Darwin Initiative Award 15/036: Monitoring and Managing Biodiversity Loss in South-East Africa's Montane Ecosystems

MT NAMULI, MOZAMBIQUE:

BIODIVERSITY AND CONSERVATION

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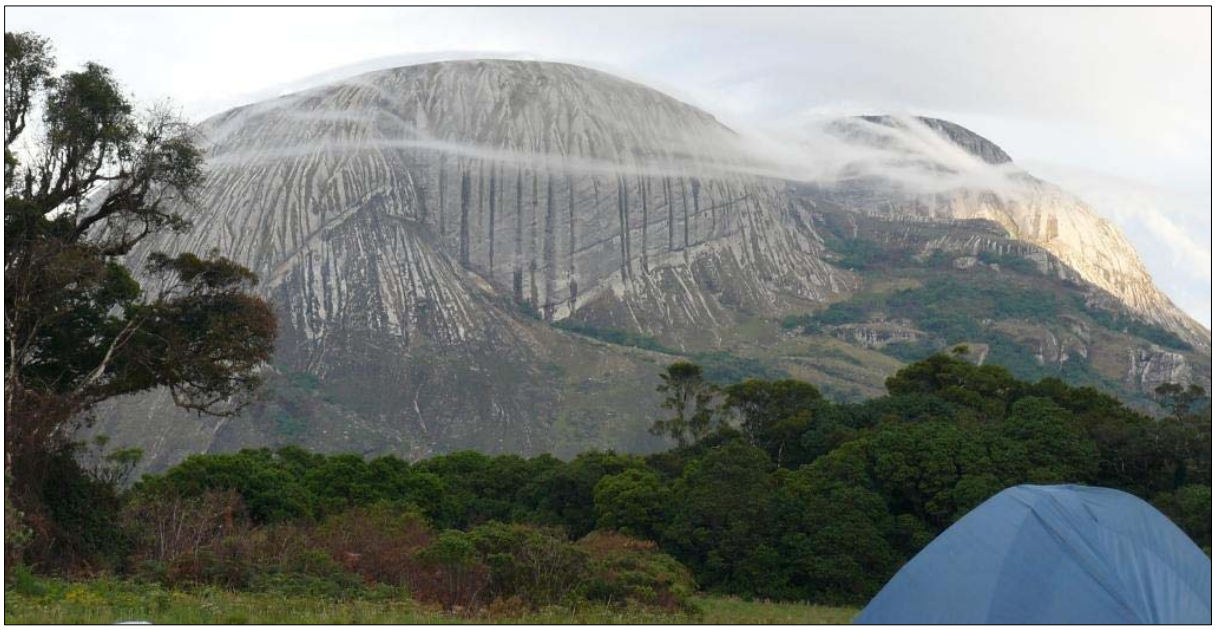

Front cover: Namuli peaks with Ukalini forest below (JT).
Frontispiece: Mts Pesse & Pesani above Muretha plateau (JT, top); campsite. Muretha plateau (JT, middle L); dwarf chameleon (JB, middle R); *Pavetta* sp. nov? (TH, bottom L); Mt Namuli & Ukalini forest from air (CS, bottom R).

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SUMMARY

Mt Namuli at 2419 m is the high point of a massif and associated granite peaks situated near Gurué town, Zambézia Province in north-central Mozambique, and the second-highest peak in the country. It is surrounded at lower altitudes by extensive tea plantations, now being rehabilitated, and has perhaps the best agro-ecological conditions in the country. Increasingly, people are settling in the area and slowly encroaching up the slopes. Although recognised for many years as being of particular biological interest, Namuli is not formally protected, is little-explored and the conservation threats to its biodiversity have not yet been properly documented. The massif supports extensive areas of montane forest and grassland, both habitats rich in biodiversity and of limited extent in southern Africa and habitats that are under increasing threat.

This report gives an account of the Namuli area, the history of its exploration and biological survey, along with the detailed findings of two international scientific expeditions carried out in 2007 under a UK Government Darwin Initiative grant.

Covering an area of about 200 km^2 above 1200 m, the broader Namuli massif comprises some spectacular rugged granite peaks and an associated series of small plateaux at altitudes of around 1800–2000 m. The extent of moist montane forest is around 1100 ha, most of it above 1700 m, with only about 135 ha of scattered medium-altitude forest below 1600 m. Comparison of forest extent as shown on 1969 airphotos with recent satellite imagery shows minimal forest loss, with most of that being of increasingly uncommon medium-altitude forest. Total extent of upland grassland – the most important habitat for plant endemics – is around 300 ha, while the remainder of the area consists of various types of bracken or scrubland and rock slopes with tussocks of *Coleochloa* and scattered grasses. Beneath the plateau, at about 1500 m and below, woodland and modified vegetation predominates.

The present surveys recorded a total of 420 plant species above 1000–1300 m altitude, with five possibly unrecorded and new to science (*Isoglossa* sp. nov. [Acanthaceae], *Crotalaria* sp. nov., *Indigofera* sp. nov. [both Fabaceae: Papilionoideae], *Englerina* sp. nov. [Loranthaceae], and *Pavetta* sp. nov. [Rubiaceae]). Combined with previous collections, there are thought to be over 530 plant taxa (species or subspecies) in the Namuli area, including 16 known only from the mountain and its slopes. Five species previously thought to be endemic to Mt Mulanje, a similar massif in southern Malawi, were recorded. The biological linkages between these and other granite mountains in south-central Africa show that they can be collectively considered as an ecoregion.

Among vertebrates, 155 bird species have been recorded (including the endemic Namuli Apalis) and 42 mammals (including the endemic Vincent's Squirrel). Reptiles and amphibians were surveyed only briefly, but 13 are recorded, including a new undescribed species of pygmy chameleon and a forest viper. The viper was previously thought to be endemic to Mt Mabu, some 130 km to the south-west. Butterflies were looked at in more detail with 126 taxa being recorded, including seven new to science. Species lists are given.

The forests on Namuli are especially important for birds, including the Namuli Apalis and Dapple-throat (both described as Vulnerable on the IUCN Red Data List), the latter being represented by an endemic race. They also contain significant numbers of the Cholo Alethe (Endangered, endemic to southeastern Malawi and adjacent northern Mozambique) and the race *belcheri* of the Green Barbet. Since the only other locality for this race, on Mt Thyolo in S Malawi, has been totally destroyed in recent years, Namuli has become its only refuge. Namuli is considered to be an Important Bird Area based on the presence of these three species, and also forms a significant part of the Tanzania–Malawi mountains Endemic Bird Area. Other birds of conservation concern are the Spotted Ground Thrush (Endangered) and White-winged Apalis (Vulnerable) – the former is only known to breed in a few mid-altitude forests in eastern Africa whilst the latter is otherwise known from mid-altitude forest in central Tanzania, southeastern Malawi and Mt Chiperone in northern Mozambique. Of significant biogeographical interest is the presence of Eastern Green Tinkerbird, an Eastern endemic previously known from only one site in Mozambique near Maputo.

The most important habitats for biodiversity conservation are upland grassland on peat and moist evergreen forest (both montane and at medium-altitude). Neither the peat grassland or montane forest is under major threat, although fire and selective logging for *Faurea wentzeliana* are having an impact and there appears to be an increasing number of patches within the forest cleared for cultivation of Irish potato. The grasslands on the western side of the massif are grazed by domestic livestock (cattle, goats); expansion of this coupled with associated fires is helping drain the grasslands and damaging forest, leading to fragmentation. Of particular concern is the increasing destruction by cultivation and fire of medium-altitude forest and riparian forest along the main streams below 1600 m. Other significant threats are feral pigs rooting up species-rich vegetation over seepages, and heavy hunting pressure on mammals; edible species are now scarce and predators mostly absent.

The biological linkages between the various montane areas in northern Mozambique and southern Malawi are shown, suggesting a coordinated approach to conservation would be beneficial. Finally, the main conservation issues for Namuli are outlined, along with suggestions for its conservation management.

Recommendations for conservation management are given:

1. There should be a move towards getting the massif above 1500 m altitude recognized and protected as a conservation area. The mechanism/s should involve the surrounding local population and could incorporate some level of consumptive utilization.
2. Promotion of the area for ecotourism should be encouraged. For example, the recent initiative by a local company for conservation through tourism and use of carbon-credits.
3. There should be strong controls on the levels of domestic livestock allowed on the plateau.
4. All clearance of forest or forest margins for potato and vegetable cultivation should be halted.
5. Wildfire on the plateau needs to be controlled, possibly using locally-employed conservation / fire scouts.

