevé: 25x25m		**Size of relevé:**	**Size of relevé:** 5x5m	
Milletia dura?	3		*Polysphaeria braunii*	2
Albizia almara	2		*Acalypha paucifolia*	1(2)
Antidesmum venosum	1		*Asparagus setaceus*	1(2)
Catunaregam spinosa	1		*Anzanza garckeana*	1
Combretum pentagonum	1		*Dalbergia obovata*	1
Flacourtia indica	1		*Milletia dura?*	1
Polysphaeria braunii	1		*Synaptolepis kirkii*	1
Sorindeia madagascariensis	1		*Albizia versicolor*	+
Xylopia parviflora	1		*Keetia venosa*	+
Allophylos congolanus	+		*Maytenus undata*	+
Bridelia duvigneaudii?	+		*Monanthotaxis buchananii*	+
Sericanthe andongensis	+		*Hypoestes verticillaris*	+
			Pancovia golungensis	+
Liana				
Uvaria lucida	1		**Liana**	
			Stephania abyssinica	1
			Smilex anceps	+

Author: Bloesch/Mbago	**Location:** Kihowera II	**Survey:** SN 8	**Date:** 17.9.2006
Elevation: 1080m a.s.l.	**Landform:** ridge top	**Aspect:**	**Slope:** 10-40%
Community: Miombo woodland		**Coordinates:** S 10°50'08.5"/E 36°34"56.2"	
Petrography: 50**%** granite outcrops, boulders	**Soil texture:**	**Species richness: 15**	

Remarks: Photo SN06 125-127; cover of herb layer 50% including mosses; potential cover considered

Tree layer: **Height:**10(12)m **Cover:** 35%		**Shrub layer:** **Height:** 1.5-5m **Cover:** 20%		**Herb layer (dry):** **Height:** -1.5m **Cover:** 20%	
Size of relevé: 25x25m		**Size of relevé:**		**Size of relevé:** 5x5m	
Brachystegia microphylla	3	*Brachystegia microphylla*	2	*Acampe* sp.	1
Usnea barbata	1	*Monotes katangensis*	1	*Adinataceae*	1
		Parinari curatellifolia	1	*Aristida adscensionis*	1
		Uapaca kirkiana	1	*Brachystegia microphylla*	1
		Uapaca nitida	1	*Cyprus* sp.	1
		Usnea barbata	1	*Otiophora scabra*	1
		Tarenna graveolens	+	*Pavetta stenosepala*	1
				Tapiphyllum discolor	1
				Tarenna graveolens	1
				Mosses	1

Author: Bloesch/Mbago	**Location:** Mtungwe Hill I	**Survey:** SN 9	**Date:** 19.9.2006
Elevation: 1060m a.s.l.	**Landform:** ridge top	**Aspect:**	**Slope:** 5-45%
Community: Miombo woodland		**Coordinates:** S 11°03'13.4"/E 36°28"07.1"	
Petrography: 40% granite outcrops	**Soil texture:**	**Species richness: 15**	

Remarks: Photo SN06 172, 173; potential cover considered

Tree layer: **Height:**10-12m **Cover:** 35%		**Shrub layer:** **Height:** 2-5m **Cover:** 20%		**Herb layer (dry):** **Height:** -2m **Cover:** 55%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Brachystegia microphylla	3	*Combretum molle*	2	***Andropogonaceae***	3
		Dalbergia nitidula	1	*Brachystegia microphylla*	2
		Brachystegia microphylla	1	*cf. Cenchrus*	1
		Entada abyssinica	1	*Dalbergia nitidula*	1
		Loranthaceae	1	*Hypoestes verticillaris*	1
		Pericopsis angolensis	1	*Rhynchosia resinosa*	1
		Bridelia cathartica	+	*Vernonia* sp.	1
				Otiophora scabra	+
				Tarenna graveolens	+
		Outside plot		*Triumfetta rhomboidea*	+
		Margaritaria discoidea			
		Markhamia obtusiofolia			
		Maytenus senegalensis		**Outside plot**	
		Monanthotaxis discolor		*Barleria fulvostellata*	
		Steganotaenia araliacea		*Beckeropsis uniseta*	
				Justicia sp.	
				Lippia javanica	

Author: Bloesch/Mbago	**Location:** Mtungwe Hill II	**Survey:** SN 10	**Date:** 19.9.2006
Elevation: 1284m a.s.l.	**Landform:** ridge top	**Aspect:**	**Slope:** 5-120%
Community: Miombo woodland		**Coordinates:** S 11°02'50.9"/E 36°27"48.3"	
Petrography: 90% granite outcrops, boulders	**Soil texture:**	**Species richness: 15**	

Remarks: Photo SN06 176-179; herb layer cover without mosses; potential cover considered

Tree layer: **Height:** 7m **Cover:** 20%		**Shrub layer:** **Height:** 0.3-4m **Cover:** 10%		**Herb layer (dry):** **Height:** -0.3m **Cover:** 35%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Brachystegia microphylla	2	*Dalbergia nitidula*	2	*Bulbostylis abortiva*	3
		Brachystegia microphylla	1	*Adiantaceae*	1
		Faurea saligna?	1	*Crassula vaginata*	1
		Julbernardia globiflora	1	*Mariscus psilostachys*	1
		Kotschya strigosa	1	*Plectranthus tetragonus*	1
		Rytigynia uhligii	1	*Sporobolus pyramidalis*	1
		Parinaria curatellifolia	+	*Anthericum* sp.	+
				Panicum sp.	+
				Outside plot	
				Compositae	
				Elphantopus scaber	
				Justicia sp.	
				Lippia javanica	

