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EXECUTIVE SUMMARY

At the request of the Sociedade para a Gestão e Desenvolvimento da Reserva do Niassa and Fauna and Flora International, a botanical survey of the Niassa Reserve in northern Mozambique was carried out in June 2003. The objectives included compiling a preliminary plant species list, collecting herbarium specimens, providing an initial characterisation of the vegetation types found there, identifying species and areas of particular importance for conservation, and providing recommendations to management on plant conservation priorities. The survey team consisted of five botanists.

Existing information on the vegetation and plants of the area is very limited. This was reviewed.

Ground and aerial surveys were conducted over a 21 day period. Owing to difficulties in accessibility and the brief period spent in the Reserve, the findings are preliminary. These findings are presented and discussed under four headings: (i) plant species; (ii) species of interest; (iii) habitats and vegetation; and (iv) threats. In addition, some suggestions for future botanical collecting are given along with indications of the main management implications.

A total of 307 plant collections were made, and have been distributed to appropriate herbaria. The provisional checklist gives 326 species. One of these, from the slopes of Serra Mecula, is new to science. In addition, there are at least seven new records for Mozambique. Although many of the plants found are typical of drier miombo woodlands that cover much of the central African plateau, there are some habitats of particular interest. These are: (a) moist forest patches on Serra Mecula (a large mountain in the east of the Reserve); (b) drier forest patches associated with gullies on the slopes of the Serra Mecula and on numerous inselbergs; (c) riverine woodland and thickets (primarily along the Rio Lugenda); and (d) dambo grasslands. Such habitats support a number of species of restricted distribution, including species usually associated with moist forests or East African coastal forests. Of particular conservation importance are the moist upland forest patches on Serra Mecula that contain significant outliers of forest species at a continental level. These patches are now threatened by frequent wildfires. Apart from fire and clearance for cultivation in some localities, there are no major threats to plant populations at present.

It is recommended that a reconnaissance-level ecological vegetation survey of the Reserve and surrounding coutadas is undertaken which can act as a framework for future biological studies. In addition, for effective conservation management, more detailed surveys and collecting are required of the whole of Serra Mecula and of the riverine woodlands of the Rio Lugenda and other major rivers. Owing to the size of the Reserve, it is suggested that plant conservation attention is focussed on these and other areas of significance for biodiversity. Serra Mecula is an area of especial conservation and aesthetic significance. Reduction in the extent and frequency of fire should be a major objective.
1. INTRODUCTION

Following a proposal to carry out a reconnaissance botanical survey of the Niassa Reserve, submitted in July 2002 by Janice Golding and Jonathan Timberlake (Golding & Timberlake 2002), the Sociedade Para a Gestão e Desenvolvimento da Reserva do Niassa (henceforth, SRN) commissioned a reconnaissance botanical survey in April 2003. This was to take place in June 2003 with funding from Fauna and Flora International. The survey forms part of a series of biodiversity studies that include vegetation cover, small carnivores, birds, reptiles/amphibians and fish (see Rodrigues 2003).

The survey was initially meant to comprise six professionals (including three Mozambicans). However, owing to last minute changes in availability, only the following persons participated:

- Jonathan Timberlake (Team Leader)
- Janice Golding (Expedition Organiser)
- Carlos Boane (Botany Technician)
- Phillip Clarke (Botanist specialising in coastal forests)
- Alfredo Nuvunga (Botany Technician)

Members of the expedition have had extensive experience in plant collecting in Southern and Eastern Africa, particularly in Mozambique, and in vegetation and plant conservation studies in Mozambique, Zimbabwe, Tanzania and South Africa.

1.1 Objectives

The study focussed on the Niassa Reserve and the objectives were to:

1. Compile a preliminary plant species list for the Reserve;
2. Collect plant specimens for regional herbaria and for a set of these to be identified by Kew Herbarium in UK;
3. Provide an initial characterisation of the vegetation types found;
4. Identify plant species and habitats of particular interest or significance for conservation;
5. Provide recommendations to management on botanical conservation of the area;
6. Provide a series of plant collecting guidelines and an indication of research needs.

1.2 Study Area

The Niassa Reserve is situated in northern Mozambique adjacent to the Rio Rovuma, the border with Tanzania. The main part of the Reserve lies between the Rovuma and Lugenda rivers from around 36°25’ E eastwards to their confluence. At present it covers 23,040 km², with a buffer zone of coutadas (hunting areas) surrounding it on three sides of a further 19,239 km², giving a total under the jurisdiction of SRN of 42,279 km² (WWF SARPO 2002a). The Reserve was originally proclaimed in 1954 as a Game Reserve, but the boundaries have been modified significantly over the following 40 years. They were fully gazetted in their present form in 1999, with a core area surrounded by six coutadas. There is a District Centre (Mecula) within the area, and an estimated human population of 12,000. Local community rights within the reserve are protected by national forestry and wildlife legislation, particularly with respect to utilization of resources for subsistence.

The landscape comprises a mostly gently undulating plateau at around 300-600 m altitude, rising to a higher plateau and hills in the west at around 1370 m, and gradually falling to 150 m
at the confluence of the Rovuma and Lugenda rivers at the northeastern boundary. Much of the plateau is covered in dry to mesic (medium rainfall) miombo woodland on relatively sandy, nutrient-poor soils. The eastern and central parts are dominated by scattered granite inselbergs rising out of the plain to 600-800 m altitude. The microclimate on these inselbergs is harsh and extreme for plant growth, although a variety of discrete forest patches are associated with fire-protected gullies. The massif of the Serra Mecula, the highest point in the Reserve, rises to an altitude of 1442 m. Within the miombo woodland itself, particularly associated with the watersheds, are numerous and poorly-defined grassy dambos. Vegetation in lower-lying areas towards the Lugenda and Rovuma rivers is increasingly dominated by dry woodland types with species of *Millettia*, *Combretum* and *Acacia* trees.

1.3 Previous Botanical and Vegetation Studies

Previous work on the botany and vegetation of the area is very limited. Gomes Pedro and Barbosa (1955) in their pioneering study on Mozambique vegetation, describe the area as "Brachystegia-Julbernardia Woodland on Granite" (their Unit 104) and "little known", one of very few termed such in the country. A later vegetation map for the Flora Zambesiaca area (Wild and Barbosa 1967) shows more detail for this area, but the vegetation boundaries are related primarily to altitude (i.e. they follow contour lines rather than observed vegetation patterns). They are unlikely to have been based on new information from the Niassa Reserve. Wild and Barbosa state that the central and western parts are *Brachystegia boehmii/* *B. allenii* woodland (Type 29), with *Brachystegia boehmii/* *Adansonia* [baobab] woodland (Type 31) at lower altitudes towards the Lugenda and Rovuma rivers. Although we observed many of the species they mention, their descriptions of vegetation patterns do not do reflect well what we observed. For example, in the far west, on higher ground, and for a large area around the Serra Mecula, they map the vegetation as *Brachystegia utilis/* *Brachystegia* species woodland (Type 28). From our fieldwork, *B. utilis* is present on rocky slopes, but can hardly be termed a characteristic species within this area.

White in his vegetation map of Africa (White 1983) terms the area "Drier Zambezian miombo woodland (*Brachystegia/Julbernardia*)" with intrusions of East African coastal elements shown along the Rovuma and Lugenda rivers. However, we found very few of these elements during our fieldwork.

The Reserve falls within the Miombo Ecoregion as described by WWF, which comprises Caesalpinoid woodlands (Frost, Timberlake & Chidumayo 2001, WWF SARPO 2002b). Covering more than 3 million km², this Ecoregion (essentially tropical dry woodland) extends northwards to Angola and southern Democratic Republic of Congo, and as far south as tropical bushlands of South Africa. Much of the Miombo Ecoregion, including the Niassa Reserve, lies on the Central African Plateau, a flat area of undulating woodlands and grasslands that track the upland drainage of the plateau. This implies a similar biogeographic history of this ancient landscape.

The first biological survey of the area was that by Lobão Tello and Dutton (1979), which primarily covered the large mammals. It has also been the most comprehensive study undertaken to date on the vegetation of the Reserve. In the course of their 53 hour aerial survey, a preliminary vegetation classification of the entire area was carried out. Twenty-two vegetation types were briefly described under grasslands, savannas, woodlands, forest, riverine forest, swamps, thickets and formations on rock. Forty-four woody plant species characteristic of the vegetation types were mentioned, although we are not sure if these identifications were all confirmed or some seen solely from the air. The value of the work done by Lobão Tello and Dutton is that it was a first attempt to distinguish between different vegetation types using dominant species, as identified from aerial surveys, as indicators.
In 1997 the Niassa Reserve Management Plan was produced (Leo-Smith, Balson & Abacar 1997) which contains a list of 307 woody species. Of these, 191 were "positively identified" while the other 116 have "yet to be verified" or "may possibly occur". It is not clear what this actually means, how they were identified, or if herbarium specimens were collected and validated. There are no records in Maputo or Harare herbaria, the main herbaria for this region. Since some species pose great difficulties in identification without access to taxonomic keys and a herbarium, the list must be treated with caution.

There appear to have been no other botanical or vegetation studies. As far as we are aware, there have been hardly any botanical collections made from the Niassa Reserve area, including during colonial times. Balsinhas may have collected inside the Reserve, but it has not been possible to track any of these collections down.

The size of the Niassa Reserve and difficulties with accessibility are critical factors that impede fieldwork, and have compromised the detail and quality of previous work on botany and vegetation. Although there have been aerial surveys (e.g. Lobão Tello & Dutton 1979, Craig & Gibson 2002), very little ground-based fieldwork has been done (but see Balson in Leo-Smith et al. 1997). As a result, many untested assumptions have been made. The limitations of existing studies are as follows:

- Information presented in the various reports differs in its terminology and conceptual approach, and is often inconsistent and contradictory;
- A number of species on botanical checklists are possibly incorrectly identified;
- Taxonomic information has not been scientifically validated by a herbarium authority;
- Characteristic species of recorded vegetation types are questionable; and as a result
- Existing vegetation maps need to be confirmed by ground-based fieldwork.

As a result of these limitations, two important issues have been overlooked, namely, (i) how botanical and vegetation information for the Reserve should feed into an overall management plan, and (ii) where and how management should concentrate its efforts for conservation. We have attempted to address these issues in this report. Despite its limitations, some of the previous work on the botany and vegetation has laid an impressive and useful foundation for future fieldwork.
2. METHODS

A distinction is made here between a botanical or plant survey and a vegetation survey. In a plant survey plant species are recorded, resulting in a species list. Whereas in a vegetation survey vegetation structure and the main component species are recorded and related to landscape features. It usually results in a vegetation map.

2.1 Botanical Survey

The botanical survey component of this study set out to collect plant specimens, in addition to contributing towards a detailed inventory of the flora of the Niassa Reserve.

Our approach was to collect fruiting and flowering specimens in localities representing the broad vegetation types of the Reserve, a form of stratification. Because of problems with accessibility (many bridges were not passable at this time), observations on vegetation were limited to the central watershed (Mbatamila - Matondavela), the Serra Mecula and the area along the Rio Lugenda in Block C east of Mussoma village. Particular attention was given to woody species, partly because they are some of the most important species ecologically and partly because they made better specimens at the time of the survey. There were very few herbaceous species with flowers or fruits adequate for identification; grasses were nearly all dry and had lost seed heads.

Specimens collected were sent to Kew Herbarium (London, UK) for scientific validation. Such validation is important to confirm species identifications and new distribution records. Specimen duplicates were sent to the following herbaria: LMA and LMU (National Herbarium and University Herbarium, Maputo, respectively), SRGH (Harare) and PRE (Pretoria).

Table 1. Collection areas and itinerary during June 2003.