1. INTRODUCTION

The Namuli massif, which includes a number of spectacular peaks including the second highest in Mozambique, lies immediately to the north of the tea centre town of Gurué in Zambézia Province, north-central Mozambique. The area has a comparatively long history of biological exploration – the first known collections from the area were of plants by Joseph Last in 1887, followed by those of birds by Jack Vincent in 1932. Various Portuguese and South African botanists collected plants during the period 1941 to 1968, but the next major ornithological trip was in 1998. Over the years, these collecting trips have discovered a number of endemic plant species, an endemic squirrel and Mozambique's only endemic bird – the Namuli Apalis. Although under no type of formal protection, its biodiversity significance and interest has been recognised for many years.

Under a collaborative project – "Monitoring and Managing Biodiversity Loss on South-East Africa's Montane Ecosystems" funded by a UK Government Darwin Initiative grant – various trips were made to the Mt Namuli area from 2005 to 2007, in particular two expeditions in May and November 2007. The expeditions were a collaborative effort between the Royal Botanic Gardens Kew (RBG Kew), the Instituto de Investigação Agraria de Moçambique (IIAM), the Maputo Natural History Museum (MHN), the Mulanje Mountain Conservation Trust (MMCT), the Forest Research Institute of Malawi (FRIM), and BirdLife International. A full list of participants for each trip is given in Annex 1. Additional persons who contributed to sections of this report are listed under Acknowledgements.

The objectives of the study and expeditions were:

1. To undertake botanical and vegetation field survey of Mt Namuli,
2. To gather additional zoological information on the mountain, particularly on birds,
3. To train a team of Mozambican and Malawian biologists in botanical and vegetation survey techniques,
4. To asses the extent and status and threats to the moist forest and other biodiversity on the mountain,
5. Based on gathered field data, to develop species and habitat recovery plans.

This report attempts not only to present and discuss findings from the two main expeditions, but also to document much of what is known from other studies on the Namuli massif and peaks. An historical account of the trips by O'Neill, Last and Vincent is given as the original accounts are not readily accessible. Detailed species lists for both plants and birds are presented, along with partial data on small mammals, reptiles and amphibians and butterflies. In addition to the species lists we give the first detailed account of the vegetation, and discuss the threats to them all. Particular attention has been paid to endemic, rare or threatened species. Our main attention was given to areas and species above 1500 m altitude, as below this height much of the vegetation has already been transformed.

2. DESCRIPTION OF STUDY AREA

2.1 Geomorphology and Geology

The Namuli massif, the highest points being the twin peaks of Mt Namuli itself (37°03'E, 15°22'S; 2419 m & 2369 m), lies immediately to the north of Gurué town in Zambézia Province (Figure 1). It is about 150 km due east of Lake Chilwa in Malawi, 160 km north-east of Mt. Mulanje, and the Indian Ocean coast lies 380 km to the east. Along with other rugged hills and high ground, the Namuli complex forms part of the watershed between the Rio Lúrio and Rio Licungo catchments, and appears to be the largest single such massif in the country. It is essentially a complex of granitic inselbergs ('whalebacks') or intrusions linked by a high plateau, exposed by millions of years of subsequent erosion. Many of the other granite domes to the east are more like inselbergs – tall domes rising abruptly out of a relatively flat landscape. Around 50 km away to the north-west near Mutuáli is the Cucuteia complex with a series of peaks from 1000 to 1900 m, and 50 km to the north-east near Malema is Mt Inago at 1730 m high, while the famous and charismatic inselbergs near Ribaué lie 150 km away in the same direction.

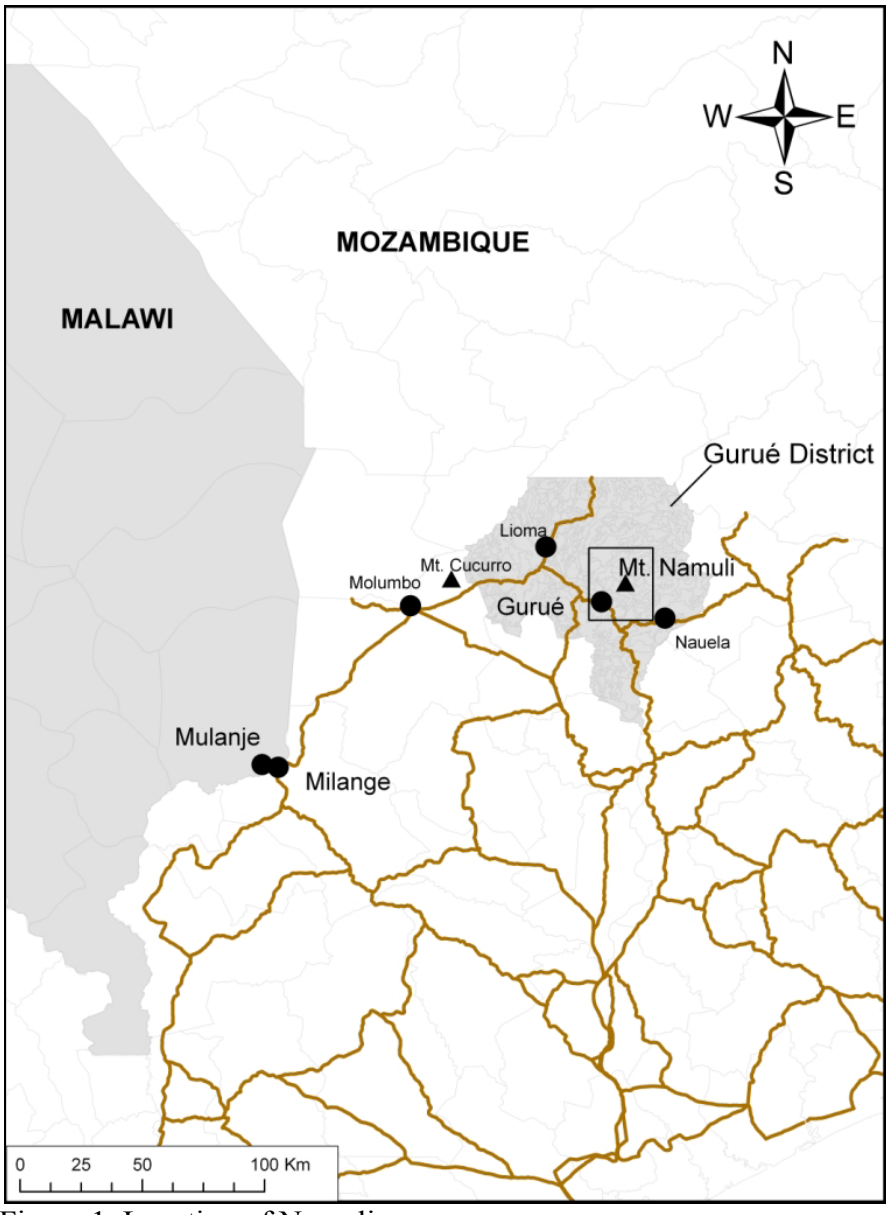


Figure 1. Location of Namuli area.

Lying at the north-eastern edge of the massif, Mt Namuli is the second highest point in the country (after Mt Binga at 2436 m in the Chimanimani Mountains on the border with Zimbabwe). There are nine other peaks in the immediate area over 2000 m high (including Mt Mirole at 2175 m, Mt Macua at 2077 m and Mt Pesse at 2303 m) and numerous others over 1800 m. Most of the taller peaks are in the northern sector but, apart from Mt Namuli itself, the most spectacular cliffs are above Gurué facing south, rising 700 m above the town. Slopes on the southern and western sides are maibly precipitous with some deep valleys, but slopes are far more gentle on the northern and, especially, eastern sides (Figure 2). The plateau portion of the massif at an altitude of 1700–1900 m slopes gently upwards from the south west to north east, with the largest grassland area in the east – the Muretha (or Moretxa, pronounced 'Morecha') plateau at around 1850 m; there are a few smaller grassland areas to the north-west. Some spectacular waterfalls are found on the western side, the best-known being the Cascata de Namuli on the Rio Licungo (15°24'40.0"S, 36°58'38.9"E, 1030 m altitude) falling about 100 m down a sloping rock face.

Figure 2. Panorama of the Namuli Hills from the southwest (JB).