Author: Bloesch/Mbago	**Location:** Ligunga	**Survey:** SN 11	**Date:** 20.9.2006
Elevation: 640m a.s.l.	**Landform:** plateau	**Aspect:** 120°	**Slope:** 3-5%
Community: Transition dry miombo woodland to savanna		**Coordinates:** S 11°09'17.9"/E 36°29"00.1"	
Petrography: -	**Soil texture:**	**Species richness: 11**	
Remarks: Photo SN06 192-193; potential cover considered			

Tree layer: **Height:** 7m **Cover:** 35%		**Shrub layer:** **Height:** 1.5-4m **Cover:** 15%		**Herb layer (dry):** **Height:** -1.5m **Cover:** 60%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Brachystegia boehmii	3	*Brachystegia boehmii*	2	*Loudetia simplex*	2(3)
Acacia goetzei subsp. *microphylla*	1	*Acacia goetzei* subsp. *microphylla*	1	*Themeda triandra*	2(3)
Combretum molle	1	*Combretum molle*	1	*Digitaria* sp.	1
		Bauhinia tomentosa	1	*Panicum maximum*	1
				Phacelurus huillensis	1
				Dipcadi cf. *Longifolia*	1
				Scleria melanomphala?	+

Author: Bloesch/Mbago	**Location:** Mkolesia	**Survey:** SN 12	**Date:** 21.9.2006
Elevation: 520m a.s.l.	**Landform:** slight valley bottom	**Aspect:** 180°	**Slope:** 1-3%
Community: Savanna woodland		**Coordinates:** S 11°32'04.1"/E 36°04"10.2"	
Petrography: -	**Soil texture:**	**Species richness: 23**	

Remarks: Photo SN06 231-233; herb layer burnt; canopy height *A. nigrescens* 15m

Tree layer: **Height:** 10(15)m **Cover:** 50%		**Shrub layer:** **Height:** 2-4m **Cover:** 20%		**Herb layer (dry):** **Height:** -2m **Cover:** 20%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Acacia nigrescens	2	*Catunaregam spinosa*	2	*Beckeropsis uniseta*	2
Acacia xanthophloea	2	*Ficus sycomorus*	2	*Hyparrhenia* sp.	2
Kigelia africana	2	*Diplorhynchus condylocarpon*	1	*Lannea discolor*	1
Piliostigma thonningii	2	*Hyphaene coriacea*	1	*Dalbergia melanoxylon*	+
Acacia senegalensis	1	*Stereospermum kunthianum*	1	*Desmodium salicifolium*	+
Combretum molle	1	*Ximenia caffra?*	1	*Kigelia africana*	+
Dichrostachys cinerea	1				
Ficus sycomorus	1				
Terminalia sericea	1			**Liana**	
Ziziphus abyssinica	1			*Abrus precatorius*	+
				Hypaene coriacea	
				Opilia celtidifolia	

Author: Bloesch/Mbago	**Location:** Magazini crossing point at former hunting camp	**Survey:** SN 13	**Date:** 24.9.2006
Elevation: 470m a.s.l.	**Landform:** slight depression	**Aspect:**	**Slope:** 0-2%
Community: Savanna woodland with *Acacia clavigera* and dense shrub understorey		**Coordinates:** S 11°40'47.8"/E 36°27"37.7"	
Petrography: -	**Soil texture:** clay	**Species richness: 22**	
Remarks: Photo SN06 264-266; potential cover considered			

Tree layer: **Height:** 18m **Cover:** 20%		**Shrub layer:** **Height:** 1-5m **Cover:** 40%		**Herb layer (very dry):** **Height:** -1m **Cover:** 25%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Acacia clavigera	2	*Combretum paniculatum*	2	*Achyranthes aspera*	2
Adansonia digitata	2	*Croton pseudopulchellus*	2	*Melinis hirsuta*	2
		Acacia goetzei subsp. *Goetzei*	1	*Justicia* sp.	2
		Boscia angustifolia	1	*Monechma debile*	1
Outside plot		*Combretum paniculatum*	1	*Diospyros mespiliformis*	1
Diospyros mespiliformis		*Combretum* sp.	1	*Reissantia buchananii*	1
		Garcinia livingstonei	1	*Sansevieria canaliculata*	1
		Grewia mollis	1	*Asparagus africanus?*	+
		Maerua kirkii	1	*Barleria spinulosa*	+
				Corchorus aestuans	+
				Plectranthus tetragonus	+

Author: Bloesch/Mbago	**Location:** Sasawala FR	**Survey:** SN 14	**Date:** 25.9.2006
Elevation: 770m a.s.l.	**Landform:** flat ridge	**Aspect:** 60°	**Slope:** 5-8%
Community: Miombo woodland		**Coordinates:** S 11°10'19.7"/E 37°06"25.2"	
Petrography: -	**Soil texture:** sandy	**Species richness: 23**	

Remarks: Photo SN06 285, 286; paddy farm in depression; potential cover considered

Tree layer: **Height:** 12(14)m **Cover:** 35%		**Shrub layer:** **Height:** 2-6m **Cover:** 15%		**Herb layer (dry):** **Height:** -2m **Cover:** 40%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Brachystegia boehmii	2	*Parinari curatellifolia*	2	*Hyparrhenia newtonii*	2
Brachystegia bussei	2	*Brachystegia stipulata*	1	*Aristida adscensionis*	1
Julbernardia globiflora	2	*Bridelia cathartica*	1	*Brachystegia bussei*	1
Petrocarpus angolensis	1	*Multidentia crassa*	1	*Julbernardia globiflora*	1
Strychnos potatorum	1	*Pericopsis angolensis*	1	*Lepidagathis andersoniana*	1
		Uapaca kirkiana	1	*Maprounea africana*	1
		Uapaca nitida	1	*Microchloa kunthii*	1
		Margaritaria discoidea	+	*Olacaceae*	1
		Diplorhynchus condylocarpon	+	*Psilotrichum schimperi*	1
				Spermacoce dibrachiata	1
				Themeda triandra	1
				Uapaca kirkiana	1
				Uapaca nitida	1