<table>
<thead>
<tr>
<th>Date</th>
<th>Collecting locality</th>
<th>Description of broad vegetation types</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-7 June</td>
<td>Mbatamila &amp; surrounds; road to Nyati</td>
<td>Deciduous woodland; vegetation on inselbergs; riverine woodland and thicket</td>
</tr>
<tr>
<td>8, 10-12 June</td>
<td>Serra Mecula (slopes and summit)</td>
<td>Deciduous woodland; vegetation on inselbergs; riverine woodland and thicket; vegetation on Serra Mecula</td>
</tr>
<tr>
<td>14-16 June</td>
<td>Rio Lugenda &amp; surrounds (Block C)</td>
<td>Riverine woodland and thicket; deciduous woodland</td>
</tr>
<tr>
<td>17-18 June</td>
<td>Mbatamila &amp; surrounds</td>
<td>Dambo vegetation; vegetation on inselbergs</td>
</tr>
<tr>
<td>19-20 June</td>
<td>Matondavela</td>
<td>Riverine woodland and thicket; deciduous woodland</td>
</tr>
<tr>
<td>21 June</td>
<td>Mbatamila &amp; surrounds</td>
<td>Vegetation on inselbergs</td>
</tr>
</tbody>
</table>

Preliminary identification of specimens was done in the field, and later with the help of John Burrows from the Buffelskloof Herbarium (Lydenburg, Mpumulanga, South Africa). Thereafter they were quarantined in a deep freeze for 7 days, and later sent to various herbaria. A full list of specimens that were collected is given in Appendix 1. For each specimen the following were noted: GPS coordinates, the number of duplicates, whether it was in fruit or flower, and a general description of the specimen and habitat from which it was collected. There were four sets of collectors: (i) J.S. Golding J.R. Timberlake & P. Clarke; (ii) C. Boane; (iii) J.R. Timberlake, A. Nuvunga & C. Boane; and (iv) J.R. Timberlake.
2.2 Vegetation Survey

A good overview of the vegetation of the eastern part of the Reserve was obtained from three and a half hours flying time in a light aircraft flown by Mike Watson (Mbatamila - Mussoma - along Rio Lugenda to Rovuma confluence - back to Mbatamila via Mecula town, followed by overflight of Serra Mecula - west to Mbatamila - south along Rio Chiulezi and Rio Luatize to Lugenda confluence - along upper Lugenda - north to Mbatamila). The flights gave a much clearer idea of the relationship of vegetation to landscape position and environment than was possible from the ground.

On the ground, observations were made on upper canopy cover (estimates of canopy closure and dominant woody species) and the herbaceous/grassy layer. Aspects such as soil type and catenary position were also noted. A description of the broad vegetation types and their threats in terms of human disturbance, fire and large mammal activity was made.

Unfortunately on the return trip to Maputo the main field notebook was stolen, along with the GPS with recorded waypoints. This necessitated the rewriting of most locality and species details. The plant specimens themselves were not affected, nor were the notes from collections by Carlos Boane. It was not possible to recreate the vegetation notes, but summary findings had already been recorded elsewhere. Detailed observations are therefore lacking in many cases, but the overall findings and conclusions were not affected.
3. FINDINGS AND MANAGEMENT IMPLICATIONS

The main findings from the study are described and discussed under five headings, covering species composition, vegetation patterns and management implications.

3.1 Plant Species Survey

Species collecting was limited to four broad localities - the area within a 10 km radius of Mbatamila Camp (miombo woodland and inselbergs), the area around Matondavela (miombo and riverine woodland), the area around Luwire Safari Camp along the Rio Lugenda in Block C (various types of woodland, including riverine), and the slopes and plateau of the Serra Mecula (miombo woodland, riverine and other forest). A total of 307 separate collections were made, 201 of which were J.Golding numbers and 106 of which were C.Boane numbers (see Appendix 1 for details). The total number of specimens collected was around 1040. A complete set of the 307 collecting numbers was sent to the Kew Herbarium (K) in London for identification by Kaj Vollesen. Other sets have been labelled and sent to the INIA Herbarium (LMA) and University herbarium (LMU) in Maputo. Any remaining specimens were divided among the National Herbarium in Harare (SRGH), that has particularly good collections from both Mozambique and the miombo woodland area, and the National Herbarium in Pretoria (PRE). Any fern and Moraceae duplicate specimens were deposited at the Buffelskloof Nature Reserve Herbarium in Mpumalanga, South Africa that has a particular interest in these groups.

A number of sterile specimens collected in the course of the vegetation component of this study were identified by R.B. Drummond in Harare. These are incorporated into the full provisional checklist (Appendix 2). Many of the 326 species listed here were also mentioned by Balson (Leo-Smith et al. 1997) or Lobão Tello and Dutton (1979). Some were identified visually during the present survey and have no supporting specimen.

An initial analysis of the list shows that most species encountered are found primarily in the dry woodlands of south central Africa, that is miombo, Millettia and Acacia woodlands. Others are typical of riverine environments and the alluvial soils that run through these seasonally dry woodlands, while a few are typical of dry evergreen forests of the East African coastal region. A small number of species, but those of greatest interest owing to their restricted or patchy distribution, are those associated with moist forests found along the plateau edge and highlands that run along the rim of Eastern Africa.

A very high proportion of the species found outside of the forest areas during the present survey were also found during a vegetation survey of state farms in the Montepuez-Balama area of Cabo Delgado province, some 150 km away (Timberlake 1985), although soils in this latter area are generally much more clay-rich (Eschweiler 1986).

3.2 Species of Conservation Interest

Notes are given on those species with interesting distributions or which represent outlying populations, and on those that are considered rare or threatened. A provisional list of these is given in Table 2 below.

The species of greatest interest were mainly found in: (a) medium or higher altitude forests on Serra Mecula, (b) along the Rio Lugenda in riverine woodland, or (c) in the occasional small patches of gully forest between inselbergs. Many of those associated with riverine habitats are outliers of the East African coastal flora, a flora that is known to be rich and with many endemics.
In terms of the forest patches found there, Serra Mecula appears to be an outlier of the East African highlands. The species composition shows similarities to that of higher altitude moist forests at 1500 m altitude in Zimbabwe, and medium altitude forests at around 1000-1200 m on Mount Selinda and the slopes of the Chimanimani Mountains and Mt Gorongosa.

Table 2. Species of particular interest found in the Niassa Reserve.

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthaceae</td>
<td>Barleria sp. nov.</td>
<td>Undescribed species of small shrub; in forest understorey on the lower slopes of Serra Mecula</td>
</tr>
<tr>
<td>Apocynaceae</td>
<td>Carvalhoa campanulata</td>
<td>Forest understorey shrub</td>
</tr>
<tr>
<td>Apocynaceae</td>
<td>Schizozygia coffaeoides</td>
<td>1st record for Mozambique; also in N Malawi. Forest understorey shrub</td>
</tr>
<tr>
<td>Arecaceae</td>
<td>Elaeis guineensis</td>
<td>Naturalised Oil Palm. 2nd record for Mozambique</td>
</tr>
<tr>
<td>Commelinaceae</td>
<td>Commelina nyasensis</td>
<td>Small herb in moist peat grassland; 1st record for Mozambique</td>
</tr>
<tr>
<td>Cyperaceae</td>
<td>Fuirena pubescens</td>
<td>Small sedge in moist peaty grassland; 1st record for Mozambique</td>
</tr>
<tr>
<td>Dracaenaceae</td>
<td>Sansevieria caniculata</td>
<td>Rare and little-known species; on clay bank in Acacia woodland</td>
</tr>
<tr>
<td>Ebenaceae</td>
<td>Diospyros anitae</td>
<td>Suffrutex endemic to N Mozambique &amp; S Tanzania miombo woodland. Until recently only known from the type specimen</td>
</tr>
<tr>
<td>Ebenaceae</td>
<td>Diospyros truncatifolia</td>
<td>Little known species from N Mozambique, S Malawi and S Tanzania. Riverine woodland</td>
</tr>
<tr>
<td>Eriocaulaceae</td>
<td>Eriocaulon bongense</td>
<td>Small herb in wet grassland flush; 1st record for Mozambique</td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td>Croton scheffleri</td>
<td>Higher altitude forest shrub (possibly mis-identified). 1st record for Mozambique</td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td>Uapaca paludosa or U. lissopyrena</td>
<td>Rare swamp forest tree with stilt roots. If U. paludosa, 1st record for Mozambique</td>
</tr>
<tr>
<td>Fabaceae: Mimosoideae</td>
<td>Acacia welwitschii</td>
<td>Tree principally from south coastal area. One of the few records for N Mozambique</td>
</tr>
<tr>
<td>Fabaceae: Papilionoideae</td>
<td>Erythrina sp.</td>
<td>Unusual tree; does not match known species</td>
</tr>
<tr>
<td>Fabaceae: Papilionoideae</td>
<td>Millettia bussei</td>
<td>Tree. Only known from S Tanzania &amp; N Mozambique</td>
</tr>
<tr>
<td>Loganiaceae</td>
<td>Strychnos cf. mellodora</td>
<td>Small forest tree. If confirmed, only 3rd record for Moz/Zim &amp; a very significant outlying population</td>
</tr>
<tr>
<td>Olacaceae</td>
<td>Olax gambecola</td>
<td>Uncertain identification; normally from Congolian forest. Here a high altitude forest tree</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td>Pavetta stenosepala</td>
<td>Understorey forest shrub; 1st record for Flora Zambesiaca region</td>
</tr>
<tr>
<td>Rutaceae</td>
<td>Zanthoxylum holtzianum</td>
<td>E African coastal species</td>
</tr>
<tr>
<td>Sapotaceae</td>
<td>Inhambanella henriquesil</td>
<td>E African coastal species</td>
</tr>
<tr>
<td>Sterculiaceae</td>
<td>Sterculia schliebenii</td>
<td>Coastal species of N Mozambique &amp; S Tanzania</td>
</tr>
</tbody>
</table>
3.3 Habitats and Vegetation

Because of problems of accessibility, observations on vegetation were limited to the central watershed (Mbatamila - Matondavela), Serra Mecula, and the area along the Rio Lugenda in Block C east of Mussoma village. Discussion of vegetation was also only a secondary objective of the present survey. The loss of the field notebook which contained numerous vegetation observations and data (including from 20 samples) restricts the detail of the discussion below, particularly in respect of species composition.

The vegetation of the Reserve can be divided into four broad groups:

- Deciduous woodlands
- Riverine woodland and thicket
- Vegetation on inselbergs
- Vegetation on Serra Mecula

**Deciduous Woodlands:** These types of woodlands cover over 95% of the area. The main type is miombo woodland, that is woodland dominated by tree species of *Brachystegia* or *Julbernardia* with a well-developed grass layer underneath. The miombo to the west, as far as could be seen from the air, is significantly taller and denser than in the east. This is probably an indication of either higher rainfall, or of soils with a higher clay content in the western part. Miombo woodland is more common on sandier soils on higher ground, and is particularly well-developed along the Mecula-Mbatamila watershed. Here it is interspersed with a number of hydromorphic grasslands or dambos. The grasslands are not only a perennial source of moisture but also support a rich herbaceous flora. Along the “eye” of the dambo a small stream is often found, generally fringed by a thin band of evergreen forest dominated by *Syzygium guineense* subsp. *barotsense* (or very similar subspecies) and *Syzygium cordatum*. On steeper slopes within miombo woodland, especially where areas have been cleared in the past, bamboo (*Oxytenanthera abyssinica*) thickets are common.

In somewhat drier areas (with shallow soils or with less soil moisture storage capacity) the woodland is shorter and more open. *Combretum* species and others are common, with fewer *Brachystegia* or *Julbernardia* trees. This is almost a transitional woodland type.

Closer to the Rio Lugenda a drier woodland type dominated by *Millettia stuhlmannii* becomes increasingly extensive. This *Millettia* woodland is interspersed with the driest types of vegetation - *Acacia welwitschii* wooded grassland in and around clay-rich pans, and very small patches of *Euphorbia cooperi* thicket on cemented soils. *Acacia* woodland is microphyllous, compared to the broadleaved woodlands elsewhere, and only partially deciduous. The environment here is obviously quite dry and seasonal. *Hyphaene coriacea* palms are locally common, and indicate access to groundwater.

The transition of woodland types across the landscape or catena can be seen as one moves from deeper sandy soils on the broad ridges (which are broader and more common furthest away from the two main rivers), through drier woodland on the slopes, to the *Millettia* and *Acacia* woodland types on soils that have much lower moisture storage capacity. The transition is gradual, with patches of miombo vegetation becoming less and less extensive, and more and
more patchy, as one moves towards the rivers.