The broader upland area around the Namuli massif is around 430 km^2 (Figure 3, roughly area inside yellow line), with about 200 km^2 of that comprising the Namuli plateau and peaks around. Areas above various altitudes are shown in Table 1. The main rivers are the Rio Malema east of the main plateau, which flows to the north to join the Rio Lúrio, and the Rio Licungo to the west of the main massif flowing southwards to the Indian Ocean near Quelimane. The northern flanks of the Namuli massif are drained by the Rio Namparro, which joins the Rio Malema futher north. The study area covered in this report covers about 180 km^2 between the Licungo and Malema valleys (Figure 4).

Table 1. Approximate extent of study area above different altitudes.

altitude (m)	area (km^2)
above 1200	197.13
above 1500	84.19
above 1800	21.58
above 2000	3.07

Lying at the southern edge of the Lurio Belt, the peaks and ridges of the Namuli massif consist of granite-porphyrite intruded into 1100–850 million year old migmatites of the Nampula and Namarroi series of the Mozambique tectonic province. All these rocks are ancient, dating from the Precambrian period. Namuli appears to be formed from the same intrusive granites as the inselbergs around Ribaué and Inago, but the inselbergs to the south

and west of Nampula are more recent (around 500–400 mya). Granitic gneisses of the Lurio Belt surround the massif at lower altitudes on the northern and southern sides (e.g. around Gurué), and are from the same period.

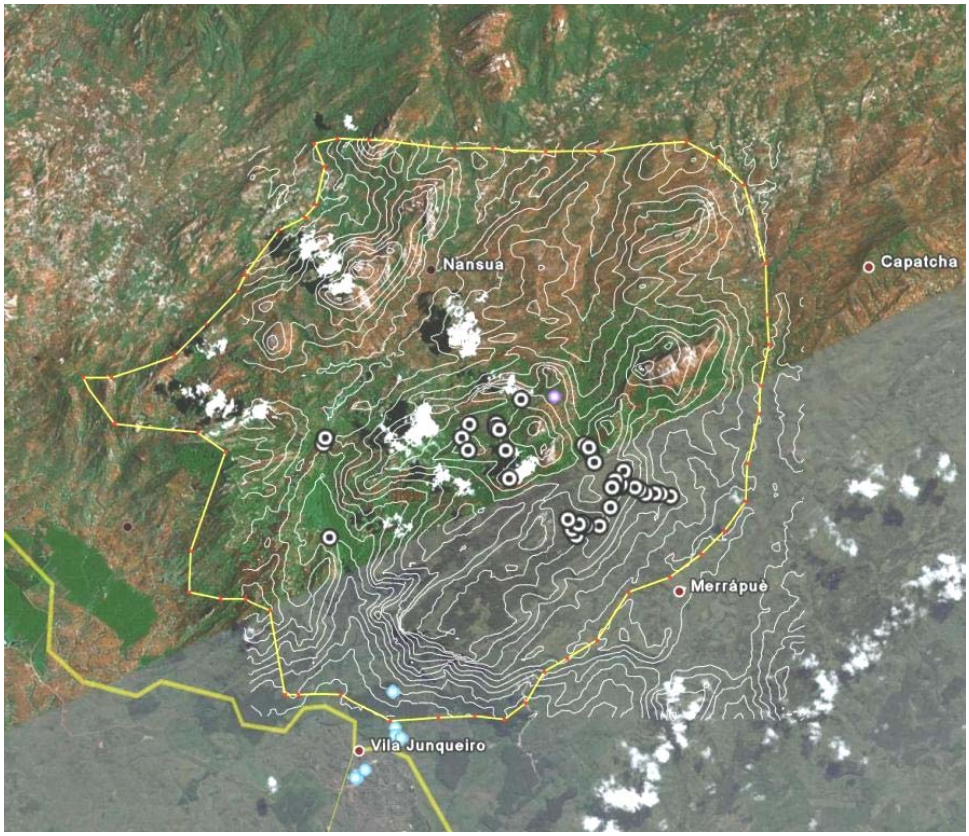


Figure 3. Broad upland area from Gurué (formerly Vila Junqueiro) to north of Namuli. Yellow line shows approximate limits above 1000 m altitude (from Google Earth, June 2008).

2.2 Climate

Climatic data for the Namuli massif itself at 1800–2000 m are not available. The only available data are for Gurué town at its southern foot at an altitude of 730 m, where the rainfall in probably significantly less and mean temperatures certainly higher. Mean annual rainfall over 28 years at Gurué town is 1995.7 mm (Kassam *et al.* 1981). There is a distinct rainy season from November to March, with each of these months having over 300 mm precipitation (mean for March, the wettest month, is 357.8 mm) and a dry season from May to October with less than 60 mm/month (mean of just 26.1 mm in September). Mean maximum temperatures are 28.0°C (ranging from 32.5° in October to 23.0° in July), while mean minima are 15.7°C (ranging from 12.3° in July to 18.3° in January). Potential evapotranspiration is 1226.7 mm/year, some 770 mm/year less than precipitation.

Early visitors record some climatic data, collected either by themselves or others. Joseph Last, based on his own observations near present-day Gurué town in August–October 1886 (Last 1887b), recorded a mean temperature of 23.9°C (75°F), with a maximum of 35.0°C and a minimum of 12.8°C. He says that the overnight minimum in August was frequently zero or below, with –3.3°C recorded at 04.00 in his camp at the foot of Mt Pesse on 25th August. Jack Vincent did not record temperature or rainfall figures himself in 1932, but mentions 3–5 year mean records from nearby local administrators (Vincent 1933a), e.g. Alto Molócuè rainfall 1379 mm/year, mean temperature 22.4°C (July–August 18.6°C), and Malema rainfall 1026 mm/year, mean temperature 24.0°C (July–August 20.2°C). Some additional climatic data for

Malema (mean rainfall 1101 mm/year, ± 52.6) and Mutuáli are available in Gomes e Sousa (1949) for the years 1950–1953. Vincent suggested that the annual rainfall in Gurué is around 1800 mm/year while up on the slopes of Mt Namuli it is probably 110–120 inches/year (2800–3050 mm). He did not think temperatures frequently went much below zero up on the plateau during the cold season, but it is clear that overnight mild frosts are not uncommon from June to August here.