Author: Bloesch/Mbago	**Location:** Sasawala FR	**Survey:** SN 15	**Date:** 25.9.2006
Elevation: 810m a.s.l.	**Landform:** mid-slope	**Aspect:** 160°	**Slope:** 5%
Community: Miombo woodland		**Coordinates:** S 11°08'52.8"/E 37°06"07.4"	
Petrography: -	**Soil texture:** sandy	**Species richness: 28**	
Remarks: Photo SN06 289, 290; potential cover considered			

Tree layer: **Height:** 20m **Cover:** 35%		**Shrub layer:** **Height:** 2-8m **Cover:** 30%		**Herb layer (dry):** **Height:** -2m **Cover:** 20%	
Size of relevé: 25x25m		**Size of relevé:** 25x25m		**Size of relevé:** 5x5m	
Brachystegia bussei	3	*Diplorhynchus condylocarpon*	2	*Themeda triandra*	2
Brachystegia stipulata	1	*Julbernardia globiflora*	2	*Catunaregam spinosa*	1
Julbernardia globiflora	1	*Parinari curatellifolia*	2	*Garcinia livingstonei?*	1
		Dalbergia nitidula	1	*Hyperthelia dissoluta*	1
		Pericopsis angolensis	1	*Hypoestes verticillaris*	1
		Pseudolachnostylis maprouneifolia	1	*Panicum maximum*	1
		Uapaca nitida	1	*Pavetta stenosepala*	1
		Dispyros verrucosa	+	*Phyllanthus nummulariifolius*	1
		Garcinia livingstonei?	+	*Sporobolus pyramidalis*	1
		Hugonia busseana	+	*Syzygium guineense*	1
		Maprounea africana	+	*Uapaca nitida*	1
		Olax dissitiflora	+	*Hippocratea* sp.	+
		Strychnos potatorum	+	*Justicia* sp.	+
		Syzygium guineense	+	*Margaritaria discoidea*	+
				Monechma debile	+
				Ximenia caffra	+

Provisional vascular plant list from the Selous-Niassa Wildlife Corridor (Sept. 2006)

Urs Bloesch & Frank Mbago

Scientific name	Ndendeule [english], (swahili)	Habitat	Uses	Remarks
Pteridophytes (Ferns)				
Adiantaceae fam. Newman		Ridge top on boulders, miombo woodland		
Pellaea doniana Hook.		Gully forest		
Equisetaceae				
Equisetum ramosissimum Desf.		Sandbank Mbarangandu River		
Monocotyledons				
Arecaceae				
Hyphaene coriacea Gaertn.		Thicket on termite hill, savanna woodland		
Raphia farinifera (Gaertn.) Hyl.		Riverine forest, spring vegetation		
Cyperaceae				
Bulbostylis abortiva (Steud.) C.B. Clarke		Inselberg		
Coleochloa setifera (Ridl.) Gilly		Inselberg		
Cyperus cf. *flavescens*		Sandbank Mbarangandu River		
Cyperus L.	Ukindu	Sandbank Mkolesya Islands		
Mariscus psilostachys C.B. Clarke		Miombo woodland on boulders		
Schoenoplectus corymbosus (Roth ex Roem. & Schult.) J. Raynal		Riverine forest		
Scleria melanomphala Kunth		Miombo woodland		
Liliaceae				
Anthericum L.		Miombo woodland on boulders		
Aloe mawii Christian		Termitaria on rock outcrop		**CITES listed App. II**
Asparagus setaceus (Kunth) Jessop		Gully forest		
Asparagus africanus Lam.		Thicket on termite hill		
Dipcadi Medik.		Savannah		
Dipcadi cf. *longifolium*		Transition dry miombo woodland to savannah		
Sansevieria canaliculata Carrière		Savanna woodland with thicket understorey		
Sansevieria ehrenbergii Schweinf. ex Baker		Thicket on termite hill		

Urginea brachystachys		Termitaria at Hippo pond Ruvuama River		
Orchidaceae				
Acampe Lindl.		Ridge top on rocks; epiphyte		**CITES listed App. II**
Angraecum stolzii Schltr.		Ridge top on boulders, miombo woodland; epiphyte		**CITES listed App. II**
Bulbophyllum mahonii Rolfe		Miombo woodland; epiphyte		**CITES listed App. II**
Microcoelia exilis Lindl.		Miombo woodland; epiphyte		**CITES listed App. II**
Polystachya dendrobiiflora Rchb. f.		Miombo woodland		**CITES listed App. II**
Poaceae				
Andropogon gayanus Kunth		Miombo woodland (savanna?); on deeper plateau soils		
Andropogon canaliculatus Schumach.		Miombo woodland		
Andropogon schirensis Hochst. ex A. Rich.		Miombo woodland (savanna?); on stony slopes		
Aristida adscensionis L.		Miombo woodland (savanna?); on leached soils		
Beckeropsis uniseta (Nees) K. Schum.		Miombo woodland, gully forest		
Brachiaria (Trin.) Griseb.		Miombo woodland		
Cenchrus L.		Miombo woodland		
Digitaria Haller		Miombo woodland		
Eragrostis patens Oliv.		Sandbank Mkolesya Islands		
Eragrostis Wolf		Sandbank Mkolesya Islands		
Hyparrhenia newtonii (Hack.) Stapf		Miombo woodland (savanna?); on stony slopes		
Hyparrhenia rufa (Nees) Stapf	Masekela	Mbuga		
Hyparrhenia variabilis Stapf	Lukuwe	Mbarangandu Riverbank, Mbuga		
Hyperthelia dissoluta (Nees ex Steud.) Clayton	Masekela	Miombo woodland (savanna?); on deeper plateau soils		
Loudetia arundinacea (Hochst. ex A. Rich.) Steud.		Rock outcrops		
Loudetia simplex (Nees)		Transition dry miombo woodland to savanna		
Melinis hirsuta Mez		Savanna woodland		
Microchloa kunthii Desv.		Miombo woodland		
Miscanthus violaceus (K. Schum.) Pilg.		Mbuga		
Oxytenanthera abyssinica (A.Rich.) Munro		Transition dry miombo woodland to savanna	Sap used for local beer (Ulahe)	
Panicum maximum Jacq.	Maboboju	Mbuga		
Panicum trichocladum Hack. ex K. Schum.		Thicket on termite hill		