**Riverine Woodland & Forest**: This group of vegetation types is found in a narrow band 20-500 metres wide along the major rivers, in particular the Rio Lugenda. They are very limited in their extent, being principally confined to river bends and confluenes. Most patches are only a few hectares in size. These woodlands are confined to alluvial soils where there is with additional available soil moisture owing to the proximity of the river. The species composition is significantly different from that of the surrounding deciduous woodland, and comprises a number of taller trees, including the characteristic and spectacular white-stemmed *Sterculia appendiculata*. Alluvial soils within the Reserve appear to be mostly deficient in clay particles, hence species normally associated with clay-rich soils, such as *Trichilia emetica*, were notably rare or absent. The understorey contains a number of shrubs of a variety of species. It was in these vegetation types that we hoped to find species more characteristic of the East African coastal area. However, most species found were typical of riverine woodland across the Zambezian savanna region, with few coastal species.

On sand banks in the main rivers, beds of the reed *Phragmites* sp. were common. Some islands seen from the air had a much denser vegetation on them of numerous shrubs with the palms *Phoenix reclinata* and (possibly) *Elaeis guineensis*. Flanking rivers in the west of the Reserve, Craig and Gibson (2002) found the palm *Raphia farinifera*. On sandy banks along the Lugenda and Rovuma rivers stands of the large tree *Faidherbia albida* are found locally.

**Inselbergs**: Vegetation on inselbergs, large rocky outcrops rising out of the plain, can be divided into four groups: (a) the bare rocky tops and steep slopes; (b) woodland on shoulders and ledges; (c) thick woodland or forest in the gullies; and (d) tall closed-canopy woodland on the footslopes.

The mostly bare slopes of inselbergs are exposed to desert-like conditions. The resurrection bush, *Myrothamnus flabellifolius*, is common along with the sedge *Coleochloa setifera*. Succulents such as *Aloe mawii*, *Euphorbia cooperi* and *Kalanchoe* species are found. Owing to the specialised adaptations required for life under such harsh conditions, including wide dispersal, most species on inselbergs are widespread in their distribution.

Woodland on slopes and ledges was not visited during the present survey. From the air it appears the main species is *Brachystegia glaucescens* (or a closely-related species). Again, the species here are likely to be widespread. Although no cycads were seen, it is in such environments that they are likely to be found.

Deeper, more nutrient-rich and moister soils in gullies or protected areas towards the base of inselbergs support thick woodland, becoming forest in places. A wide variety of woody species is found, including lianas. Although many are widely distributed, a few species are more typical of the East African coastal forests, e.g. *Grewia forbesii* and *Bombax rhodognaphalon*.

On the footslopes of inselbergs, on deeper and more clay-rich soils, tall dense woodland is found, dominated by *Julbernardia globiflora* or *Brachystegia* species up to 15 m high. The species composition is similar to the surrounding deciduous woodland, but the structure is different along with the size of trees.

**Serra Mecula**: The vegetation of the Serra Mecula is the most diverse within the Reserve, and also contains two types of vegetation not found elsewhere - moist forest and higher altitude shrubland or low woodland. The plateau on the mountain top, at around 800-1000 m altitude, comprises *Brachystegia* woodland (mostly *B. spiciformis*?). However, in the southern and eastern parts, human activity over almost 100 years (the German Army settled here for a period
during the First World War) has destroyed much of the woodland, resulting in a fire-maintained sub-climax grassland with scattered shrubs and small trees, especially *Strychnos spinosa*. On the outer slopes of the mountain a tall, moderately open woodland (10-15 m high, 75% canopy cover) of *Brachystegia boehmii*, *B. utilis* and *B. bussei* is found. Denser woodland or forest is found along the deeply-incised streams, and contains a number of interesting species such as *Uapaca cf. lissopyrena*, *Treculia africana* and *Khaya anthotheca*. Most significantly, the small patches of evergreen moist forest (1 to 5 ha in size) up on the plateau at a higher altitude (1000-1300 m) or associated with gullies below the larger peaks contain species, such as *Peddiea africana*, more commonly associated with forests of the mountains running along the eastern African plateau scarp from Ethiopia to South Africa, in particular those of Malawi, eastern Zimbabwe and Gorongosa.

On the highest peaks is found a scrub vegetation type with low scattered trees and a range of herbs and succulents. The species are often the same as those found in similar exposed but moist situations in eastern Zimbabwe. Serra Mecula is an outlier of upland or montane vegetation and species, and hence is of great conservation significance.

### 3.4 Threats

The level of threat to botanical diversity within the Niassa Reserve is much less than in other areas in northern Mozambique. The prime reason is a much lower human population density (due probably to a combination of poor soils, low rainfall and, historically, disease). Although a significant number of people live within the Reserve their subsistence agricultural activities involving bush clearance are comparatively restricted. However, the incidence and impacts of wildfires during the long dry season are significant.

Much of the miombo woodland seen showed signs of having been at least partially cleared at some time over the past 50 years, and virtually all showed evidence of burning within the past 2-3 years. Although miombo woodland is adapted to fire, it seems that the present frequency of fire is significantly higher that what was once 'natural'. Increased fire frequency leads to reduced recruitment of tree seedlings into the small tree layer, and to an increase in fire-adapted tall grasses and shrubs. Over decades fire can alter both woodland structure (making it more open) and the relative abundance of woodland species (favouring those adapted to fire).

No evidence was seen of selective logging of valued timber trees such as *Dalbergia melanoxylon* (Pau Preto), *Millettia stuhlmannii* (Panga Panga) or *Pterocarpus angolensis* (Kiaat). Individuals of these species are of poor size and form in the Reserve, but this is probably a natural feature and not a result of previous exploitation. Close to settlements various trees have been felled, but this is primarily construction timber for local use. A moderately wide range of hardwood species appear to be used.

There is no cattle grazing in the Reserve, and browsing by goats is limited to areas around settlements. Wildlife numbers are not sufficiently high to cause significant environmental impact. However, in Block C close to the Rio Lugenda there is evidence of elephant impact on vegetation, particularly to riverine woodland and thickets. Low branches are broken, thus increasing coppicing and shrubbiness. Around the clay pans, a number of shallow-rooted *Acacia* trees and others have been uprooted by elephant, presumably when the soils were very wet. Although not of major conservation concern at this stage, it is suggested that such damage could become problematic later if elephant concentrations build up. Impact is particularly prevalent during the dry season when elephants concentrate close to water sources such as the Rio Lugenda.
Of particular concern are wildfires on the Serra Mecula and on inselbergs. Evidence of fire is very apparent, and it is slowly "eating into" the important patches of forest found in the gullies. Protection against fires in such places, particularly up on the Serra Mecula, should be a conservation management priority. In particular, it was noted that a significant part of the secondary grassland/shrubland on the mountain was subjected to annual burning set by Niassa Reserve game scouts in order to keep footpaths open. What were intended to be small controlled fires rapidly become burnt hectares. The edges of the forest patches here are becoming increasingly 'hardened', and the size of the patches is likely to diminish slowly. A similar phenomenon was noted in Block C. Game scouts there burnt along the vehicle tracks in order to facilitate access and game viewing, but this results in square kilometres of woodland being burnt every year.

Very few plant species known to be globally or nationally threatened were found during the present survey. Of the seven species from the Reserve listed as threatened (Table 3, based on records in Walter & Gillett 1998, Oldfield et al. 1998 and Golding 2002), four are only considered threatened because of utilisation elsewhere (Bombax rhodognaphalon, Khaya anthotheca, Sterculia appendiculata and S. quinqueloba) but are in fact quite widespread.

Table 3. Species recorded as being threatened globally or within the region.

<table>
<thead>
<tr>
<th>Species</th>
<th>Notes</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombax rhodognaphalon</td>
<td>Tree; fairly widely distributed; threatened through utilisation</td>
<td>1, 2</td>
</tr>
<tr>
<td>Diospyros anitae</td>
<td>Endemic suffrutex in miombo woodland</td>
<td>2</td>
</tr>
<tr>
<td>Khaya anthotheca</td>
<td>Widespread tree; not truly threatened except locally by utilisation</td>
<td>1</td>
</tr>
<tr>
<td>Sterculia appendiculata</td>
<td>Tree; threatened by utilisation in parts of Moz</td>
<td>2</td>
</tr>
<tr>
<td>Sterculia quinqueloba</td>
<td>Tree; threatened by utilisation in parts of Moz</td>
<td>2</td>
</tr>
<tr>
<td>Sterculia schliebenii</td>
<td>Tree; coastal forests</td>
<td>1</td>
</tr>
<tr>
<td>Strychnos mellodora</td>
<td>Small tree; needs confirmation of i/d. moist forests - very scattered</td>
<td>1</td>
</tr>
</tbody>
</table>


3.5 Framework for Botanical Collecting

There are three main considerations when determining a strategy for future botanical work in the area: (a) that logistics are difficult, thus requiring a carefully targeted approach, not widespread sampling, (b) that a high proportion of the plant diversity is found in a very small proportion of the area; and (c) that large parts of the Reserve are relatively homogeneous in terms of both vegetation and plant species composition. From this it can be seen that any further botanical survey should be targeted towards certain areas or vegetation types. In terms of diversity and unusual species (those of restricted or patchy distribution) these areas are:

- Serra Mecula (woodland on slopes, rocky outcrops at higher altitude, and especially moist forest patches associated with gullies and drainage lines);
- Riverine woodland and thicket on alluvial soils (particularly along the Rio Lugenda);
- Inselbergs (particularly forest and thickets in gullies);
- Dambo grasslands along the central watershed.
There has been very little botanical study in the area and the survey has shown that some species are present outside of their previously known range. Thus it is important to collect voucher specimens of most species that can be verified in a herbarium, as species can be readily misidentified in the field. A herbarium specimen with reasonable notes on locality is proof that the species exists in the area.

The Serra Mecula can be surveyed on foot based out of the old Camp Simba (the proposed site for a small lodge). This is accessible by road. Forests on the outer slopes, which are particularly well-developed on the northeastern slopes of the mountain, would have to be accessed on foot from tracks near Mecula town.

The principal riverine woodlands, as seen from the air and as noted in discussions with safari operators in Block C, are along the Rio Lugenda, both downstream and upstream of the bridge. Block B apparently has much riverine thicket. It is in these areas that East African coastal species are likely to be most frequent. There is a track, accessible by vehicle during the hunting season, along the southern and eastern banks of the river from 70 km upstream of the bridge downstream to the confluence with the Rio Rovuma.

Inselbergs are scattered throughout the Reserve, but those in the eastern part are generally more accessible. Some can be accessed by helicopter, allowing for botanical collecting in the upper (higher) parts relatively easily, whilst others (such as around Mbatamila) can be readily accessed on the ground from motorable tracks. One promising site is on the inselbergs around Mbatamila Camp. Inselbergs in the western part pose more of a problem. A helicopter may be essential here. Gully forests on inselbergs are not easy places to work in.

The majority of dambo grasslands are found along the central watershed or 'spine' of the Reserve running between Mbatamila and Mecula. The grasslands in the north west close to the Rio Rovuma shown on the existing vegetation cover map, which were not seen, are unlikely to be moist dambo grasslands. Dambos support a wide range of herbaceous plants, often growing from bulbs, that mostly appear and flower in the early part of the season (November to January), effectively disappearing afterwards. A number of ground orchids are likely to be found which are often limited in their distribution. Effective collecting should be done early in the growing season. Many of the areas are relatively easily accessible by road from Mbatamila, whilst others are accessible by helicopter. A range of moist dambos need to be sampled.

In terms of logistics and timing, for comprehensive botanical collecting in the Niassa Reserve and surrounding areas one needs about 4-6 weeks in the field, around 20 plant presses and 3000 sheets of newspaper, and a field drying system (to facilitate plant drying by artificial heat), especially if the survey is carried out during the rains or during a humid period. Survey work should be done either in November/December, when plants are flowering but before roads become impassable, or in April/May before leaf fall but when accessibility improves after the rains. Use of a helicopter would greatly facilitate access. A series of rainy days not only reduces field time, but creates major problems in getting specimens dried.

3.6 Management Implications

As mentioned previously, there are no major threats to plant populations at present, other than the extent and frequency of wildfires. Clearance for cultivation and utilisation of plants by humans is very localised, although its effect can be seen more widely in woodland structure (skewed age classes, high levels of coppicing, etc.). In general, both vegetation and most species can look after themselves. There are no special plants identified so far that require particular conservation attention. However, if any cycads are found (none were seen during the survey but here have been verbal reports of some on inselbergs) they would need special
protection from collectors.

There are three major findings of direct relevance to management: (a) that any conservation action relating to plants and vegetation should be focussed on very few areas; (b) that there needs to be some control on the incidence of wildfire; and (c) that there need to be restrictions on the area of human settlement and utilisation. These are elaborated upon below.