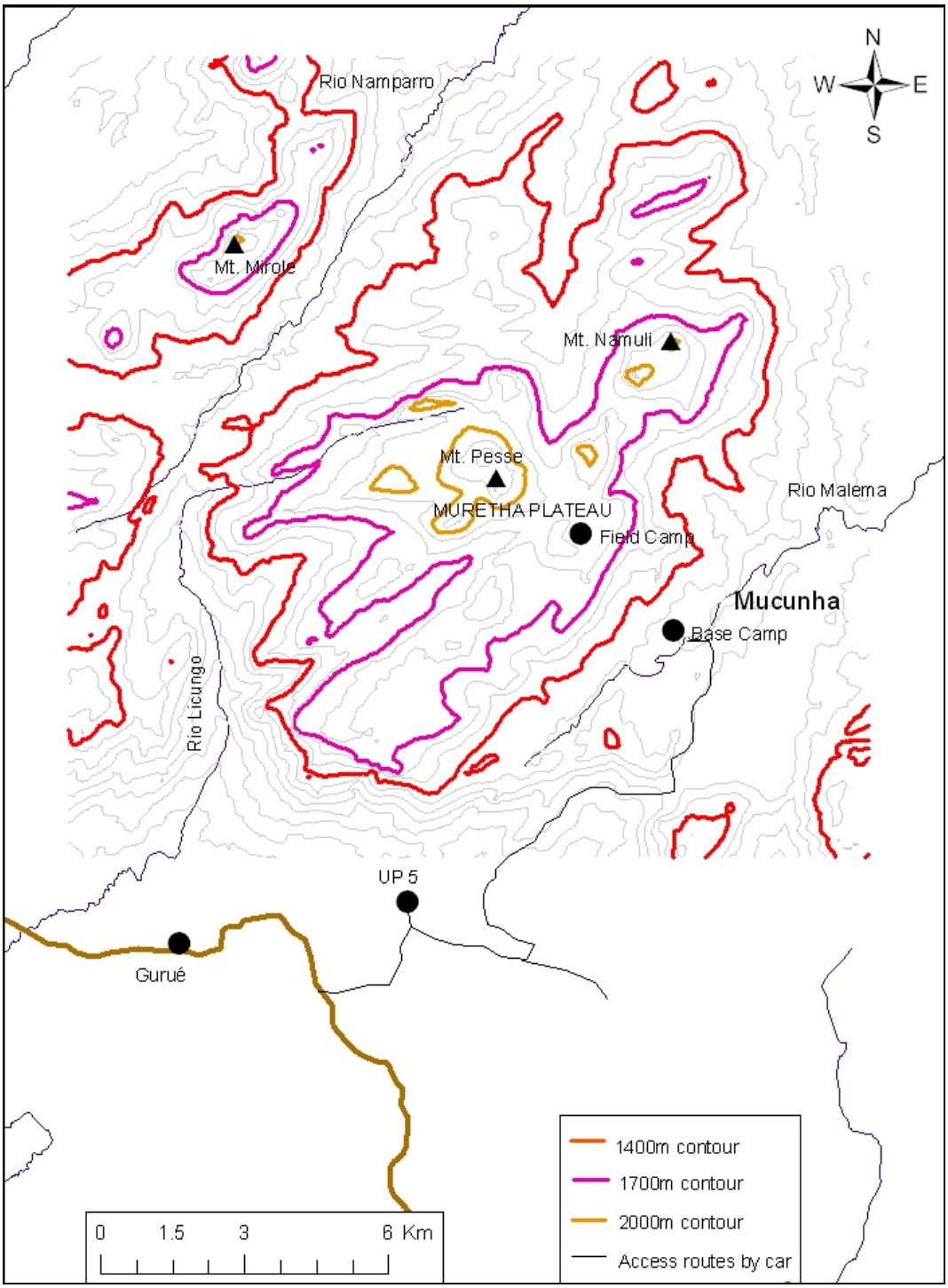


Figure 4. Limits to Namuli study area, showing main localities, contours and access.

According to FAO's climatic resources inventory map for Mozambique (FAO 1982), the Namuli area has the longest growing season of any area in the country at 300 days, with a moderately cool (15–20°C) temperature regime during the growth period.

2.3 Soils

In the course of fieldwork 46 soil samples of topsoil and subsoil (0–20, 40–60 and 100 cm depth) were taken from 18 sites across the massif to try and determine the main soil types and characteristics. The samples were subsequently analyzed at the IIAM Soil Laboratory in Maputo. Full results are not given here, but are summarized in Table 2.

Following the Mozambique national soil classification, the Namuli massif is entirely covered by Lithic soils (Unit 1). Four subdivisions are recognized within this Unit related to geomorphological position, including bare rock.

Table 2. General soil characteristics of samples from the Namuli massif.

Soil group	Soil characteristics	Geomorphology	Slope (%)	Topsoil-subsoil texture	Soil depth (cm)	Drainage
Lithic soils	brown sandy loam, shallow soils over altered rock	inselbergs, erosion zones, rock outcrops	> 30%	LS-SL altered rock	0–30	excessive

Topsoil pH(H_20)	Topsoil organic matter (%)	Sodicity	Soil classification		Land capability classification (USDA)
			FAO 1988	USDA 1992	
4.2–4.8 very acid	high to v.high 4.5–25.0	non-sodic	Eutric Leptosols	Lithic Ustorthents	Vii – viii p

Most topsoil samples (0–20 cm depth) have high to very high organic matter, are very strongly acid (exceptionally down to pH 3.4), with very low calcium (Ca = 0.03–0.06 cm mol/kg), very low magnesium (Mg = 0.15–0.25 cm mol/kg), medium to high potassium (K = 0.5–0.6 cm mol/kg), very low sodium (Na = 0.5–0.8 cm mol/kg), but high phosphorous (P = 4–5 ppm). The mean pH over all samples, topsoil and subsoil, was 4.6. Surprisingly, the samples from peat grassland did not show significantly different nutrient levels.

3. HISTORY AND EARLY COLLECTING

3.1 Administration

The area lies in the District of Gurué in Zambézia Province, with the District centre being Gurué town. There are a number of Localities around the mountain falling under the Posto Administrativo do Gurué . On the eastern side, the main one is Mukunha Locality with 10,300 inhabitants, comprising most of the upper Malema valley. The population is distributed between 16 cells in four zones – Mukunha (at the base of Mt Namuli), Kuruka (near Ukalini forest), Murrabue (area around our base camp) and Moresse (zone above the tea plantations SE of the Namuli massif). Each Zone is the responsibility of a Secretary or Chefe de Zona. The population size in the upper Licungo valley area on the western side of the massif is not known, but is probably less than that in the Mukunha area.

Local traditional administration is through the Regulo, or spiritual leader. The Regulo (or "Queen") for Mukunha Locality is Senhora Adelina Jackson, who lives in the main settlement of Mukunha on the north-eastern slopes of Mt Namuli. It is required that visitors to Namuli first visit her to ask permission, with a small ceremony and exchange of gifts (Alves & Sousa 2008). There is a Secretário, Sr. Estimado, who maintains the communication between the Regulo and the Tchamassuas, or Chefes das Zonas.

The Instituto de Investigação Agraria de Moçambique (IIAM) has recently established a small office in Gurué based in the Department of Agriculture (formerly DDA, now Serviços Distritais dos Actividades Ecómicos, SDAE).

3.2 Local Economy and Land Use

The main activity for which Gurué has been known in recent years is tea production. Plantations were established by Portuguese settlers in the first part of the 20th Century, and a number were certainly functional in the early 1930s when Jack Vincent visited (Vincent 1933a). The area has been regarded, both before and after Independence, as a major agricultural area. There were at least four large tea factories functioning here from the 1950s to the early-1980s. A fairly large and developed settlement was built up at Gurué Town, with government offices, a large Catholic Mission, traders, cinema, garages, etc.

After Independence, Gurué District was still a major tea-producing area under the state-owned Emocha company. The plantations were said to be the largest in southern Africa, exceeding even those in Malawi around Mulanje. Much of the tea went for export, and was of some significance in Mozambique's economy. However, in the mid-1980s, Renamo attacks during the civil war forced the closure of the tea factories and many other support services; many people left for more secure places. The tea plantations fell into disuse and the local economy all but collapsed.

It is only in the last few years that local development and rehabilitation has picked up, some years after the peace accords of 1991. Traders are again operating, bringing products in from the coast on newly-repaired roads, and the tea plantations have been rehabilitated by cutting back overgrown, tree-like bushes to manageable 1 m or so high shrubs. Large *Albizia* trees that had grown up in the plantations are being cut out. The state has sold many of the plantations to private operators and companies, although it is not clear if these are all Mozambican or also represent external investment. At least two of the tea factories are in the process of being rehabilitated (2007).

Apart from the tea plantations and rehabilitation, trading and local administration provide some formal employment in Gurué town. There is a large Catholic Mission in Gurué incorporating a sawmill and furniture making factory. However, apart from casual and contract employment on the tea plantations, the main economic activity immediately around the massif would appear to be subsistence farming. The main crops grown are cassava and sweet potato, with some maize, sorghum and beans. Increasingly, small-scale horticulture for cash is being practiced, particularly tomatoes and Irish potato. The produce is sold in Gurué town and nearby. For many in the Malema valley, this is probably one of their major sources of cash.

There are some smaller cattle owners in the upper reaches of the Namparro valley on the northern slopes of Namuli. These *criadores* graze their livestock in the valley at around 1200–1400 m, and on some of the grassy plateau above at 1800–2000 m. Total cattle numbers are probably around 100–150 head. Cattle are left to roam by themselves for days on end, or are attended by herdsboys, who camp out with them.

3.3 History

The people living around the Namuli massif are mostly Lomwe, a subgroup of the Macua, a tribal / linguistic group found across much of northern Mozambique and into S Malawi and S Tanzania. The Lomwe dialect appears to be slightly different from that of other Macua peoples, but little seems to be recorded on their oral history and origins.

From brief discussions with the traditional local authorities, in particular the Regulo or 'queen' who lives on the slopes of Mt Namuli, it appears that this group have been living here for some hundreds of years. An early explorer, H.E. O'Neill, recorded that the Lomwe people living here, who were distinct from the Macua to the east, had a great respect for Mt Namuli. The mountain, they said, gave birth to the first of the human race (O'Neill 1884a). However, this sacredness, which still necessitates obtaining permission from traditional authority to climb it, appears to be confined to Mt Namuli itself and does not extend to other peaks or to the Muretha plateau. Although the first man and woman "came out" of Mt Namuli, the first animals came out from another hill some 6 days journey to the northwest. In addition, the massif was probably also a place of refuge from their enemies, this being a time of much raiding with large parts of the country depopulated owing to insecurity and warring chiefs.