Panicum L.		Miombo woodland		
Pennisetum purpureum Schumach.		Mbuga		
Phacelurus huillensis (Rendle) Clayton		Miombo woodland		
Phragmites mauritianus Kunth	(Matete)	River sandbank		
Sporobolus pyramidalys P. Beauv.		Miombo woodland		
Themeda triandra Forssk.	Luhimba	Miombo woodland, savanna; ubiquitous		
Dicotyledons				
Acanthaceae				
Barleria fulvostellata C.B. Clarke		Miombo woodland		
Barleria spinulosa Klotzsch		Savanna woodland		
Blepharis affinis Lindau		Miombo woodland		
Hypoestes verticillaris (L. f.) Sol. ex Roem. & Schult.		Thicket on termite hill		
Justicia L.		Miombo woodland		
Lepidagathis andersoniana Lindau		Miombo woodland		
Monechma debile (Forssk.) Nees		Savanna woodland		
Pseuderanthemum hildebrandtii Lindau		Groundwater forest		
Ruellia patula Jacq.		Miombo woodland		
Thunbergia Retz.		Miombo woodland		
Amaranthaceae				
Achyranthes aspera L.		Thicket on termite hill		
Psilotrichum schimperi Engl.		Miombo woodland		
Amaryllidaceae				
Hypoxis obtusa Burch.		Miombo woodland		
Anacardiaceae				
Lannea discolor (Sond.) Engl.		Miombo woodland, thicket on termitaria on rock outcrop, savanna		
Ozoroa insignis Delile subsp. *reticulata* (Bak.f.) J.B. Gillett		Miombo woodland		
Rhus longipes Engl.		Spring vegetation, riverine forest		
Rhus natalensis Bernh.		Thicket on termite hill, miombo woodland		
Sclerocarya birrea (A. Rich.) Hochst.		Riverine forest	Fruit edible, rich in vitamin C; also eaten by a variety of game	
Sorindeia madagascariensis Thouars ex DC.		Riverine forest, gully forest		

Annonaceae				
Annona senegalensis Pers.		Miombo woodland, savanna	Fruit edible	
Artabotrys brachypetalus Benth.		Riverine forest		
Dielsiothamnus divaricatus (Diels) R.E. Fr.		Riverine forest		
Lettowianthus stellatus Diels	Mpunju	Groundwater forest		**Endemic in TZ; IUCN vulnerable**
Monanthotaxis buchananii (Engl.) Verdc.		Gully forest, groundwater forest		
Monanthotaxis discolor (Diels) Verdc.		Miombo woodland		**Endemic in TZ**
Uvaria lucida Bojer ex Benth.		Gully forest, groundwater forest		
Xylopia parviflora Spruce		Gully forest		
Xylopia sp. nov.		Riverine forest		**Novel species**
Apiaceae				
Peucedanum winkleri H. Wolff		Rock outcrop Jiwe la Bwana		
Steganotaenia araliacea Hochst.		Riverine forest		
Apocynaceae				
Carissa edulis (Forssk.) Vahl		Thicket on termite hill	Fruits edible	
Landolphia parvifolia K.Schum.		Miombo woodland; often associated with rock outcrops		
Diplorhynchus condylocarpon (Müll. Arg.) Pichon		Miombo woodland; ubiquitous but often associated with thin, rocky soils		
Rauvolfia caffra Sond.	Msesewe	Groundwater forest		
Rauvolfia mombasiana Stapf		Groundwater forest		
Saba comorensis (Bojer ex A. DC.) Pichon		Riverine forest, gully forest, groundwater forest		
Voacanga africana Stapf		Riverine forest		
Asclepediaceae				
Ectadiopsis oblongifolia (Meisn.) Schltr.		Riverine forest		
Asteraceae				
Aspilia africana (Pers.) C.D. Adams		Spring vegetation		
Aspilia pluriseta Schweinf.		Miombo woodland		
Berkheya zeyheri (Sond. & Harv.) Oliv. & Hiern		Miombo woodland		
Bidens pilosa L.	Manywegelele	Thicket on termite hill		
Elephantopus scaber L.		Miombo woodland on boulders		
Guizotia scabra (Vis.) Chiov.		Miombo woodland		
Helichrysum foetidum (L.) Moench		Miombo woodland		