Roughly half of the plant species diversity of the Reserve is found in only 5 to 10% of the area, and this half contains the species of most interest. Therefore, from a species conservation viewpoint, attention should be given primarily to a small proportion of the total area. These areas are forests on the Serra Mecula, gully forests in inselbergs, riverine woodland and dambos. The Serra Mecula in particular should be of major management concern, not least as it is one of the main areas threatened by human activities. If the habitat is conserved then generally the species occurring there also are.

Wildfires are very widespread at present, and their incidence at any particular locality is also very frequent. This needs to be reduced. Both vegetation in the Reserve and its constituent species are adapted to fire, but the increased frequency now is having a long-term effect. What needs to be achieved is to reduce the incidence of fire (not total prevention, which would be far too difficult), particularly on the Serra Mecula and on inselbergs. This could be by educational campaigns as well as increased patrolling. At present it appears that some of the fires are started by Reserve or coutada scouts for track clearance, and left to get out of control.

There are around 12,000 people living within the Reserve at present, and this number can easily increase if controls are not kept on immigration and where people can settle. Of particular concern here, from a biodiversity viewpoint, is Serra Mecula (especially on the south eastern slopes) and patches of riverine woodland along the Lugenda and Rovuma rivers.
4. CONCLUSIONS

Conclusions are given under five headings.

4.1 Vegetation and Habitats

- There are five main groups of vegetation types, the distribution and extent of which is determined principally by available soil moisture. These are: (1) Forest vegetation where additional moisture is received, particularly during the dry season; (2) Riverine vegetation on alluvium with additional moisture from perennial rivers; (3) Deciduous Woodland, which covers most of the Reserve and only receives moisture from incident rainfall; (4) Dambo vegetation where trees are precluded owing to poorly drained conditions during the growing season; and (5) Inselbergs with very poor moisture storage capacity and almost desert-like conditions (e.g. extremes of temperature). The majority of the area, perhaps 95%, is covered by deciduous woodland which is not particularly diverse in terms of species. This forms part of the Zambezian Caesalpinoid woodlands that cover much of south-central Africa. These woodlands are particularly extensive in the Reserve, and are relatively undisturbed compared to similar woodlands elsewhere in Mozambique.

- The Serra Mecula is perhaps the most important botanical area within the Reserve owing to its diversity of vegetation types, particularly forests. It is a prime conservation environment and of great aesthetic appeal.

- Certain parts of the Reserve are just moist enough to support forest patches of marginally deciduous or evergreen species. These are located in various places: (a) on high altitude (>800 m) slopes of the Serra Mecula which receive additional moisture from air flows or low cloud during the dry season, (b) in gullies at the base of mountain slopes or associated with small rivers that receive additional run-on moisture, and (c) in gullies around the base of inselbergs.

- Riverine woodland and thickets are surprisingly poorly developed across the Reserve, perhaps in part owing to a deficiency of clay particles in the system.

- The vegetation of the Niassa Reserve mostly comprises dry miombo woodland, with drier woodland types \textit{(Combretum, Millettia or Acacia)} at somewhat lower altitudes closer to the Rovuma and Lugenda rivers. Based on our aerial survey, vegetation in the western part appears to be moister, consisting of taller and denser miombo woodland. The vegetation is forms a mosaic, with patches of more mesic types (i.e. miombo) declining in frequency and extent as one moves closer to the main rivers, and drier types (e.g. \textit{Millettia}) becoming more common.

- The dambos present are not particularly well developed. The landscape is probably too dry and not sufficiently flat for their extensive development.

- The soils of the Reserve, at least in the eastern parts, seem to be more deficient in clay than soils outside to the south (Marrapa) and areas towards Montepuez. Here, extensive areas of red clay soils, good for agriculture, are found. This can also be seen in the lack of clay deposits along the main rivers, where only sand banks are present. As a result, the vegetation here is less diverse than was expected, and also drier owing to poor moisture storage capacity, hence it is suited to agriculture. Trees lose their leaves earlier compared to areas to the south.
The most important vegetation types from a conservation and biodiversity viewpoint are:
(a) Moist Forests, (b) Gully Forests, (c) Riverine Woodland, (d) Dambo Grasslands, and (e) Inselbergs. The main evergreen forest areas are on the upper slopes of Serra Mecula, while the main riverine woodlands are found along the Rio Lugenda. Other important, but drier forest areas, are associated with inselbergs, either in gullies or at the base of the larger outcrops. Dambo grasslands are mostly found along the watershed between Mbatamila and Matondavela but have woodland encroaching on their margins. Inselbergs are large with a number of perched flatter areas where dry woodland can develop.

4.2 Species

Biodiversity is not evenly distributed. Perhaps half of the plant diversity of the Reserve in terms of numbers of species is found in less than 5% of the total area.

We had hoped to find a number of species with East African coastal affinities coming in along the main river valleys (the East African coastal area is known to be very bio-diverse with a number of species of restricted distribution). However, the number of coastal species found within the Reserve was relatively low, and there were very few patches resembling East African coastal vegetation types.

Of particular interest were a number of small (1 to 5 ha) forest patches on the Serra Mecula, above 800 m altitude. These patches contain a number of species associated with montane forests such as found in Malawi, eastern Zimbabwe and southern Tanzania. Thus the Serra Mecula supports outlying populations of these species, similar to Mt Gorongosa.

Few species of major interest were noted. These include (some pending confirmation) forest species such as *Strychnos mellodora* and *Uapaca* cf. *lissopyrena*; East African coastal species such as *Grewia forbesii* and *Zanthoxylon holtzianum*; and new records for Mozambique such as *Schizogygia coffaeoides* and *Erythrina* sp. A species of *Barleria* is new to science. There are records of a *Pandanus*, but this was not seen. No cycads were noted. Islands in the Rio Lugenda had what appeared to be *Elaeis guineensis* (the oil palm) on them.

There are unlikely to be any species restricted to the Niassa Reserve. Most of the habitats present are widespread, and those that are unusual (e.g. forest) normally contain species of wider (although very patchy) distribution. In addition to the seven new records for Mozambique and one new species found during this trip, there are likely to be a number of additional new records for the country still to be found.

4.3 Threats

Plant species and vegetation are under relatively little threat at present compared to other areas in northern Mozambique. Perhaps the major threat to plant diversity is the high frequency of fire. Most woodland species are adapted to fire, but not to fires as frequent as every year. Some areas are showing poor regeneration of the woody layer and a dominance of fire-resistant species. This is also occurring on the slopes of many inselbergs, which appear to burn every year.

Increasing settlement by humans along the main rivers and on the slopes of Serra Mecula is a significant threat. Utilization of plants by humans is not significant at present owing to
distance from markets for commercialisation, difficulties in transportation and the low population pressure.

- Changes in hydrology will impact on dambo grasslands. Such changes may come from road construction (causeways), frequent burning, or cultivation in the immediate catchment. At present the hydrological regime is very 'natural' and any soil erosion is very localised.

- A possible future threat is the impact of concentrations of elephant during the dry season on riverine woodland and thickets. Another possible threat is inappropriate infrastructure developments associated with tourism, such as camps in riverine woodland and up on the Serra Mecula.

4.4 Future Studies

- The major priority is a landscape-guided ecological vegetation survey of the Niassa Reserve and surrounding areas. This should be done at a scale of 1:250,000 using satellite imagery. It will give an ecological classification of the Reserve that can be used as a basis for other biodiversity studies and for conservation management zonation.

- A detailed vegetation survey (at around 1:50,000 scale) should be carried out of the Serra Mecula. This is a very important area biologically, and will possibly be the main focus for future tourist development. It also has particular threats upon it from human populations in Mecula.

- The present botanical survey was very incomplete, and was just a first reconnaissance. Although some ideas of diversity and important areas are now beginning to emerge, further botanical survey is needed of selected areas, especially forests. Priority study areas are the Serra Mecula, inselberg bases and gullies, riverine woodlands and thickets, and dambos.

- After a more comprehensive botanical survey it will be possible to determine which are the plant species of restricted distribution, which are of particular ecological significance, and which are under particular threat from human settlement, fire, changes in hydrology or elephant impact. Particular attention should be paid to species linked to the East African coastal vegetation or to moist forests.

4.5 Conservation and Management Issues

- There is a need to be more clear on the conservation objectives of the Niassa Reserve, and what the ecological factors that determine or impact on these might be.

- Key habitats, such as moist forests, riverine woodland/thickets and dambos, should be given major conservation priorities. The Serra Mecula should be a major conservation target area.

- There should be greater control over the incidence of fire Many fires are set by game scouts. There could be a programme of education or sensitisation in the worst affected areas, such as around the Serra Mecula.
5. **RECOMMENDATIONS**

1. A synthesis of existing information and data on the biodiversity of the area, its distribution and status should be carried out. This synthesis, essentially a desk job, should also cover information on relevant aspects of the physical environment (geology, soils, climate and landform). It should provide a platform for all future studies within the Reserve, and help inform conservation management.

2. An ecological vegetation survey of the Niassa Reserve and surrounding coutadas should be carried out. This should be done at a reconnaissance scale of around 1:250,000. The most suitable method is to use satellite imagery followed by low-level aerial survey to back this up. Ground-based fieldwork is essential in order to determine species composition and environmental detail. Given problems of accessibility, a helicopter would be most useful for this activity.

3. Within the reconnaissance-scale vegetation survey, more detailed surveys should be carried out in selected areas of conservation importance and management significance. The two areas of highest priority are the Serra Mecula and immediate surrounds, and the riverine woodlands/thickets along the Rio Lugenda. Air photos are the more appropriate medium, along with ground-based fieldwork. Much of the riverine survey could be done from a light aircraft.

4. Further botanical survey is required, principally of particular habitats or areas. These are:
   - the forests and woodlands of the Serra Mecula;
   - riverine woodlands and thickets;
   - gully forests at those at the base of inselbergs;
   - the slopes and upper reaches of the inselbergs themselves; and
   - dambos.

   Specimens should be collected for verification in a competent herbarium as new records and some unusual finds are likely. Particular attention should be paid to species likely to be of restricted distribution and to determining species under threat.

5. Conservation management should focus its attention on those areas and habitats of greater biodiversity significance, as well as on large mammal populations. Such areas will include the Serra Mecula, riverine fringes along the Rio Lugenda, inselberg woodlands and dambos.

6. The frequency of fire over the NGR could be investigated using satellite imagery, with particular reference to key inselberg areas and the Serra Mecula. This study will give a firmer base to subsequent management interventions towards reducing the incidence of fire.

7. Some reports dating back to the 1970s cover the NGR but appear to only exist in one or two copies (e.g. Lobão Tello & Dutton 1979). These are invaluable sources of information. They should be copied and stored in an archive as well as being made more widely available to researchers.
6. ACKNOWLEDGEMENTS

Many thanks to the staff of the Niassa Reserve for their assistance during this survey, in particular to the warden, Baldeu Chande, and to Jose Alves, who was based there at the time. Mike Watson gave us a good overview of the area in the SRN plane. We also wish to thank Anabela Rodrigues and Michelle Souto of SRN in Maputo for doing so much of the organisation and arranging logistics. We are grateful to the managers of Luwire Safaris, Jamie Wilson and Derek Lyttleton, for generous hospitality while we were in their concession area. Finally, we are very grateful to Kaj Vollesen, Bob Drummond, Anthony Mapaura and John Burrows for identifying the specimens.

7. REFERENCES


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Appendix 2. Provisional list of plants recorded from the Niassa Reserve during the survey.

**PTERIDOPHYTA** (Ferns)
Actinopteris radiata (Sw.) Link
Christella chaseana (Schelpe) Holttum
Pleopeltis macrocarpa (Willd.) Kaulf.