The Gurué area was the centre of the tea industry in the Portuguese colonial times, the first plantations being put in around 1930. At Independence, these were considered to be the largest in Africa, although they fell into decline during the civil war in the 1980s. Most plantations are now privatised and are being rehabilitated, particularly during the last 2–4 years. Plantations were extensive up the entire length of the Licungo valley to an altitude of around 1200 m, but rarely above this. Although there are no tea plantations in the Malema valley, extensive plantations are found on the south-eastern slopes of the Namuli massif east of Gurué up to 800 m.

Linked to the tea estates in colonial times were a few cattle-raising enterprises, possibly run by the tea companies themselves to provide the workforce with meat. Grazing areas and livestock handling facilities were mostly situated on Namuli's northern slopes and in the Namparro valley. These probably collapsed at or soon after Independence, although small cattle owners are grazing these areas again now. The roads leading to them are still servicable, lined in places with over-mature trees of *Eucalyptus alba*, although a number of the small bridges are damaged.

3.4 Early Explorers and Collectors

It has not been possible to search Portuguese colonial archives or records, but it appears that, at least in the English-language literature, the first mention of Namuli was by the British Consul in Mozambique, Henry O'Neill in 1883. O'Neill spent a lot of time travelling on foot through northern Mozambique, in particular the routes between the coast and the British-settled areas of Nyasaland (O'Neill 1884a,b, 1885). In his account of travels from the coast at Ilha de Moçambique along the southern Lurio watershed, via what are now the towns of Ribáuè, Malema and Lioma to Lake Chilwa (Lake Kilwa) in Malawi, he mentions that on 13 August 1883 he first saw the peaks of Mt Namuli across the broad Malema valley (O'Neill 1884a: 638). He says it was a remarkable feature, although "not reaching the description that traders in this country generally give of them", suggesting that he, and no doubt others, was fully aware of the massif before seeing it. The highest point was estimated as being 8500–9000 feet high (2600–2750 m), a fairly good estimate given the knowledge at the time and the fact that altitudes were calculated by measuring the boiling point of water.

Being a stranger in these parts, and possibly as he didn't have a guide and the areas through which he was travelling had many warring factions, O'Neill was travelling with a coast trader, who was probably also involved in slavery. He had to wait for 17 days near the village of Mwedederi, probably close to the present-day Nintulo in the Malema plain and some 30 km NNW of Namuli, while the trader went off on his own business. During this time he took bearings on Mt Namuli from the slopes of the nearby peak of Mwakwa. From his description it is possible that Mwakwa was the distinctive peak (Mt Mácua?) about 20 km north of Namuli with three upright boulders on it. The first sketch map of the Namuli range and a segment from his larger map of the area east of Lake Kilwa (O'Neill 1884b) are shown in Figures 5 and 6, respectively. Although he didn't get closer to the Namuli massif than this, he pointed out that it was a beautiful, well-watered and fertile area, healthy after the fever-ridden coast, and well-suited to both European settlement and the establishment of a "central mission and sanitarium, from which branch stations could radiate into the surrounding country....".

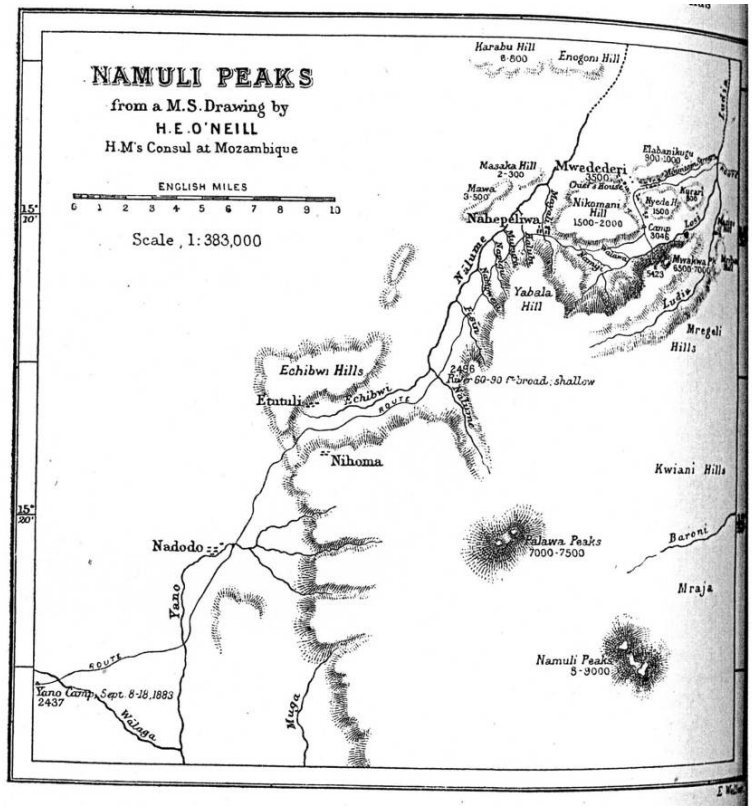


Figure 5. The first published map showing Namuli, sketch map from O'Neill (1884b).

Later, on his return journey to the coast, O'Neill describes the southern side of Namuli (O'Neill 1884b), although again he did not seem to actually set foot on the massif. He notes its strange shape, unlike any other mountain he had seen in the Lomwe and Macua areas, and suggests that it may have been of volcanic origin, the steep aspect as seen from the east or west being a crater rim. Again he records the very sacred nature of the mountain to the Lomwe people, who seemed reluctant to talk of it.

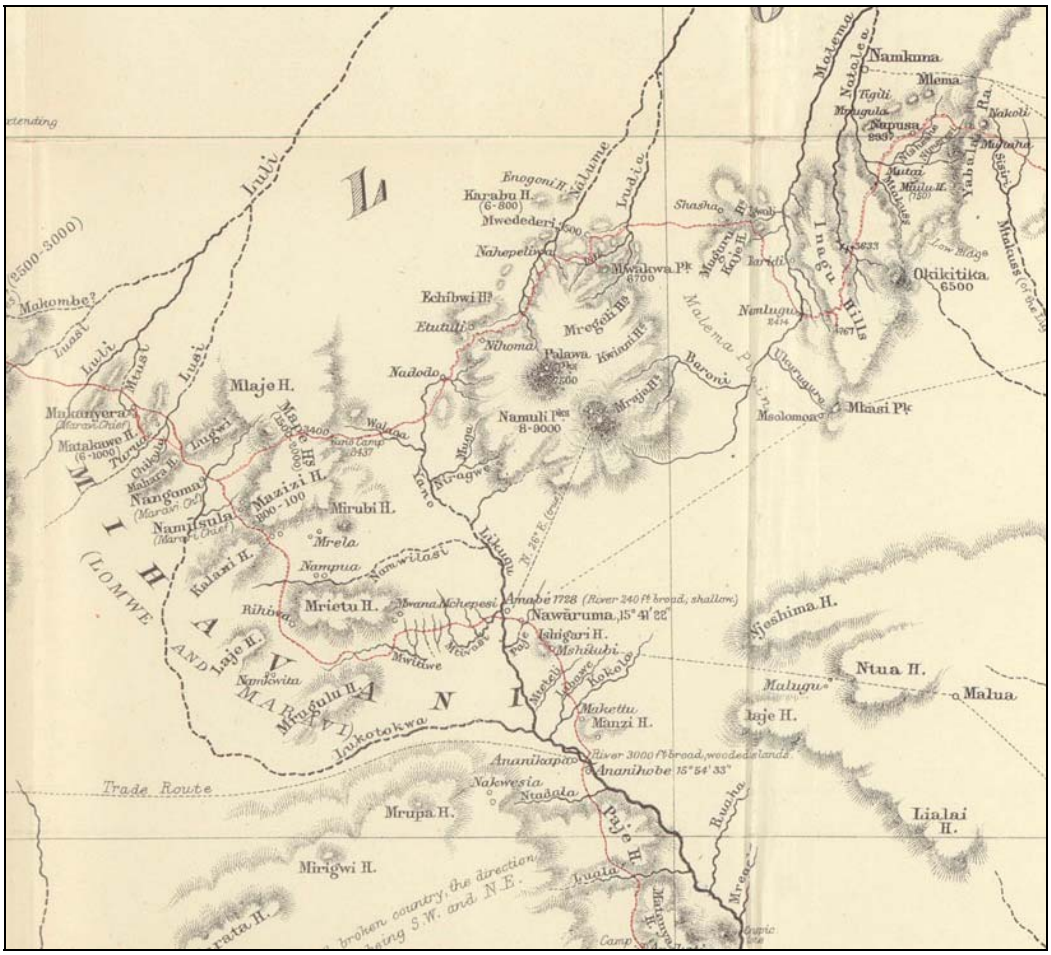


Figure 6. Portion of map of O'Neill's journey to Lake Kilwa, June 1883–Jan 1884 showing Mt Namuli (O'Neill 1884b). The routes he travelled are shown in red.