Launaea cornuta (Hochst. ex Oliv. & Hiern) C. Jeffrey		Riverine forest		
Melanthera albinervia O. Hoffm.		Groundwater forest		
Pleiotaxis pulcherrima Steetz		Miombo woodland		
Vernonia galamensis (Cass.) Less.		Miombo woodland		
Vernonia glabra (Steetz) Vatke	Nalioto	Groundwater forest, riverine forest		
Vernonia melleri Oliv. & Hiern		Miombo woodland		
Vernonia stenocephala Oliv.		Miombo woodland		
Vernonia Schreb.		Miomboe woodland		
Bignoniaceae				
Kigelia africana (Lam.) Benth.	[Sausage tree]	Riverine forest		
Markhamia obtusifolia (Baker) Sprague	Mpughupughu	Miombo woodland, gully forest		
Stereospermum kunthianum Cham.		Edge riverine forest, savanna woodland		
Boraginaceae				
Cordia ovalis R. Br.		Savanna woodland		
Trichodesma physaloides (Fenzl) A. DC.		Cultivation		
Bombacaceae				
Adansonia digitata L.		Savanna in south-eastern Corridor		
Burseraceae				
Commiphora schimperi (O. Berg) Engl.		Riverine forest		
Commiphora Jacq.		Thicket on termite hill		
Commiphora Jacq.		Rock outcrop Jiwe la Bwana		
Caesalpiniaceae				
Afzelia quanzensis Welw.	Mbarikila (Mbambakofi)	Miombo woodland; groundwater forest	Highly sought for its timber	
Bauhinia tomentosa L.		Riverine forest edge		
Bobgunnia madagascariensis (Desv.) J.H. Kirkbride & Wiersema		Miombo woodland		
Brachystegia boehmii Taub.		Exclusively in miombo woodland	Wood used for tools; Bark used for ropes	
Brachystegia bussei Harms	Mtondo	Exclusively in miombo woodland; rocky hills		
Brachystegia floribunda Benth.	Mnguku	Exclusively in miombo woodland		
Brachystegia longifolia Benth.	Muhiga	Exclusively in miombo woodland; in higher rainfall areas		
Brachystegia microphylla Harms		Exclusively in miombo woodland; only on rocky summits and ridges		

Brachystegia spiciformis Benth.	Mgelegele	Exclusively in miombo woodland;deeper plateau soils or on terraces which are traditionally used by shifting cultivation		
Brachystegia stipulata De Wild.		Exclusively in miombo woodland		
Brachystegia utilis Hutchinson & Burtt Davy	Nyombo or Unguku	Exclusively in miombo woodland		
Burkea africana Hook.	Mpuga jike	Tall miombo woodland at Ruvuma River	Potential as timber	
Cassia abbreviata Oliv.		Miombo woodland, gully forest, thicket on termite hill; ubiquitous		
Cassia afrofistula cf. Brenan		Riverine forest		
Cassia L.		Gully forest		
Cryptosepalum maraviense Oliv.	Ikome	Miombo woodland		
Englerodendron usambarense Harms		Riverine forest Hippo pond Ruvuma		
Erythrophleum africanum (Welw. Ex Benth.) Harms		Tall miombo woodland at Ruvuma River	Potential as timber	
Erythrophleum suaveolens (Guill. & Perr.) Brenan	Mpuga dume	Riverine forest		
*Julbernardia globiflora (*Benth.) Troupin	Mchenga	Exclusively in miombo woodland; characteristic of rocky and thin soil	Bark used for ropes	
Piliostigma thonningii (Schumach. & Thonn.) Milne-Redh.	Mheghehe	Tall miombo woodland at Ruvuma River; riverine forest		
Tamarindus indica L.		Miombo woodland, savanna, thicket on termite hill, riverine forest; ubiquitous	Fruit edible, and a pleasant drink (which is laxative) is made from them; good charcoal	
Capparaceae				
Boscia angustifolia A. Rich.		Thicket on termite hill, savanna		
Boscia coriacea Pax		Thicket on termite hill		
Boscia salicifolia Oliv.		rock outcrop Jiwe la Bwana		
Cadaba kirkii Oliv.		Thicket on termite hill		
Maerua kirkii (Oliv.) F. White		Thicket on termite hill		
Ritchiea capparoides (Andrews) Britten		Thicket on termite hill		
Thylachium DC.		Thicket on termite hill		
Celastraceae				
Elaeodendron buchananii (Loes.) Loes.		Miombo woodland		
Maytenus heterophylla (Eckl. & Zeyh.) N. Robson		Fallow land, savanna?		
Maytenus senegalensis (Lam.) Exell		Fallow land, savanna?		
Maytenus undata (Thunb.) Blakelock		Riverine forest		
Reissantia buchananii (Loes.) N. Hallé		Thicket on termite hill		

Chrysobalanaceae				
Hirtella zanzibarica Oliv.		Riverine forest; gully forest		
Maranthes floribunda (Baker) F. White		Thicket on termite hill		
Parinari curatellifolia Planch. ex Benth.	Mbula	Miombo woodland on plateau	Fruit (pulp and kernel) edible	
Clusiaceae				
Garcinia huillensis Welw. ex Oliv.	Mpusa swala	Miombo woodland		
Garcinia livingstonei T. Anderson	Mpusa swala	Miombo woodland, savanna		
Garcinia cf. *livingstonei*	Mpusa swala	Riverine forest		
Harungana madagascariensis Lam. ex Poir.		Spring vegetation		
Psorospermum febrifugum Spach	Kihakara	Miombo woodland		
Combretaceae				
Combretum fragrans F. Hoffm.	Mrama	Savanna		
Combretum molle R. Br. ex G. Don	Mrama	Miombo woodland		
Combretum paniculatum Vent.	Mrama	Savanna		
Combretum pentagonum M.A. Lawson	Mrama	Gully forest, groundwater forest		
Combretum schumannii Engl.	Mrama	Miombo woodland		
Combretum zeyheri Sond.	Mrama	Miombo woodland, savanna		
Combretum Loefl.	Mrama	Miombo woodland		
Combretum Loefl.	Mrama	Riverine forest		
Combretum Loefl.	Mrama	Savanna		
Combretum Loefl.	Mrama	Savanna		
Combretum Loefl.	Mrama	Thicket on termite hill		
Pteleopsis myrtifolia (M.A. Lawson) Engl. & Diels		Edge riverine forest		
Terminalia mollis M.A. Lawson		Savanna		
Terminalia sericea Burch. ex. DC.	Mpula mwihe	Miombo woodland		
Convolvulaceae				
Ipomoea L.		Liana termitaria on rock outcrop		
Ipomoea L.		Groundwater forest		
Merremia hederacea (Burm. f.) Hallier f.		Riverine forest		
Crassulaceae				
Crassula vaginata Eckl. & Zeyh.		Miombo woodland		
Kalanchoe lanceolata (Forssk.) Pers.		Gully forest		
Dipterocarpaceae				