**MONOCOTYLEDONS**

**Aloaceae**
Aloe mawii Christian

**Anthericaceae**
Chlorophytum nubicum (Baker) Kativu

**Arecaceae**
Elaeis guineensis Jacq.
Hyphaene coriacea Gaertn.
Phoenix reclinata Jacq.

**Commelinaceae**
Commelina nyasensis C.B.Clarke

**Cyperaceae**
Coleochloa setifera (Ridl.) Gilly
Fuirena pubescens (Lam.) Kunth.
Scleria nutans Kunth

**Dracaenaceae**
Dracaena mannii Baker
Sanseveria caniculata Carr.

**Eriocaulaceae**
Eriocaulon bongense Engl. & Ruhr.

**Orchidaceae**
Cyrtorchis sp.

**Poaceae**
Andropogon sp.
Aristida sp.
Eragrostis chapelieri (Kunth) Nees
Eragrostis japonica (Thunb.) Trin.
Heteropogon sp.
Hyparrhenia sp.
Hyperthelia dissoluta (Staud.) Clayton
Loudetia arundinacea (A.Rich.) Steud.
Melinis ambiguia Hack.
Oxytenanthera abyssinica (A.Rich.) Munro
Pennisetum polystachion (L.) Schult.
Pennisetum unisetum (Nees) Benth.
Phragmites mauritianus Kunth
Sporobolus sp.

**DICOTYLEDONS**

**Acanthaceae**
Barleria sp. nov.
Blepharis affinis Lindau
Dyschoriste verticillaris (Oliv.) C.B.Clarke
Justicia nyassana Lindau
Lepidagathis andersoniana Lindau
Monochema depauperatum (T.Anderson) C.B.Clarke
Peristrophe paniculata (Forssk.) Brummitt
Phaulopsis imbricata (Forssk.) Sweet
Ruspolia decurrens (Nees) Milne-Redh.

**Amaranthaceae**
Celosia trigyna L.

**Anacardiaceae**
Lannea discolor (Sond.) Engl.
Mangifera indica L.
Ozoroa insignis Delile subsp. reticulata (Baker f.) J.B.Gillett
Rhus longipes Engl.
Rhus tenuinervis Engl.
Sclerocarya birrea (A.Rich.) Hochst.
Sorindeia madagascariensis DC.

**Annonaceae**
Annona senegalensis Pers.
Cleistochlamys kirkii (Benth.) Oliv.
Dielsiothamnus divaricata (Diels) R.E.Fries
Friesodielsia obovata (Benth.) Verdc.
Monanthotaxis buchananii (Engl.) Verdc.
Monodora junodii Engl & Diels
Xylopia aethiopica (Dunal) A.Rich.

**Apiaceae**
Heteromorpha trifoliata (Wendl.) Eckl. & Zeyh.

**Apocynaceae**
Carvalhoa campanulata K.Schum.
Diplorhynchus condylocarpum (Müll.Arg.) Pichon
Holarrhena pubescens (Buch.-Ham.) G.Don
Schizozygia coffaeoides Baill.
Voacanga africana Stapf

**Aristolochiaceae**
Aristolochia albida Duch.

**Asteraceae**
Dicoma sessiliflora Harv.
Helichrysum kirkii Oliv. & Hiern
Laggera crispata (Vahl) Hepper & J.R.I.Wood
Mikania chenopodifolia Wild.
Pleiotaxis pulcherrima Steetz
Sphaeranthus humilis O.Hoffm.
Vernonia colorata (Wild.) Drake subsp. colorata
Vernonia colorata (Wild.) Drake subsp. oxyura (O.Hoffm.) C.Jeffrey
Vernonia ugandensis S.Moore

**Balanitaceae**
Balanites aegyptiaca (L.) Delile
Balanites maughamii Sprague

**Bignoniaceae**
Kigelia africana (Lam.) Benth.
Markhamia zanzibarica (DC.) K.Schum.
Stereospermum kunthianum Cham.
Bombacaceae
Adansonia digitata L.
Bombax rhodogynaphalon K.Schum.

Burseraceae
Commiphora cf. glandulosa Schinz
Commiphora mollis (Oliv.) Engl.

Capparaceae
Boscia angustifolia A.Rich. var. corymbosa (Gilg) DeWolf
Boscia mossambicensis Klotzsch
Cadaba kirkii Oliv.
Capparis cf. sepiaria L.
Cladostemon kirkii (Oliv.) Pax & Gilg
Courbonia glauca (Klotzsch) Gilg & Bened.
Maerua edulis (Gilg & Bened.) DeWolf
Thilachium africanum Lour.

Caryophyllaceae
Polycarpaea eriantha A.Rich.

Celastraceae
Gymnosporia mossambicensis (Klotzsch) Blakelock
Maytenus senegalensis (Lam.) Exell

Chrysobalanaceae
Parinari curatellifolia Benth.

Clusiaceae
Garcinia buchananii Baker
Garcinia livingstonei Anderson
Psorospermum febrifugum Spach

Combretaceae
Combretum adenogonium A.Rich.
Combretum celsaestroides M.A.Lawson
Combretum collinum Fresen.
Combretum elaeagnoides Klotzsch
Combretum molle G.Don
Combretum mossambicense (Klotzsch) Engl.
Combretum psidioides Welw.
Combretum zeyheri Sond.
Pteleopsis myrtifolia (M.A.Lawson) Engl.& Diels
Terminalia brachystemma Hiern
Terminalia sericea DC.
Terminalia stenostachya Engl.& Diels

Connaraceae
Rourea orientalis Bail.

Convolvulaceae
Astripomoea malvacea (Klotzsch) A.Meeuse

Crassulaceae
Crassula setulosa Harv.
Kalanchoe elizae Burger
Kalanchoe lanceolata (Forssk.) Pers.

Dilleniaceae
Tetracera boviniana Bail.
**Dipterocarpaceae**
Monotes engleri *Gilg*

**Ebenaceae**
Diospyros anitae *F.White*
Diospyros kirkii *Hiern*
Diospyros mespiliformis *A.DC.*
Diospyros senensis *Klotzsch*
Diospyros truncatifolia *A.N.Caveney*
Diospyros verrucosa *Hiern*
Euclea natalensis *A.DC.*

**Erythroxylaceae**
Erythroxylum emarginatum *Thonn.*

**Euphorbiaceae**
Antidesma rufescens *Tul.*
Antidesma vogelianum *Müll.Arg.*
Bridelia cathartica *G.Bertol.* subsp. *cathartica*
Bridelia cathartica *G.Bertol.* subsp. *melanthesoides (Baill.) J.Léonard*
Bridelia cf. *duvigneadii J.Léonard*
Cleistanthus schlechteri *(Pax) Hutch.*
Croton gratissimus *Burch.*
Croton megalobotrys *Müll.Arg.*
Croton menyhartii *Pax*
Croton scheffleri *Pax*
Drypetes arguta *(Müll.Arg.) Hutch.*
Euphorbia cooperi *A.Berger*
Flueggea virosa *(Wild.) Voigt*
Hymenocardia acida *Tul.*
Hymenocardia ulmoides *Oliv.*
Macaranga mellifera *Prain*
Phyllanthus bellei *Hutch.*
Phyllanthus ovalifolius *Forssk.*
Phyllanthus reticulatus *Poir.*
Pseudolachnostylis maprouneifolia *Pax*
Uapaca lissopyrena *Radcl.-Sm.*
Uapaca nitida *Müll.Arg.*
Uapaca sansibarica *Pax*

**Fabaceae: Caesalpinioideae**
Afzelia quanzensis *Welw.*
Bauhinia tomentosa *L.*
Brachystegia alienii *Burtt Davy & Hutch.*
Brachystegia Boehmii *Taub.*
Brachystegia bussei *Harms*
Brachystegia glaucescens *Burtt Davy & Hutch.*
Brachystegia longifolia *Benth.*
Brachystegia manga *De Wild.*
Brachystegia spiciformis *Benth.*
Brachystegia utilis *Burtt Davy & Hutch.*
Burkea africana *Hook.*
Cassia abbreviata *Oliv.*
Cassia afrofistula *Brenan*
Chamaecrista mimosoides *(L.) Greene*
Erythrophleum africanum *(Benth.) Harms.*
Julbernardia globiflora *(Benth.) Troupin*
Piliostigma thonningii *(Schumach.) Milne-Redh.*
Pterolobium stellatum *(Forssk.) Brenan*
Senna petersiana *(Bolle) Lock*
Tamarindus indica *L.*
Fabaceae: Mimosoideae
Acacia gerrardii Benth.
Acacia goetzii Harms subsp. microphylla Brenan
Acacia nigrescens Oliv.
Acacia nilotica (L.) Delile subsp. kraussiana (Vatke) Brenan
Acacia polyacantha Willd. subsp. campylacantha (A.Rich.) Brenan
Acacia robusta Burch. subsp. clavigera (E.Mey.) Brenan
Acacia schweinfurthii Brenan & Exell
Acacia senegal (L.) Willd. var. rostrata Brenan
Acacia sieberiana DC.
Acacia welwitschii Oliv. subsp. delagoensis (Harms) J.H.Ross & Brenan
Albizia adianthifolia (Schumach) W.Wight
Albizia harveyii E.Fourn.
Albizia tanganyikensis Baker f.
Albizia versicolor Oliv.
Dichrostachys cinerea (L.) Wight & Arn. subsp. nyassana (Taub.) Brenan
Faidherbia albida (Delile) A.Chev.
Mimosa pigra L.

Fabaceae: Papilionoideae
Adenodolichos punctatus (Micheli) Harms subsp. bussei (Harms) Verdc.
Aeschynomene schimperi A.Rich.
Baphia massaiensis Taub. subsp. gomesii (Baker f.) Brummitt
Cordyline africana Lour.
Crotalaria goreensis Guill.& Perr.
Crotalaria laburnifolia L.
Crotalaria pallida Alton
Dalbergia arbutifolia Baker
Dalbergia boehmii Taub.
Dalbergia lactea Vatke
Dalbergia melanoxylon Guill.& Perr.
Dalbergia nitidula Baker
Erythrina sp.
Millettia bussei Harms
Millettia stuhlmannii Taub.
Mundulea sericea (Wild.) A.Chev.
Ormocarpum kirkii S.Moore
Pericopsis angolensis (Baker) Meeuwen
Philemoptera bussei (Harms) Schrire
Philemoptera violacea (Klotze) Schrire
Pterocarpus angolensis DC.
Swartzia madagascariensis Desv.
Xeroderris stuhlmannii (Taub.) Mendonça & E.P.Sousa

Flacourtiaceae
Flacourtia indica (Burm.f.) Merr.
Xylotheca tetensis (Klotzsch) Gilg

Ixonanthaceae
Phyllocosmos lemaireanus (De Wild. & T.Durand) T.Durand & H.Durand

Lamiaceae
Aeollanthus ukamensis Gürke
Clerodendrum cephalanthum Oliv. subsp. swynnertonii (S.Moore) Verdc.
Clerodendron robustum Klotzsch var. fischeri (Gürke) Verdc.
Haumaniastrum venosum (Baker) Agnew
Hemizygia bracteosa (Benth.) Briq.
Leucas nyassae Gürke
Solenostemon lateriflorus (Benth.) J.K.Morton
Tetradenia riparia (Hochst.) Codd
Vitex doniana *Sweet*
Vitex cf. mombassae *Vatke*

**Lentibulariaceae**
Utricularia firmula *Oliv.*
Utricularia livida *E.Mey.*

**Linaceae**
Hugonia orientalis *Engl.*

**Loganiaceae**
Strychnos madagascariensis *Poir.*
Strychnos cf. mellidora *S.Moore*
Strychnos spinosa *Lam.*

**Loranthaceae**
Tapinanthis forbesii (**Sprague**) *Wiens*

**Malvaceae**
Abutilon angulatum (**Guill. & Perr.**) *Mast.*
Azanza garckeana (**F.Hoffm.**) *Exell. & Hillc.*
Hibiscus calphyllus *Cav.*
Urena lobata *L.*
Wissadula rostrata (**Schumach. & Thonn.**) *Hook.f.*

**Melastomataceae**
Dissotis debilis (**Sond.**) *Triana*

**Meliaceae**
Khaya anthotheca (**Welw.**) *C.DC.*
Trichilia dregeana *Sond.*
Trichilia emetica *Vahl*
Turraea nilotica **Kotschy & Peyr.**
Turraea robusta *Gürke*
Turraea sp.