It was around this time that there appear to have been rumours or reports of a snow-capped mountain in the area, although there is nothing in O'Neill's writings referring to this possibility. Such reports presumably intrigued the British exploration fraternity, coming as they did not long after the discovery of Mts Kilimanjaro and Kenya and the Ruwenzori Mountains in East Africa. Phenomena such as snow in the tropics had, until then, been considered impossible. Not long after these reports surfaced, the Royal Geographical Society in London raised funds for a small expedition to northern Mozambique, and the man chosen to lead it was Joseph Last (1847–1933, Figure 7).

Last was an explorer and linguist who had been a missionary in Kisulutini on the Kenya coast, and later in central Tanzania at Mpwapwa and at Mamboya in the Nguru mountains. In 1885 he set out alone from Britain on an expedition that was to last over a year. There appear to have been four objectives for his trip: to accurately determine the position of the Rovuma–Lugenda confluence at Negomano (the Rio Rovuma formed the border between German East Africa and the still unconsolidated Portuguese sphere of influence of Mozambique); to "study the climate and economic products of the District" (i.e. northern Mozambique from the coast to Lake Niassa/Malawi and the Rio Zambezi); to "study the character and languages of the

native tribes" and, perhaps most significantly, to "spend six months in examining the neighbourhood of the Namuli Hills, making an accurate survey and studying its climate, its chief mineral, vegetable, and animal products, commercial resources, and the condition of the native tribes, returning to the coast by way of the populous valley of the Likugu [Licungo]" (Anon. 1885).

Figure 7. Joseph Last (from Gomes e Sousa 1940).

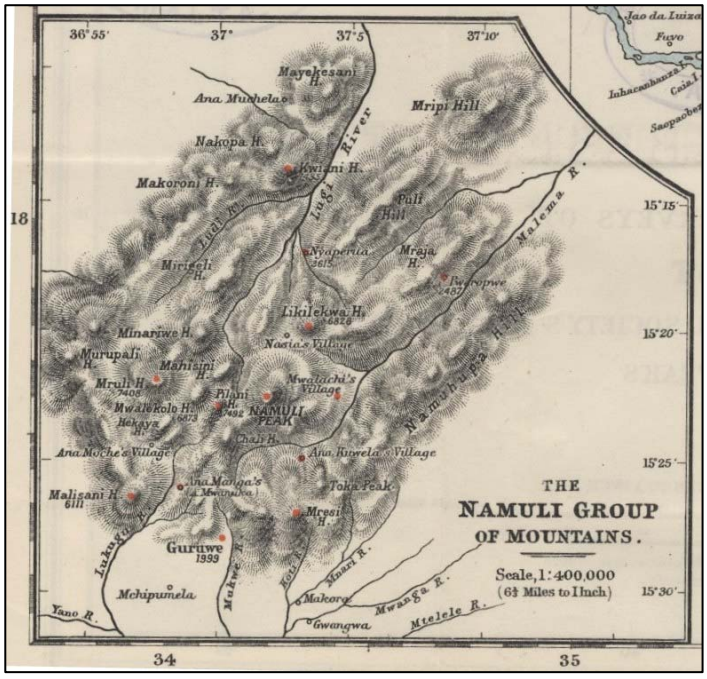


Figure 8. First detailed map of the Namuli mountains (Last 1890).

After meeting the British Consul in Zanzibar, Sir John Kirk, who had accompanied Livingstone on his Zambezi expedition from 1858–63 and who had also collected many plant specimens from Mozambique, Last arrived at the mouth of the Lindi River in SE Tanzania in October 1885 (Last 1887b). From here he set off south-eastwards on foot with a few porters reaching Negomano on 15 November (see maps in Last 1890), where he took numerous position readings and determined altitude by means of recording the temperature at which water boiled. Continuing on foot along the Lugenda River he reached Blantyre in then British Nyasaland (now Malawi) on 13 January, making many interesting observations on the way (Last 1887b).

After a period recovering from illness and various other trips in southern Malawi, Last set off from Blantyre to Namuli on 12 July 1886, passing south of Lake Chilwa (Last 1887a). On 3 August 1886 he reached Ana Guruwe's kraal (37°02'20"E, 15°27'30"S), situated on the Namuli foothills by the track up to the Malema valley some 5 km east of the present-day town of Gurué, a site now covered by tea plantations. Here he was welcomed, given huts to stay in, and was based for three months while exploring and surveying the Namuli massif. His descriptions of the massif and its natural history (Last 1887b) and his detailed sketch map (inset in Last 1890, Figure 8) appear to be the first from the massif itself. Unfortunately it is difficult to reconcile this map with current ones, in part probably owing to difficulties in determining latitude. Last determined the height of seven of the peaks in the area, but apparently not that of Mt Namuli, which he said was too difficult to climb, and also took numerous meteorological readings around Ana Guruwe's village. He briefly describes the vegetation and mentions spectacular waterfalls, the various cone-shaped peaks of "Mrule, Pilani and Pesani", mentions the soft green grass of the Malema valley (to be seen today along

the Rio Malema floodplain), and spent time up on the Muretha plateau itself. However, he seemed to focus his attention more on the Licungo valley and slopes above. The position of Mt Namuli is given by Last as 37°04'15"E, 15°20'12"S, the latitude of which seems a bit out according to modern maps, and he estimates the height at 8000 feet (2440 m), very close to that given on maps now (2419 m). There was no settlement up on the plateau then, but he records much inter-village conflict with people from the east side not wishing to visit the west. There was even a group in the upper Licungo in the hamlet of Mana who were reportedly cannibals, but Last found this to be more due to fear and bluff than reality.

Last left Ana Guruwe's kraal on 23 October along the Rio Licungo and reached Quelimane in 16 November, from where he returned to Blantyre. Shortly after, on 28 January 1887, he set off for the coast along the upper Rio Lugenda, then cross-country to the Rio Mtepwesi (possibly what are now Rios Mu-upua and Montepuez) and Ibo Island north of Pemba. At one point on the return journey, in what appears to be the Marrupa area, he and his porters had to hide all their baggage in the hills in order to move on more rapidly to get food, as there were no settlements or people from which they could buy and hunger was setting in. On returning later they found all their baggage stolen, including, apparently, many of Last's natural history specimens. There seems to be no record of how much was lost, and whether this included notes. They were helped a lot after this incident by a Chief Mweli in what is probably now the Balama–Montpuez area, before reaching Ibo.

Archive correspondence and lists at the Royal Botanic Gardens Kew show that from this trip Joseph Last brought back at least 79 plant specimens and 16 fungi (dated January 1887 so presumably the specimens were shipped directly from Blantyre as Last did not arrive back in UK until June 1887), plus an assortment of economic botany artefacts such as cloth, instruments, utensils and seeds donated in November 1887. All are labelled as being from "Namuli, Macua Country, 1887" (Figure 30). At least 20 of these plants are types, specimens used to describe new species, although 14 names are now reduced to synonymy (see Table 7).

Subsequently Last worked in Zanzibar (1899) as Commissioner for Slavery, and in Madagascar, where he developed a particular interest in ferns. At one time his house in Suffolk, UK was called "Namuli".