Monotes katangensis (De Wild.) De Wild.		Miombo woodland; often associated with thin, rocky soils		
Ebenaceae				
Diospyros mespiliformis Hochst. ex A. DC.		Riverine forest		
Diospyros L.		Groundwater forest		
Diospyros verrucosa Hiern		Miombo woodland		
Euclea natalensis A. DC.		Gully forest		
Euclea schimperi (A. DC.) Dandy		Gully forest, thicket on termite hill		
Erythroxylaceae				
Erythroxylum emarginatum Thonn.		Riverine forest		
Euphorbiaceae				
Acalypha fruticosa Forssk.		Gully forest		
Acalypha paucifolia Baker & Hutch.		Gully forest		
Antidesma venosum E. Mey. ex Tul.		Riverine forest		
Bridelia cathartica G. Bertol.		Miombo woodland		
Bridelia duvigneaudii J. Léonard		Miombo woodland		
Bridelia micrantha (Hochst.) Baill.		Riverine forest		
Croton pseudopulchellus Pax		Savanna		
Desmodium salicifolium (Poir.) DC.		Savanna woodland		
Euphorbia candelabrum Tremaux ex Kotschy		Thicket on termite hill		
Euphorbia hirta L.		Road talus		
Flueggea virosa (Roxb. ex Willd.) Voigt		Groundwater forest		
Hymenocardia acida Tul.	Kahupa kanguku	Riverine forest		
Mallotus oppositifolius (Geiseler) Müll. Arg.		Riverine forest edge		
Maprounea africana Müll. Arg.		Miombo woodland; often on rocky summits		
Margaritaria discoidea (Baill.) G.L. Webster		Gully forest		
Phyllanthus nummulariifolius Poir.		Miombo woodland		
Phyllanthus reticulatus Poir.		Riverine thicket, Ruvuma River	Baiting fishes	
Sapium ellipticum (Hochst.) Pax		Riverine forest (Mburukasese)		
Pseudolachnostylis maprouneifolia Pax	Muhoro	Miombo woodland; ubiquitous species but often found on escarpments and plateaus	Fruits are mainly eaten by birds, antelopes and elephants; leaves are browsed by antelopes and elephants	

Uapaca kirkiana Müll. Arg.	Mhuko mkurunga (Msuku)	Miombo woodland; at the edges of mbugas, on shallow and often bare soil; in association with *U.sansibarica*	Fruit edible; melliferous; ectomycorrhizal association with a number of mushroom species, include some chanterelles (Smith & Allen 2004)	
Uapaca nitida Müll. Arg.	Mhekela	Miombo woodland; ubiquitous species	Fruit edible	
Uapaca sansibarica Pax	Uhuko mtoto (Msuku mdogo)	Miombo woodland; on shallow and often bare soils; in association with *U.kirkiana*		
Fabaceae				
Abrus precatorius L.		Savanna woodland		
Baphia massaiensis Taub.		Miombo woodland		**Endemic in TZ**
Crotalaria cephalotes Steud. ex A. Rich.		Miombo woodland		
Crotalaria keniensis Baker f.	Marejea	Riverine forest		
Crotalaria ringoetii Baker f.		Miombo woodland		
Crotalaria L.		Miombo woodland		
Dalbergia armata E. Mey.	Mkurumo	Riverine forest		
Dalbergia nitidula Welw. ex Baker		Miombo woodland; often associated with thin, rocky soils		
Dalbergia melanoxylon Guill. and Perr.	Mpingo [African Ebony]	Dry miombo woodland (transition to savanna); often associated with *Oxytenanthera abyssinica*	Excellent hardwood, used for carving and instrument-making; becoming rarer in Tanzania due to overexploitation	
Dalbergia obovata E. Mey.		Gully forest		
Drogmansia pteropus		Miombo woodland		
Eriosema (DC.) Desv.		Savanna woodland		
Kotschya strigosa (Benth.) Dewit & P.A. Duvign.		Miomboe woodland		
Lonchocarpus bussei Harms		Dry miombo woodland (transition to savanna)		
Lonchocarpus capassa Rolfe		Savanna		
Macrotyloma africanum (Brenan ex R. Wilczek) Verdc.		Groundwater forest		
Macrotyloma axillare (E. Mey.) Verdc.		Gully forest		
Millettia dura Dunn		Gully forest, groundwater forest		
Millettia bussei Harms		Thicket on termite hill		**IUCN vulnerable**
Millettia elongatistyla J.B. Gillett		Groundwater forest		
Mucuna stans Welw. ex Baker	Upupu [Buffalo beans]	Fallow land	Irritant bristles	
Mundulea sericea (Willd.) A. Chev.		Miombo woodland		
Neorautanenia mitis (A. Rich.) Verdc.		Savanna woodland		
Ormocarpum kirkii S. Moore		Miombo woodland		