**Melianthaceae**
Bersama abyssinica *Fresen.* subsp. engleriana (**Gürke**) *F.White*

**Moraceae**
Ficus capreifolia *Delile*
Ficus ingens (**Miq.**) *Miq.*
Ficus sur *Forssk.*
Ficus sycomorus *L.*
Treculia africana **Decne**
Trilepisium madagascariensis *DC.*

**Myrothamnaceae**
Myrothamnus flabellifolius *Welw.*

**Myrsinaceae**
Maesa lanceolata *Forssk.*

**Myrtaceae**
Syzygium cordatum *C.Krauss*
Syzygium guineense (**Wild.**) *DC.* subsp. afrumontanum *F.White*
Syzygium guineense (**Wild.**) *DC.* subsp. barotsense *F.White*
Syzygium guineense (**Wild.**) *DC.* subsp. guineense

**Nymphaeaceae**
Nymphaea nouchali *Burm.f.*
Ochnaceae
Brackenridgea zanguebarica Oliv.
Ochna leptoclada Oliv.

Olacaceae
Olax gambecola Baill.
Ximenia caffra Sond.

Onagraceae
Ludwigia octovalvis (Jacq.) P.H.Raven

Orobanchaceae
Orobanche minor Sm.

Oxalidaceae
Biophytum umbraculatum Welw.

Piperaceae
Peperomia tetraphylla (G.Forst.) Hook.& Arn.

Polygalaceae
Polygala albida Schinz
Securidaca longipedunculata Fresen.

Proteaceae
Faurea saligna Harv.
Protea angolensis Welw. var. divaricata (Engl.& Gilg) Beard
Protea welwitschii Engl.

Rhamnaceae
Berchemia discolor (Klotzsch) Hemsl.

Rubiaceae
Anthospermum whyteanum Britten
Breonadia salicina (Vahl) Hepper & J.H.I.Wood
Catunaregum spinosa (Thunb.) Tirveng. subsp. taylorii (S.Moore) Verdc.
Crossopteryx febrifuga (G.Don.) Benth.
Gardenia resiniflua Hiern
Hymenodictyon parvifolium Oliv.
Keetia venosa (Oliv.) Bridson
Keetia zanzibarica (Klotzsch) Bridson subsp. zanzibarica
Oldenlandia rosulata K.Schum.
Oxyanthus goetzei K.Schum.
Pavetta stenosepala K.Schum.
Polyphaeria dischistocalyx Brenan
Polyphaeria multiflora Hiern
Psychotria capensis (Eckl.) Vatke subsp. capensis
Psychotria capensis (Eckl.) Vatke subsp. riparia (K.Schum.& K.Krause) Verdc.
Psychotria kirkii Hiern
Psychotria pumila Hiern
Rothmannia engleriana (K.Schum.) Keay
Rothmannia fischeri (K.Schum.) Bullock subsp. moramballae (Hiern) Bridson
Rothmannia manganjae (Hiern) Keay
Rytigynia cf. macrura Verdc.
Spermacoce dibrachiata Oliv.
Spermacoce subvulgata (K.Schum.) J.G.Garcia
Tarenna pavettoides (Harv.) Sim subsp. affinis (K.Schum.) Bridson
Vangueria esculenta S.Moore
Vangueria madagascariensis J.F.Gmel.
Rutaceae
Vepris bachmannii (Engl.) W.Mziray
Zanthoxylum cf. holtzianum (Engl.) Waterman

Sapindaceae
Allophylus sp.
Aporrhiza paniculata Radlk.
Blighia unijugata Baker
Deinbollia oblongifolia (E.Mey.) Radkl.
Lecaniodiscus fraxinifolius Baker
Paullinia pinnata L.

Sapotaceae
Englerophytum magalismontanum (Sond.) T.D.Penn.
Englerophytum natalense (Sond.) T.D.Penn.
Inhambanella henriquesii (Engl.& Warb.) Dubard

Scrophulariaceae
Buchnera hispidula D.Don
Buchnera randii S.Moore
Micrargeria filiformis (Schumach.& Thonn.) Hutch.& Dalziel
Striga asiatica (L.) Kuntze
Striga pubiflora Klotzsch

Sterculiaceae
Dombeya acutangula Cav.
Melochia corchorifolia L.
Sterculia africana (Lour.) Fiori
Sterculia appendiculata K.Schum.
Sterculia quinqueloba (Garcke) K.Schum.
Sterculia schliebenii Mildbr.

Thymeleaceae
Peddiea africana Harv.
Synaptolepis alternifolia Oliv.
Synaptolepis kirkii Oliv.

Tiliaceae
Carpodiptera africana Mast.
Grewia bicolor Juss.
Grewia forbesii Mast.
Grewia inaequilatera Garcke
Triumfetta rhomboidea Jacq.

Ulmaceae
Celtis africana Burm.f.
Trema orientalis (L.) Blume

Violaceae
Rinorea ilicifolia (Oliv.) Kuntze
Appendix 3. Waypoints from Niassa study.

Garmin 45 (car), datum WGS 84, Long/Lat decimal minutes. June 2003

<table>
<thead>
<tr>
<th>Waypoint</th>
<th>Latitude (S)</th>
<th>Longitude (E)</th>
<th>Date</th>
<th>Time (-2 hrs)</th>
<th>Notes</th>
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<td>WP 433</td>
<td>1210.87482</td>
<td>03732.88337</td>
<td>08-JUN-03</td>
<td>08:02:30</td>
<td>near Mbatamila camp</td>
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<td>WP 434</td>
<td>1206.77940</td>
<td>03740.06418</td>
<td>08-JUN-03</td>
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<td>Mecula town, Agricultura offices</td>
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<td>WP 435</td>
<td>1225.52450</td>
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<td>Acacia pan—Luwire, JG73</td>
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<td>5</td>
<td>Caparraceae</td>
<td>Boaica angustifolia var. corymbosa</td>
<td>7 June</td>
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<td>Scrophulariaceae</td>
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<td>Acanthaceae</td>
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<td>Caesalpinioideae</td>
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Nassa plant specimens_revised Feb 2004, page 1
<table>
<thead>
<tr>
<th>Family</th>
<th>Genus</th>
<th>Common Name</th>
<th>Location</th>
<th>Elevation</th>
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<tr>
<td>Lamiaceae</td>
<td>Clerodendron</td>
<td>cephalanthum</td>
<td>Mecula Serra Mecula S E 1300</td>
<td>1000</td>
<td>Succulent tree shrub in higher altitude moist evergreen forest. First record for Mozambique.</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Tetradenia</td>
<td>riparia</td>
<td>Mecula Serra Mecula S E 1400</td>
<td>1000</td>
<td>Semi-succulent herb on rock on forest margin in shade. Higher altitude moist evergreen forest below Serra Mecula Peak. Not common.</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Pelvetia</td>
<td>stenosipala</td>
<td>Mecula Serra Mecula S E 1300</td>
<td>1000</td>
<td>Small shrub on forest margin, below Serra Mecula Peak. In higher altitude moist evergreen forest. First record for Mozambique.</td>
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<tr>
<td>Fabaceae</td>
<td>Senna</td>
<td>petersoniana</td>
<td>Mecula Serra Mecula S E 1200</td>
<td>1000</td>
<td>Shrub with yellow flowers. In mid-altitude moist evergreen forest. Common on forest edges. 0.5 km from new Simba camp towards summit.</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td>Oxyanthus</td>
<td>goetzei</td>
<td>Mecula Serra Mecula S E 1300</td>
<td>1000</td>
<td>Shrub with large, shiny yellow flowers tapering at both ends. Local in mid-altitude moist evergreen forest. 0.5 km from new Simba camp towards summit.</td>
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<td>Loganiaceae</td>
<td>Gymnosporia</td>
<td>mossambicense</td>
<td>Mecula Serra Mecula S E 1300</td>
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<td>In mid-altitude moist evergreen forest. Rare. 0.5 km from new Simba camp towards summit.</td>
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<td>Acanthaceae</td>
<td>hispida</td>
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<td>kirkii</td>
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*Note: All records are based on field observations and voucher specimens.*
Golding JS, Timberlake, J & Clarke P

99 Placaceae Matricaria ambiguus 11 June Mecula Sierra Mecula S 37 43.52 E 1400 Dominant grass with Urochloa. On summit of Sierra Mecula.

Golding JS, Timberlake, J & Clarke P

60 Rubiaceae Anthospermum whyteanum 11 June Mecula Sierra Mecula S 37 43.52 E 1400 Low woody shrub. No more than 1m high. Axillary flowers. On summit of Sierra Mecula. Not collected.

Golding JS, Timberlake, J & Clarke P

61 Asteraceae Achillea asplenifolia 11 June Mecula Sierra Mecula S 37 43.52 E 1400 Unfrequented. Axillary sprays of white flowers. On summit of Sierra Mecula. Ineffuent.

Golding JS, Timberlake, J & Clarke P

62 Pteridophyta Blechnum macrocarpa 11 June Mecula Sierra Mecula S 37 43.52 E 1400 Small reduced leaves. Epiphyte on summit of Sierra Mecula. Common.

Golding JS, Timberlake, J & Clarke P

63 Cistaceae Kalanchoe elatae 11 June Mecula Sierra Mecula S 37 43.52 E 1400 Semi-succulent herbs to 1.5m. Yellow flowers, reddish stems. Single plant seen. Collected underneath Rhus on summit of Sierra Mecula.

Golding JS, Timberlake, J & Clarke P

64 Euphorbiaceae Uapaca patudosia 11 June Mecula Mecula, old Posto Administrativo 12 06 S 37 39.4 E 1400 Forest tree with stiff roots arising from up to 1m from base, like Rhizophora. In dense riparian forest along perennial stream. 0.5 km from Simba camp. Only single individual seen. First record for Mozambique.

Golding JS, Timberlake, J & Clarke P

65 MISSED

Golding JS, Timberlake, J & Clarke P

66 Myrtaceae Szczyrium guineense subsp. barbense 12 June Mecula Simba Camp S 37 43.52 E 1400 Tree in tall Brachystegia spiciformis woodland near new Simba camp.

Golding JS, Timberlake, J & Clarke P

67 Sapindaceae Deinbolla oblongifolia 12 June Mecula Simba Camp S 37 43.52 E 1400 Tree in tall Brachystegia spiciformis woodland near new Simba camp.

Golding JS, Timberlake, J & Clarke P

68 Euphorbiaceae Piptadenia reticulata 12 June Mecula Simba Camp S 37 43.52 E 1400 Tree in tall Brachystegia spiciformis woodland near new Simba camp.

Golding JS, Timberlake, J & Clarke P

69 Fabaceae Papilionoideae Baphia massaiensis subsp. gomesii 12 June Mecula Simba Camp S 37 43.52 E 1400 Understorey species in tall dense canopy Brachystegia spiciformis woodland near new Simba camp.

Golding JS, Timberlake, J & Clarke P

70 * Apocynaceae Holarrhena pubescens 14 June Mecula Kiboko 12 24.78 S 37 43.52 E 1400 Small tree in low Julbernardia globiflora thicket. Block C, along road.

Golding JS, Timberlake, J & Clarke P

71 Apocynaceae Holarrhena pubescens 14 June Mecula Kiboko 12 24.78 S 37 43.52 E 1400 Small tree in low Julbernardia globiflora thicket. Block C, along road.

Golding JS, Timberlake, J & Clarke P

72 Fabaceae Mimosoideae Acacia robbusta subsp. blandingia 14 June Mecula Kiboko 12 23.17 S 37 43.56 E 1400 Tree by clay path to Rio Lugenje. Block C, 10 km E of Kiboko.

Golding JS, Timberlake, J & Clarke P

73 Fabaceae Mimosoideae Acacia nigrescens 14 June Murrupa Kiboko 12 23.17 S 37 43.56 E 1400 Tree in clay path to Rio Lugenje. Block C, 10 km E of Kiboko.

Golding JS, Timberlake, J & Clarke P

74 * Cistaceae Kalanchoe falcata 14 June Murrupa Kiboko 12 23.17 S 37 43.56 E 1400 Succulent herb to 1m with orange flowers. Common on clay path in sites protected against browsing. Block C, 10 km E of Kiboko. Common.

Golding JS, Timberlake, J & Clarke P

75 Fabaceae Mimosoideae Acacia senegal var. rostrata 14 June Murrupa Kiboko 12 17.33 S 37 47.97 E 1400 Small tree on clay path to Rio Lugenje. Block C, 10 km E of Kiboko. Common.

Golding JS, Timberlake, J & Clarke P

76 * Cistaceae Lycorhiza pubescens 14 June Murrupa Kiboko 12 17.33 S 37 47.97 E 1400 Annual herb to 30cm in wet flush on clay soils. "Locky" mound. Block C, 10 km E of Kiboko. Adjacent to Mieltia woodland. First record for Mozambique.