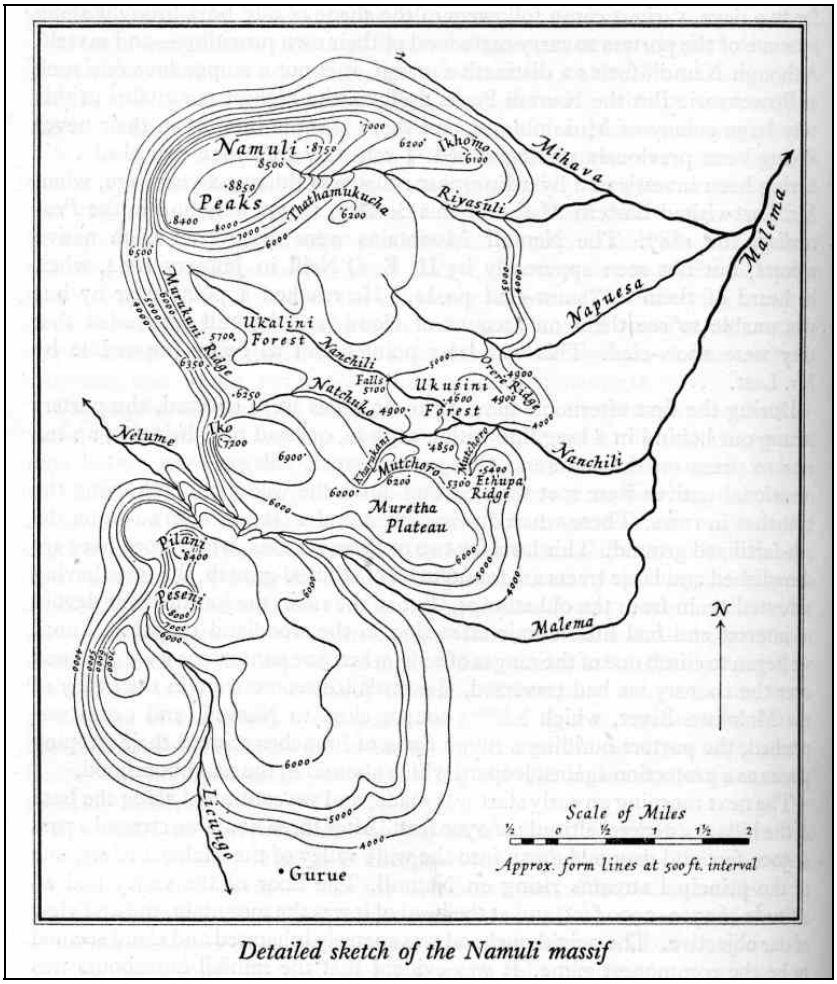
Almost 50 years were to pass before the next significant biological records from Namuli. In the interim there was presumably much development in the surrounding area, as Vincent (1933a) mentions the newly-established tea plantations around Gurué in 1932. It has not been possible so far to determine the rate of expansion of these plantations, or of the associated livestock enterprises on the drier sides of the massif, but they all appear to have been well-established by the 1950s.

In 1932 Jack Vincent, a British ornithologist from the Natural History Museum in London, visited Namuli as part of an extensive collecting trip around northern Mozambique. Given the large gap in knowledge of species and distributions, his principal interest was to determine where the transition zone lay between the East African and southern African bird faunas. He realised that the Zambezi River was unlikely to be a barrier for bird distribution, and thought the transition zone was more likely to be the series of hills along the Lurio watershed, of which Namuli forms part. These mountains and outcrops also support forest patches, an important habitat for unusual birds.

Like Last before him, Vincent based himself in Blantyre in southern Malawi, but instead of using porters and travelling on foot he bought a second-hand 1 ton Ford truck, and with five assistants (including at least one Zulu bird skinner he had trained), spent the next 10 months

collecting and skinning birds across large parts of southern Malawi and northern Mozambique. During this time he visited Blantyre, Mt Mulanje, Mocuba, Gurué, Angónia, Furancungo, Tete, Malema, Ribáuè, Nampula, Mossuril and Namapa, as well as what was probably his principal objective – Mt Namuli. During the earlier stages of his travels, in January 1932 in the rainy season, he camped near Gurué, but found the vegetation there too thick for moving around and successful bird collecting, so returned to Malawi. There was also the problem of possibly being stuck for up to four months once the Rio Licungo flooded. Later, in July 1932, Vincent came back to Namuli after collecting in the Nampula and Malema areas. He stopped at the run-down Scotch Mission at Nauela, some 60 km east of Namuli, and from here walked with porters to the Malema valley, where he set up camp on 21 July in the Ukusini forest in a small clearing at an altitude of around 1400 m. His detailed paper in the Royal Geographical Society's journal (Vincent 1933a) gives not only the first known photos of the mountain, many places still being recognisable now, but also a sketch map of the eastern and northern parts (Figure 9). He also provides numerous descriptions of natural history and the people of the Malema valley, their lifestyle and agriculture.

Vincent's explorations were primarily on the north-eastern parts of the Namuli massif. He climbed the Murukuni ridge which links the main Namuli peaks with the Muretha plateau (including an impressive photo, Figure 10), but he states that the peaks here were too steep for him to climb. Most of his bird collecting was done in the Ukalini forest, the 'apron' of forest below the steep SE-facing slopes of Namuli at 1560–1900 m (see front cover), and in what he calls the Ukusini forest lower down at around 1200–1400 m along the Rio Nanchili. Much of the latter forest now seems to have been cleared, but the Ukalini appears similar to what it was in his day.



Detailed sketch of the Namuli massif

Figure 9. Sketch map of Namuli massif (Vincent 1933a).

He describes the Muretha plateau at around 1890 m in some detail. On the way up there was much spiny *Smilax anceps* and a ginger-lily (probably *Aframomum* sp.). The rolling short grass plateau itself was often wet and cloud-covered, dotted with patches of thick forest comprising trees similar to those in the gullies below, but not so high. On forest edges *Tetradenia riparia* was common with the small tree *Myrsine africana*, and on only the south sides of forest patches he mentions a 5 m high species of *Aeschynomene* (possibly *Kotschya recurvifolia*). The grassland, mostly of *Themeda triandra* with *Eragrostis* and *Loudetia* species, was underlain by perennially waterlogged, black peat soil, and many grass tufts concealed water-filled holes (Figure 11). A species of everlasting *Helichrysum* that Vincent did not recognise is mentioned, along with ground orchids and a type of gentian (possibly *Swertia curtioides*). The finest and most characteristic tree of Ukalini and Ukasini forest, rising to 30 m, was reported to be *Newtonia buchananii*, along with the common liana *Dalbergia arbutifolia* and a large species of *Marattia* fern. But there was no *Widdringtonia whytei* (Mulanje cedar), no bamboo, no bauxite, and no human settlement, although there was apparently some settlement higher up on the western side. Wild pigs were said to be common up on the plateau, and leopard not uncommon, but there was no trace of bushbuck or other antelope. Native hunters and trappers used nets and decoys to catch birds, especially a partridge-like '*Pternistis*' (Hildebrandt's Francolin). On steep rock faces there were tree *Vellozia* (*Xerophyta viscosa*?), along with a white *Crassula* (*C. globularioides*?) and a blue *Lobelia* (*L. blantyrensis*?). Such descriptions suggest an environment very similar to what is seen today, except for leopard and wild pig, now replaced by domesticated livestock.

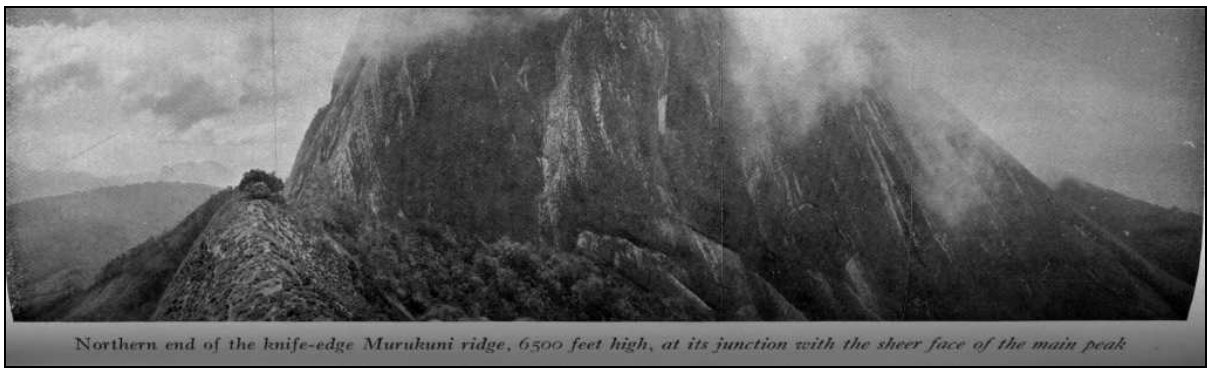


Figure 10. Photograph from 1932 along the Murukini ridge from Muretha to the main Namuli peaks (Vincent 1933a).