Pericopsis angolensis (Baker) van Meeuwen	Mvanga	Miombo woodland	Potential as timber	
Pterocarpus angolensis DC.	Mtumbati (Mninga)	Miombo woodland	Highly sought for its timber	
Pterocarpus tinctorius Welw.		Gully forest		
Rhynchosia micrantha Harms		Gully forest		
Rhynchosia orthobotrya Harms		Riverine forest		
Rhynchosia resinosa Hochst. ex Baker		Miombo woodland		
Xeroderris stuhlmannii (Taub.) Mendonça & E.C. Sousa		Groundwater forest, riverine forest		
Flacourtiaceae				
Flacourtia indica (Burm. f.) Merr.	Ndawa tawa	Miombo woodland on deeper plateau soils, riverine forest, gully forest	Fruits edible	
Hippocrateaceae				
Hippocratea L.		Miombo woodland		
Hydrostachyaceae				
Hydrostachys polymorpha Klotzsch		Ruvuma River		
Icacinaceae				
Apodytes dimidiata E. Mey. ex Arn.		Gully forest		
Ixonanthaceae				
Phyllocosmus lemaireanus (De Wild. & Th. Dur.) Th. & H. Dur.		Miombo woodland, thicket on termite hill		
Lamiaceae				
Becium obovatum (E. Mey. ex Benth.) N.E. Br.		Miombo woodland		
Fuerstia africana T.C.E. Fr.		Miombo woodland		
Leucas tettensis Vatke		Miombo woodland		
Orthosiphon rubicundus (D. Don) Benth.		Miombo woodland		
Plectranthus tetragonus Gürke		Savanna woodland		
Pycnostachys dewildemaniana Robyns & Lebrun		Mbuga		
Linaceae				
Hugonia busseana Engl.		Miombo woodland		
Loganiaceae				
Strychnos cocculoides Baker		Miombo woodland		
Strychnos potatorum L. f.		Miombo woodland; groundwater forest		
Strychnos spinosa Lam.		Miombo woodland		
Strychnos innocua Delile	Mngulanguha	Riverine forest		
Loranthaceae				

Agelanthus sansibarensis (Engl.) Polhill & Wiens		Riverine thicket		
Phragmanthera dschallensis (Engl.) M.G. Gilbert		Miombo woodland; hemi-parasitic mistletoe on *Brachystegia* spp.		
Phragmanthera usuiensis (Oliv.) M.G. Gilbert		Miombo woodland		
Malvaceae				
Azanza garckeana (F. Hoffm.) Exell & Hillc.		Riverine forest, gully forest		
Hibiscus L.		Savanna		
Melastomataceae				
Memecylon flavovirens Baker	Mkwiro	Miombo woodland; escarpments, rocky hillsides and ridges	Fruits eaten by birds	
Meliaceae				
Khaya anthotheca (Welw.) C. DC.	[African Mahogany]	Riverine forest, groundwater forest, gully forest	Highly sought for its timber	**IUCN vulnerable**
Trichilia dregeana Sond.		Riverine forest, groundwater forest		
Trichilia emetica Vahl		Groundwater forest	Potential as timber	
Turraea holstii Gürke		Riverine forest		
Turraea nilotica Kotschy & Peyr.		Miombo woodland		
Menispermaceae				
Stephania abyssinica (Quart.-Dill. & A. Rich.) Walp.		Gully forest		
Tiliacora funifera (Miers) Oliv.		Thicket on termite hill		
Mimosaceae				
Acacia clavigera E. Mey.		Savanna woodland, gully forest		
Acacia goetzei Harms subsp. *goetzei*		Savanna woodland		
Acacia goetzei Harms subsp. *microphylla* Brenan		Miombo woodland, dry miombo woodland (transition to savanna)		
Acacia nigrescens Oliv.		Savanna woodland		
Acacia polyacantha Willd.		Riverine savanna woodland		
Acacia senegalensis (Houtt.) Roberty		Savanna woodland		
Acacia xanthophloea Benth.		Savanna		
Albizia amara (Roxb.) Boivin		Gully forest		
Albizia antunesiana Harms		Savanna woodland Mkolesia		
Albizia glaberrima (Schumach. & Thonn.) Benth.		Riverine forest	Potential as timber	
Albizia versicolor Welw. ex Oliv.		Gully forest		
Dichrostachys cinerea (L.) Wight & Arn.		Savanna		

Entada abyssinica Steud. ex A. Rich.		Miombo woodland		
Entada gigas (L.) Fawc. & Rendle		Riverine forest, gully forest		
Mimosa pigra L.		Riverine thicket		
Parkia filicoidea Welw. ex Oliv.		Riverine forest, groundwater forest		
Moraceae				
Ficus lutea Vahl		Groundwater forest		
Ficus sycomorus L.		Riverine forest		
Ficus thonningii Blume		Riverine forest		
Ficus L.	Mkuyu	Riverine thicket Mkolesia Island		
Treculia africana Decne.		Riverine forest		
Myrsinaceae				
Embelia schimperi Vatke		Miombo woodland		
Maesa lanceolata Forssk.		Spring vegetation		
Myrtaceae				
Syzygium cordatum Hochst.	Unyonyo	Mbuga, riverine forest	Fruits edible	
Syzygium guineense (Willd.) DC. subsp. *guineense* Boutique	Mtepela	Riverine forest	Fruits edible	
Syzygium guineense (Willd.) DC.	Huvuhuvu	Miombo woodland		
Nymphaeaceae				
Nymphaea lotus L.		Rock pool on rock outcrop Rutukira River		
Ochnaceae				
Ochna holstii Engl.		Groundwater forest		
Ochna macrocalyx Oliv.		Riverine forest		
Ochna mossambicensis Klotzsch		Riverine forest		
Olacaceae				
Olax dissitiflora Oliv.		Miombo woodland		
Olax obtusifolia De Wild.		Miombo woodland		
Ximenia americana L.		Miombo woodland, riverine forest		
Ximenia caffra Sond.	Mbingipingi	Miombo woodland		
Oleaceae				
Jasminum L.		Groundwater forest		
Jasminum L.		Thicket on termite hill		
Onagraceae				
Ludwigia octovalvis (Jacq.) P.H. Raven		Rock outcrop		