Golding JS, Timberlake, J & Clarke P

77 * Cissamaceae Commelina nyasaensis 14 June Murrupa Kiboko 12 17.33 S 37 47.97 E 1400 Treeing annual herb to 30cm, purple flowers. Wet flush amongst Cynocephalea on clay soils. Block C, 10 km E of Kiboko. First record for Mozambique.

Golding JS, Timberlake, J & Clarke P

78 * Fabaceae Millettia stuhlmannii 14 June Murrupa Kiboko 12 17.33 S 37 47.97 E 1400 Thin stemmed tree with light bark. Dominant and locally common. Mostly leafless. Block C, 10 km E of Kiboko.

Golding JS, Timberlake, J & Clarke P

79 Euphorbiaceae Euphorbia salsola 14 June Murrupa Kiboko 12 17.33 S 37 47.97 E 1400 Tree on termite mound with bare, grey clay soils. Commelinaceae species present. Block C, 10 km E of Kiboko.

Golding JS, Timberlake, J & Clarke P

80 * Fabaceae Vochytanga alissana 14 June Murrupa Kiboko 12 17.33 S 37 47.97 E 1400 In Mieltia woodland. Not common. Block C, 10 km E of Kiboko.

Golding JS, Timberlake, J & Clarke P

81 * Apocynaceae Vochytanga alissana 14 June Murrupa Kiboko 12 17.33 S 37 47.97 E 1400 In Mieltia woodland. Not common. Block C, 10 km E of Kiboko.

Golding JS, Timberlake, J & Clarke P

82 MISSED

Golding JS, Timberlake, J & Clarke P

83 * Acanthaceae Chrysanthemum rubicundum 14 June Murrupa Kiboko 12 14.34 S 38 00.18 E 1400 Herb from scale. "Timberline white flowers". Single plant seen along roadside. Block C, 10 km E of Kiboko.

Golding JS, Timberlake, J & Clarke P

84 Fabaceae Mimosoideae Acacia senegal var. rostrata 15 June Murrupa Luwire 12 14.50 S 38 00.70 E 1400 Spreading shrub to 2m. Broad pods; flaking bark; 2 or 3 thorns. Common and locally abundant in clay-rich savanna. Block C, 600 m E of Luwire camp.

Golding JS, Timberlake, J & Clarke P

85 * Fabaceae Papilionoideae Leucaena leucocephala subsp. leucocephala 15 June Murrupa Luwire 12 14.50 S 38 00.70 E 1400 Tree with blue-green leaves. Yellow-green flowers. On clay soils. Block C, 600 m E of Luwire camp.

Golding JS, Timberlake, J & Clarke P

86 * Fabaceae Papilionoideae Malvaviscus arboreus 15 June Murrupa Luwire 12 14.50 S 38 00.70 E 1400 Small shrub to 4ft, reddish fruits. On margins of clay soils close to Rio Lugenje. Block C.

Golding JS, Timberlake, J & Clarke P

87 Asteraceae Sphimedia humilis 15 June Murrupa Luwire 12 14.50 S 38 00.70 E 1400 Trailing herb in moist grassland patches on clay soils dominated by Combretum. On clay soils. Block C, 600 m E of Luwire camp. Rare species.

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88 * Dicotyladaceae Samadigena cantaloupea 15 June Murrupa Luwire 12 12.97 S 38 06.05 E 1400 Clustered rhizomatous herb to 70cm. Loose racemes of white flowers. On clay soils by roadside guille that possibly cut into termite soil. Not seen elsewhere. Block C, 600 m E of Luwire camp. Rare species.

Nassa plant specimens, revised Feb 2004, page 3
<table>
<thead>
<tr>
<th>Page</th>
<th>Species</th>
<th>Location</th>
<th>Date</th>
<th>Coordinates</th>
<th>Notes</th>
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<td><em>Rubiaceae</em> Hymenodictyon pavoninum</td>
<td>Murrupa Luwire</td>
<td>15 June</td>
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<td>utilis</td>
<td>18 June</td>
<td>Mecula</td>
<td>12.08.30</td>
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<td>utilis</td>
<td>18 June</td>
<td>Mecula</td>
<td>12.08.30</td>
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<td>Fabaceae: Bignoniaceae</td>
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<td>kumudum</td>
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<td>sumatranum</td>
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**Footnotes:**
- **X**: Not observed or not common.
- ****: Not observed or not common.
Golding JS, Timberlake, J & Clarke P

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<th>Occurrence</th>
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<td>Clusiaceae</td>
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<td>Mecula Matondavela</td>
<td>18 June</td>
<td>12.08.50 S</td>
<td>37.30.11 E</td>
<td>Small tree, glossy leaves with serrated margins. In well developed Brachystegia woodland. 20km along road from Mbatamila to Matondavela.</td>
<td>x</td>
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<td>Rubiaceae</td>
<td>Breonadia salicina</td>
<td>Mecula Matondavela</td>
<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Small shrub on eroded edge of bank with yellow flowers. Common. Rio Chizulu crossing on road to Chamba, 5 km from Matondavela Occasionally.</td>
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<td>Fabaceae</td>
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<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Growing on steep soil bank along Rio Chizulu. Fronds dried.</td>
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<td>Myrtaceae</td>
<td>Syzygium guineense</td>
<td>Mecula Matondavela</td>
<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Main tree in riviere fence along Rio Chizulu. Pale coloured bark. Open canopy with young leaves reddish. Intermediate between ssp. afrormontanum and ssp. barossense.</td>
<td>x</td>
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<td>Myrtaceae</td>
<td>Listera capricorni</td>
<td>Mecula Matondavela</td>
<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Small tree in riparian woodland along Rio Chizulu.</td>
<td>x</td>
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<td>37.30.11 E</td>
<td>Small tree in riparian woodland along Rio Chizulu.</td>
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<td>Euophorbiaceae</td>
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<td>37.30.11 E</td>
<td>Small tree in riparian woodland along Rio Chizulu.</td>
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<td>Mecula Matondavela</td>
<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Black fruit. Common.</td>
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<td>Fabaceae</td>
<td>Kigelia africana</td>
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<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Very small annual herb. Common on footpath close to edge of Rio Chizulu.</td>
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<td>Dainboia oblongifolia</td>
<td>Mecula Matondavela</td>
<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Along footpath in riparian woodland by Rio Chizulu.</td>
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<td>37.30.11 E</td>
<td>Common in riparian woodland along Rio Chizulu.</td>
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<td>Dioica sessiliflora</td>
<td>Mecula Matondavela</td>
<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Herb with spiny bracts. In miombo woodland on edge of Rio Chizulu.</td>
<td>x</td>
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<td>Voinhina colorata</td>
<td>Mecula Matondavela</td>
<td>19 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Woody shrub to x. Along edge of Rio Chizulu in riparian woodland.</td>
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<td>Fabaceae</td>
<td>Acacia polyacantha</td>
<td>Mecula Matondavela</td>
<td>20 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Tree. Leaves go black on drying. Common in Brachystegia woodland. 5 km from Matondavela on Chamba road, close to Rio Chizulu.</td>
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<td>Clerodendrum robustum var. fuscheri</td>
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<td>20 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Long tubular white flowers. Weed in agricultural field on alluvial soil.</td>
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<td>Pseudococcus sycomorus</td>
<td>Mecula Matondavela</td>
<td>20 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Large tree with addobe fruits. Fruits taken from ground. Old. Not Matondavela.</td>
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<td>Mecula Matondavela</td>
<td>20 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Herb with white flowers. Roadside on way from Matondavela to Mbatamila. In Brachystegia woodland.</td>
<td>x</td>
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<td>Fabaceae</td>
<td>Stryphnolusia pubescens</td>
<td>Mecula Matondavela</td>
<td>20 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Herb to 95cm. Terminal white flowers, swollen fleshy roots. In Brachystegia woodland on Mbatamila-Matondavela road. Dambo margin by roadside.</td>
<td>x</td>
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<td>Moraceae</td>
<td>Treuilia africana</td>
<td>Mecula Matondavela</td>
<td>20 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Tree to 15m overhanging river. Millky latex, no fruits. On Mbatamila-Matondavela road.</td>
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<td>Rubiaceae</td>
<td>Psychotria kola</td>
<td>Mecula Matondavela</td>
<td>20 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Woody herb with red barries. Locally common.</td>
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<tr>
<td>Fabaceae</td>
<td>Dichrostachys cinerea subsp. myssaeana</td>
<td>Mecula Matondavela</td>
<td>21 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Shrub or small tree to 3m. Collected posts. On Nyali road. 5 km from Mbatamila main camp. Miombo woodland.</td>
<td>x</td>
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<td>Fabaceae</td>
<td>Brachystegia bussei</td>
<td>Mecula Matondavela</td>
<td>21 June</td>
<td>12.07.14 S</td>
<td>37.30.11 E</td>
<td>Common tree with Brachystegia spiciformis and Julbernardia. On Nyali road. 5 km from Mbatamila main camp. Miombo woodland.</td>
<td>x</td>
<td></td>
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</table>
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162 Fabaceae: Caesalpinioideae  Brachystegia boehmi  21 June Mecula Mbamatina main camp  12.10 S  37.33 E  400 Common tree in Brachystegia and Julbernardia woodland. Large heavy woody pods. 1km towards Serra Mecula from Nyati road.

163 Fabaceae: Mimosoideae  Acacia gerrandii  21 June Mecula Mbamatina main camp  12.10 S  37.33 E  400 Small tree to 4m. Orange under-bark. Rare in miombo woodland. On Nyati road 5 km from Mbamatina main camp. Miombo woodland.

164 * Fabaceae: Caesalpinioideae  Cassia sellowiana  11 June Mecula Mbatamila  37.33 E  500 White succulent reddish coloured hairs with white flowers. On path to Serra Mecula summit. In thin soil on rock faces. Locally abundant.

166 Moraceae  Trema africana  8 June Mecula, Mbatamila, old Posto Administrative  37.39 E  600 Riverine tree in gallery forest. River below old Posto Administrative on Serra Mecula.

167 Pteridophyta  Thelypteris chasena  8 June Mecula, Mbatamila, old Posto Administrative  37.39 E  600 Fern in riparian forest understorey. By river below old Posto Administrative on Serra Mecula.

168 Fabaceae: Caesalpinioideae  Brachystegia boehmi  8 June Mecula Mbatamila, old Posto Administrative  37.39 E  600 Tree to 8m. In tall closed-canopy Brachystegia spiciformis miombo woodland, below new Simba Camp.

Timberlake JR, Nuvunga A & Boane C

4087 Ixonanthaceae  Phyllanthus nilaensis  6 June Mecula Mbamatina senior staff camp  12.11 S  37.32 E  500 Multistemmed tree to 12 m. Dark grey/black striated bark, dark green scalyphyllous leaves, dense. Flowering (in bud), with erect racemes of white flowers. On steep gneiss slope in Brachystegia boehmi-Julbernardia woodland/grassland with rocky outcrops.

4088 Sterculiaceae  Sterculia quinqueloba  6 June Mecula Mbamatina senior staff camp  12.10 S  37.32 E  535 Tree to 8m at base of rocky outcrop. Trunk mottled, mottled pinkish mauve, flaking or smooth bark. Thick stems. No leaves; dry leaves on ground. Flowering; some young fruits. Grassland on steep gneiss rocky slope with Themeda, Coccothra. Andropogon to 1.5m.

4089 Annonaceae  Bridelia cf. duvequeaei  6 June Mecula Mbamatina senior staff camp  12.10 S  37.32 E  535 Small tree under Sterculia quinqueloba. Grassland on steep gneiss rocky slope with Themeda, Coccothra. X

4090 Annonaceae  Chlorophyllum maculatum  6 June Mecula Mbamatina senior staff camp  12.11 S  37.32 E  463 Herb with fleshy fleshy leaf 17cm. White flowers. Open grassy area by Mbamatina camp with Themeda, Hyparrhenia grass to 1.5m, surrounded by tall miombo woodland (Brachystegia boehmi- Julbernardia). Poorly drained.

4091 Asclepiadaceae  Baphia altissima  6 June Mecula Mbamatina senior staff camp  12.11 S  37.32 E  463 Annual low spiny herb. Unusal leaves. Pale mauve flowers clustered. More open areas in seasonally poorly-drained grassland by Mbamatina camp with Themeda, Hyparrhenia grass to 1.5m, surrounded by tall miombo woodland (Brachystegia boehmi- Julbernardia). X

4092 Eriocaulaceae  Eriocaulon bongense  6 June Mecula Mbamatina senior staff camp  12.11 S  37.32 E  471 Herb to 30cm. Basal rossette with terminal inflorescence. In peaty moist patch of seepage grassland below rock, surrounded by miombo woodland. First record for Mozambique.