Opiliaceae				
Opilia celtidifolia (Guill. & Perr.) Endl. ex Walp.		Savanna woodland		
Passifloraceae				
Passiflora foetida L.		Grondwater forest		
Plumbaginaceae				
Plumbago zeylanica L.		Groundwater forest		
Proteaceae				
Faurea rochetiana (A. Rich.) Chiov. ex Pic. Serm.		Open miombo woodland		
Faurea saligna Harv.		Miombo woodland		
Protea angolensis Welw.	Kihewa	Open miombo woodland		
Protea madiensis Oliv.	Kihewa	Miombo woodland		
Rhamnaceae				
Ziziphus abyssinica Hochst. ex A. Rich.		Riverine forest		
Ziziphus mucronata Willd.		Thicket on termite hill		
Rubiaceae				
Breonadia salicina (Vahl) Hepper & J.R.I. Wood	Mgwina	Riverine forest, gully forest, Korongo	Highly sought for its timber	
Catunaregam spinosa (Thunb.) Tirveng.	Kihuruhuru	Groundwater forest		
Chassalia umbraticola Vatke		Thicket on termite hill		
Cremaspora triflora (Thonn.) K. Schum.		Gully forest		
Crossopteryx febrifuga (Afzel. ex G. Don) Benth.		Transition dry miombo woodland to savanna		
Gardenia resiniflua Hiern		Thicket on termite hill		
Gardenia ternifolia Schumach. & Thonn.		Miombo woodland		
Ixora narcissodora K. Schum.		Miombo woodland		
Keetia venosa (Oliv.) Bridson		Miombo woodland, gully forest		
Multidentia crassa (Hiern) Bridson & Verdc.	Maviro	Miombo woodland	Fruit edible	
Otiophora scabra Zucc.		Miombo woodland (boulders)		
Paederia foetens (Hiern) K. Schum.		Riverine forest		
Pavetta schumanniana F. Hoffm. ex K. Schum.		Miombo woodland		
Pavetta stenosepala K. Schum.		Miombo woodland		
Polysphaeria braunii K. Krause		Riverine forest, groundwater forest		
Psychotria riparia (K. Schum. & K. Krause) E.M.A. Petit		Spring vegetation, groundwater forest		
Rytigynia uhligii (K. Schum. & K. Krause) Verdc.		Miombo woodland		
Rytigynia Blume		Miombo woodland		

Sericanthe andongensis (Hiern) Robbr.		Gully forest		
Spermacoce dibrachiata Oliv.		Miombo woodland		
Tapiphyllum discolor (De Wild.) Robyns		Miombo woodland		
Tarenna graveolens (S. Moore) Bremek.		Thicket on termite hill		
Tricalysia coriacea (Benth.) Hiern		Miombo woodland, riverine forest		
Tricalysia ovalifolia Hiern		Spring vegetation		
Tricalysia ruandensis Bremek.		Groundwater forest		
Rutaceae				
Vepris glomerata (F. Hoffm.) Engl.		Thicket on termite hill		
Sapindaceae				
Blighia unijugata Baker		Groundwater forest		
Allophylus congolanus Gilg		Gully forest		
Allophylus L.		Riverine forest Hippo pond Ruvuma		
Deinbollia borbonica Scheff.		Riverine forest		
Pancovia golungensis (Hiern) Exell & Mendonça		Gully forest		
Pappea capensis Eckl. & Zeyh.		Thicket on termite hill		
Paullinia pinnata L.		Riverine forest		
Sapotaceae				
Manilkara mochisia (Baker) Dubard		Thicket on termite hill		
Mimusops obtusifolia Lam.		Thicket on termite hill; riverine forest		
Scrophulariaceae				
Buchnera quadrifaria Baker		Miombo woodland		
Sopubia mannii Skan		Miombo woodland		
Simaroubaceae				
Harrisonia abyssinica Oliv.		Riverine forest edge		
Smilacaceae				
Smilax anceps Willd.		Gully forest		
Sterculiaceae				
Dombeya mupangae K. Schum.		Riverine forest		
Dombeya rotundifolia (Hochst.) Planch		Miombo woodland		
Dombeya Cav.	Luyogoyo	Groundwater forest		
Sterculia africana (Lour.) Fiori		Miombo woodland		
Sterculia quinqueloba (Garcke) K. Schum.		Riverine forest	Potential as timber	
Thymelaeaceae				

Gnidia mollis C.H. Wright		Miombo woodland		
Synaptolepis kirkii Oliv.	Kipala pala	Groundwater forest		
Tiliaceae				
Corchorus aestuans L.		Savanna woodland		
Grewia mollis Juss.		Savanna		
Grewia cf. *stolzii*		Miombo woodland		
Triumfetta rhomboidea Jacq.		Gully forest		
Velloziaceae				
Xerophyta spekei Baker		Rock outcrop		
Verbenaceae				
Clerodendron R. Br. ex Meisn.		Riverine forest Hippo pond Ruvuma		
Lippia javanica (Burm f.) Spreng.		Riverine forest		
Vitex mombassae Vatke		Miombo woodland		
Vitex doniana Sweet		Gully forest		
Vitaceae				
Cissus cornifolia (Baker) Planch.		Thicket on termite hill		
Cissus L.		Riverine forest at Hippo pond Ruvuma		
Zygophyllaceae				
Balanites aegyptiacus (L.) Delile		Miombo woodland		
Zingiberaceae				
Aframomum mala (K. Schum.) K. Schum.		Spring vegetation		