4093 Commelinaceae  Commelina nyasensis  6 June Mecula Mbamatina senior staff camp  12.11 S  37.32 E  471 Herb to 30cm. Among Urochloa grass in peaty moist patch of seepage grassland below rock, surrounded by miombo woodland. First record for Mozambique.

Timberlake JR

4094 Euphorbiaceae  Bridelia cathartica  subsp. malanthessi  7 June Mecula Mbamatina main camp  12.09 S  37.02 E  510 Shrubs/small tree to 3m. Fruit still green. In open miombo woodland - Julbernardia/Brachystegia boehmi/B. spiciformis/Diplorhynchus. Grass to 1.5m.

4095 Kaffiraceae  Brachystegia longifolia  9 June Mecula Mbamatina main camp  12.18 S  35.32 E  510 Large woody exploitive lianas. In open miombo woodland - Julbernardia/Brachystegia boehmi/B. spiciformis/Diplorhynchus. Grass to 1.5m.

4096 Fabaceae: Caesalpinioideae  Brachystegia ale ste  9 June Mecula Mbatamila  25.93 S  37.04 E  337 Tree to 6m with 10cm/6cm flowers. Large woody exploitive lianas. Scattered trees in wooded Tristachya grassland, seasonally waterlogged, with Paspali, Diplorhynchus, Hyparrhenia. X

4097 Euphorbiaceae  Hydrocolax acida  9 June Mecula Mbatamila  25.93 S  37.04 E  337 Tree to 4m, with 10cm/6cm flowers. In wooded Tristachya grassland, seasonally waterlogged, with Paspali, Diplorhynchus, Hyparrhenia. X

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Niassa plant specimens, revised Feb 2004, page 8
Boane C 25 Euphorbiaceae Euphorbia acida

9 June Murrupa Luwire

Boane C 26 Lamiaceae Leucas nyassae

5 June Murrupa Luwire

Boane C 27 Poaceae Loutetia arundinacea

5 June Murrupa Luwire

Boane C 28 Combretaceae Combretum colurnum

10 June Mecula Mtambila senior staff camp Arvore c.8m de altura. Frutos imaturos. Mata com Brachystegia sspiciformis e Grewia rotundifolia.

Boane C 29 Poaceae Pennisetum unisetum

10 June Mecula Mtambila senior staff camp Arbusto erecta c.2m de altura. Espiguetas acastanhadas. Mata com Brachystegia sspiciformis e Grewia rotundifolia.

Boane C 30 Fabaceae Papilionoideae Pseudanthina hookeri

10 June Mecula Mtambila senior staff camp Arbusto multicauca c.70cm de altura. Frutos maduros, acastanhados. Mata com Brachystegia sspiciformis e Grewia rotundifolia.

Boane C 31 Combretaceae Terminalia stanistachya

10 June Mecula Mtambila senior staff camp Arvore c.7m de altura. No patio do acampamento.

Boane C 32 Rubiaceae Crossosomum febrifuga

10 June Mecula Mtambila senior staff camp Arvore c.8m de altura. No patio do acampamento.

Boane C 33 Apocynaceae Diplorhynchos condylostaphyos

10 June Mecula Mtambila senior staff camp Arvore c.10m de altura. Frutos imaturos, verde. No patio do acampamento.

Boane C 34 Lamiaceae Pennisetum polydactylon

10 June Mecula Mtambila senior staff camp Arbusto c.15cm de altura. No patio do acampamento.

Boane C 35 Onagraceae Ludwigia octovalvis

10 June Mecula Mtambila senior staff camp Arbusto c.65cm de altura. Flores amarelas. A longo do riacho.

Boane C 36 Combretaceae Combretum inda

10 June Mecula Mtambila senior staff camp Arbusto c.10m de altura. Em voluta do riacho.

Boane C 37 Lamiaceae Asclepias ukamensis

10 June Mecula Mtambila senior staff camp Erva viva c.30cm de altura. Flores azuis. Perto do rio.

Boane C 38 Polygalaceae Polygala abrica

10 June Mecula Mtambila senior staff camp Erva viva c.20cm de altura. Inflorescências esbranquiçadas. Perto do rio.

Boane C 39 Rubiaceae Psychotria capenesis

10 June Mecula Mtambila senior staff camp Arbusto c.3m de altura. Frutos maduros; vermelhos. Em voluta do riacho.

Boane C 40 Rubiaceae Acalypha nipa

11 June Mecula Mtambila senior staff camp Arbusto suculenta c.30cm de altura. Flores amarelas. Mata aberta na base de serra, Mtambila.

Boane C 41 Polygalaceae Polygala coppeii

11 June Mecula Mtambila senior staff camp Arbusto c.2m de altura, com espinhos. No cima do serra, Mtambila.

Boane C 42 Euphorbiaceae Euphorbia caponii

11 June Mecula Mtambila senior staff camp Arbusto c.3m de altura, No cima do serra, Mtambila.

Boane C 43 Euphorbiaceae Commiphora mildei

11 June Mecula Mtambila senior staff camp Arbusto c.4m de altura. No cima do serra, Mtambila.

Boane C 44 Sterculiaceae Sterculia quinqueloba

11 June Mecula Mtambila senior staff camp Arvore c.7m de altura. Frutos esbranquiçados. Cimo da serra.

Boane C 45 Apocynaceae Holarrhena pubescens

11 June Mecula Mtambila senior staff camp Arbusto c.2m de altura. Solo arenoso. Mata aberta de Millettia stuhlmannii, Bloco C, Rio Luagenda.

Boane C 46 Sterculiaceae Melochia corchorifolia

14 June Murrupa Kiboko Pequeno arbusto erecta c.1.3m de altura. Sobre Millettia stuhlmannii, Bloco C, Rio Luagenda.

Boane C 47 Tiliaceae Carpodiptera africana


Boane C 48 Fabaceae Papilionoideae Blighia massalasensis


Boane C 49 Tiliaceae Grewia forbesii

14 June Murrupa Kiboko Arbusto multicauca c.5m de altura. Proximai de uma baixa humida.

Boane C 50 Sterculiaceae Mikania conchoniirosa

14 June Murrupa Kiboko Arbusto c.2.5m de altura. Cimo da serra, Mtambila.

Boane C 51 Cassia latifolia


Boane C 52 Aristolochiaceae Aristolochia tanzanica


Boane C 53 Tiliaceae Campeperta africana

14 June Murrupa Kiboko Arbusto c.2.5m de altura. Sobre arenosa. Sobre millettia stuhlmannii, Bloco C, Rio Luagenda.
Boane C 56 Rubiaceae Zanthoxylum abyssinica 14 June Murupuá Luwire Arbusto c.4m de altura com espinhos. Flores mombuladas, acastanhado. Solo compacto. 600m de acampamento de Luwire, Bloco C, Rio Luganda.

Boane C 57 Asteraceae Sphaeraloctia humilis 14 June Murupuá Luwire Erva próspera c.150cm de altura. Flores de cor de vinho. Solo compacto. 600m de acampamento de Luwire, Bloco C, Rio Luganda.


Boane C 59 Fabaceae Papilionoideae Bauhinia tomentosa 14 June Murupuá Luwire Arbusto c.1m de altura. Flores vermelhos. Nas baias de uma vala, 600m de acampamento de Luwire, Bloco C, Rio Luganda.


Boane C 64 Ebenaceae Diospyros franciscou 15 June Murupuá Luwire Arbusto c.1m de altura. Margens direito do Rio Chitande. Bloco C.


Boane C 67 Placodiaceae Xylophaga retamans 16 June Murupuá Luwire Arbusto c.5m de altura. No início do acampamento do Luwire, Bloco C, margem do Rio Luganda.

Boane C 68 Ebenaceae Diospyros mespiliformis 16 June Murupuá Luwire Arbusto c.10m de altura. Floresta de ribeirinhata da margem direito do Rio Luganda. Acampamento Luwire, Bloco C.

Boane C 69* Celastraceae Gymnocalycium semegekani 16 June Muculá Kiboko Arbusto c.1m de altura. Flores brancas. Solo atroz. Junto ao posto de control de fiscais, estrada para Mbatamila.

Boane C 70 Rubiaceae Psychotria potoni 16 June Muculá Kiboko Arbusto c.1m de altura. Flores vermelhos. Junto ao posto do control de fiscais, estrada para Mbatamila.


Boane C 72 Scrophulariaceae Micrantha tithornia 16 June Muculá Kiboko Arbusto c.50cm de altura. Flores lilás. Junto ao posto do control de fiscais, estrada para Mbatamila.

Boane C 73 Rubiaceae Spermacoce indigovaga 16 June Muculá Kiboko Arbusto c.60cm de altura. Flores brancas. Em volta de muremuche. Estrada para Mbatamila.

Boane C 74* Combretaceae Combretum spinosum 16 June Muculá Kiboko Arbusto c.4m de altura. Estrada para Mbatamila.

Boane C 75* Fabaceae Caesalpinoideae * Brachyphylla alleii 16 June Muculá Kiboko Arbusto c.90cm de altura. Flores brancas. Floresta, juventude. Estrada para Mbatamila.


**Boane C 88** Rubiaceae Rothmannia engleriana 19 June Mecula Matondavela Arbusto c.3m de altura. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 89** Loranthaceae Tapinanthes forbesi 19 June Mecula Matondavela Planta sobre Dichostachya cinerea de 2,5m. Flores avermelhadas. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 90** Acanthaceae Dysochonista vernickiens 19 June Mecula Matondavela Subarbusto c.80cm de altura. Flores azuis. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 91** Asteraceae Pteleotaxis puclerimira 19 June Mecula Matondavela Subarbusto c.45cm de altura. Flores pequenos. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 92** Fabaceae: Caesalpinoideae Brachystegia boerhaviana 19 June Mecula Matondavela Arbusto c.1m de altura. Flores blancas. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 93** Proteaceae Protea angolensis var. divaricata 19 June Mecula Matondavela Arbusto c.3m de altura. Flores brancas. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 94** Myrtaceae Syzygium guineense subsp. guineense 19 June Mecula Matondavela Arvore c.8m de altura. Flores em bolos. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 95** Ocoteaceae Ocotia latifolia 19 June Mecula Matondavela Arbusto c.1m de altura. Flores em bolos. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 96** Anacardiaceae Ozonza insignis subsp. reticulata 19 June Mecula Matondavela Arbusto c.2m de altura. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 97** Polygalaceae Polygalia macrostigma 19 June Mecula Matondavela Arbusto c.1m de altura. Flores esbranquiçadas. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 98** Asteraceae Laggena crisipata 19 June Mecula Matondavela Arbusto c.2m de altura. Flores brancas. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 99** Fabaceae: Caesalpinoideae Brachystegia boerhaviana 19 June Mecula Matondavela Arbusto c.1m de altura. Flores brancas maduradas com dourados. Perto do Rio Chulichi, estrada para Chamba.

**Boane C 100** Proteaceae Protea macrostigma 19 June Mecula Matondavela Arbusto c.1m de altura. Flores brancas maduradas com dourados. Perto do Rio Chulichi, estrada para Chamba.

**Boane C 101** Malvaceae Urena lobata 19 June Mecula Matondavela Arbusto c.2m de altura. Flores alosadas. Perto do Rio Chulichi, estrada para Chamba.

**Boane C 102** Fabaceae: Papilionoideae Ceratotheca tubifera 19 June Mecula Matondavela Arbusto c.1m de altura. Flores amarelas. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 103** Fabaceae: Papilionoideae Acleptyrolineae subsp. subpendula 19 June Mecula Matondavela Arbusto c.1m de altura. Flores amarelas. Margem do Rio Chulichi, estrada para Chamba.

**Boane C 104** Fabaceae: Caesalpinoideae Brachystegia manga 20 June Mecula Matondavela Pequeno arvore c.6m de altura. Solo arenoso. Picada avermelhadas. Zona cultivada.


**Boane C 106** Lamiozoes Crenoleichrum robustum var. `fischeri` 20 June Mecula Matondavela Arbusto c.2,5m de altura. Flores brancas com fundo avermelhados. Zona cultivada.