During his travels across northern Mozambique, Vincent describes seeing much wildlife, something now sadly absent, recording elephant, black rhino, wildebeest, eland, sable, hartebeest, reedbuck, hippo, crocodile, lion and hyena. At this time there were many instances of man-eating lions around villages, and he records a country-wide estimate of around 2000 people per year being killed by lions, many of the lions not being old or incapable but just perhaps finding humans easier to catch. At one camp near Malema, he arrived when lions had eaten 20 people in 21 days. Vincent also refers to black rhino being common, even being shot for meat rations for road workers at times. Although he had a plan to visit Mt Chiperone with an elephant hunter, this trip did not materialise, but he mentions on at least two occasions that he thought that mountain would be very interesting to visit zoologically. Mt Chiperone was the focus of the previous expedition under the current Darwin project (Timberlake *et al*. 2007).

Vincent left Namuli for Malawi on 10 August after almost a month in the area. He had got what he considered to be a very representative list of birds from the mountain, recording 68 species above about 1360 m, and collecting 250 skins of 53 species. Some of these birds were

described as new to science, including the endemic Namuli Apalis. He also collected a few small mammals, including five specimens of what was later described as the endemic Vincent's squirrel, some plants (he says he couldn't get flowers or fruits of many forest trees), insects and at least one unusual black mollusc, and later published extensively on his bird collections and collecting localities (Vincent 1933b, 1933–36). It has not been possible to locate his plant specimens, which are probably held at the Natural History Museum herbarium (BM) in London.

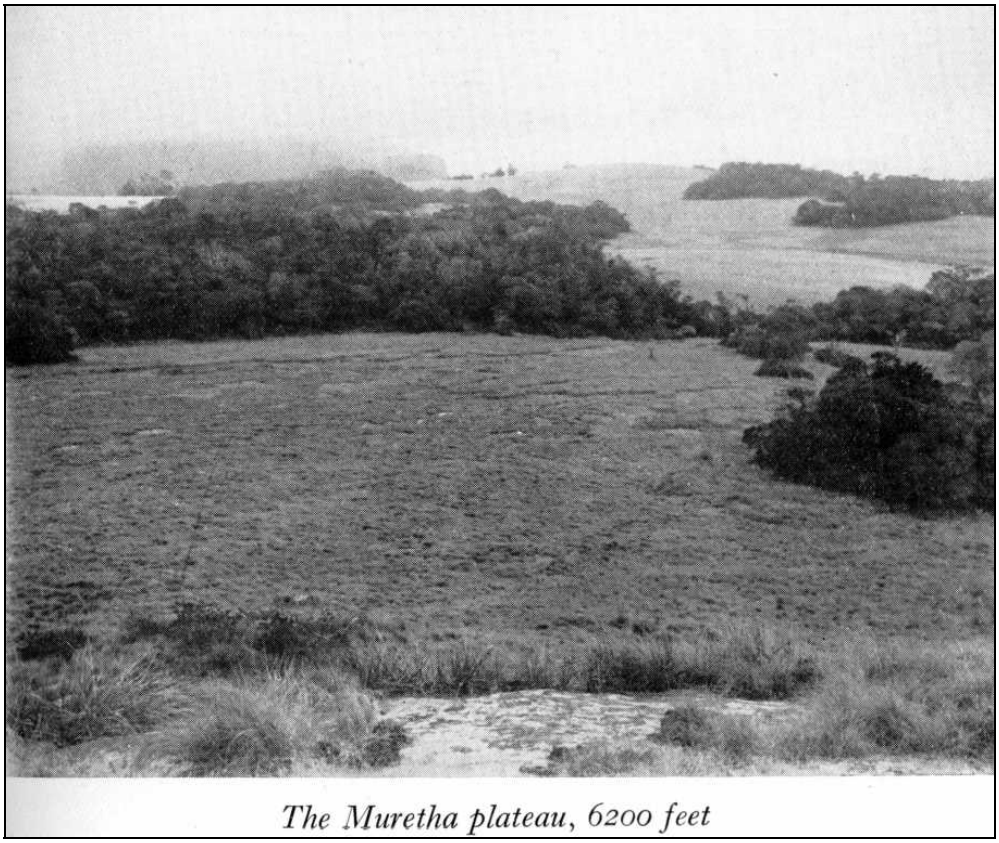


Figure 11. Photograph from 1932 of the Muretha plateau, close to the present expedition's campsite (Vincent 1933a).

3.5 Recent Biological Survey

The previous section outlined visits and collections up to the 1930s. This section primarily looks at the period from the Second World War to date. All known collectors and dates are shown in Table 3.

Apart from Joseph Last, who collected about 79 specimens (including at least 22 later described as new), Charles Swynnerton (then living in Chirinda Forest in SE Zimbabwe) who collected a little in the Malema valley in 1906, and a few specimens from Jack Vincent in 1932, no detailed plant collecting seems to have been done until a series of visits by António Rocha da Torre to the mountains around Gurué from 1937 to 1943. Initially Torre's collections appear to have been under his own initiative, but in April and June 1943 he collected more extensively in the area (90 specimens from Namuli) as part of a nationwide botanical survey by the Missão Botânica de Moçambique. At least five new species resulted from these trips. After Torre there were scattered collections, mostly from the Gurué area and surrounding country at lower altitudes, by the Portuguese collectors Mendonça (1942, 1944), Andrade (1949), and Grandvaux Barbosa & Carvalho (1949). However, little seems to be known about these trips other than the specimen notes, and most of the plant labels are not very specific.

Many years later, between 1966 and 1968, Torre again visited the Namuli area on at least four occasions with M.F. Correia. These visits, resulting in at least 482 collections, were to the Licungo valley and western massif slopes (Feb 1966 and Feb 1967), to the slopes and riverine forests of Mt Namuli on the eastern side of the massif (Nov 1967), and to the forest and upper slopes above Gurué town (Jan 1968). They collected in all the main habitats up to at least 1820 m, including montane forest and grassland, but possibly not higher up. However, most of these collections were from 1300 m altitude or lower (around 260 specimens), with a sizeable number from there up to 1700 m. Perhaps only 130 specimens were collected from 1700 m or above, the point at which the plateau and montane forest can be said to truly begin.

Table 3. List of botanical and zoological collectors/recorders from the Namuli area.

Collector	**Date**	**Notes**
J.T. Last	Aug-Oct 1886	plants (Mt Namuli, date given as 1887)
C.F.M. Swynnerton	Nov 1906	plants (v.few) (Malema valley)
J. Vincent	July-Aug 1932	bird collecting, plants, small mammals, molluscs
A.R. Torre	May 1937	plants (hills in Gurué area)
A.R. Torre	Sept-Oct 1941	plants (Serra Gurué)
A.R. Torre	Apr 1943	plants (Gurué, Namuli)
A.R. Torre	June 1943	plants (Gurué, Namuli)
F.A. Mendonça	Oct-Nov 1942	plants (Serra Gurué)
F.A. Mendonça	Sept 1944	plants (Gurué, Namuli)
E.C. Andrada	Aug 1949	plants (Gurué, Namuli)
L.A.G. Barbosa, M. Carvalho	Sept-Oct 1949	plants (Gurué)
L. Leach, E.A.C. Schelpe	July 1962	plants; Schelpe & Leach for Pteridophytes
A.R. Torre, M.F. Correia	Feb 1966	plants
A.R. Torre	Feb 1967	plants
A.R. Torre	Nov 1967	plants
A.R. Torre	Jan 1968	plants (Gurué, Namuli)
J. de Koning, P.A. Schafer	July-Aug 1979	plants (Gurué)
P. Ryan, C. Bento, C. Cohen, J. Graham, V. Parker, C. Spottiswoode	Nov-Dec 1998	bird recording & ringing
M.P. de Melo, R. Covas, K-D. Dijkstra	Dec 2001	bird ringing, Odonata
Chicago Field Museum	July-Aug 2003	bird collecting
J. Kerbis, E. Sarmiento	Nov 2004	small mammals, bird collecting; unpublished
P. Bruyns	Jan 2004	plants, Licungo valley
J. Bayliss, H. Patel	Nov 2005	butterflies, plants
S. van Noort, K. Tolley, A. Gardiner	May 2006	herps, figs, butterflies (foothillls)
A. Monadjem	Aug 2006	bat collecting (Gurué)
J.R. Timberlake, T. Harris, H. Patel	May-June 2007	plants
J.R. Timberlake, T. Harris, H. Patel	Nov 2007	plants
J. Bayliss, L. Sabão	May-June 2007	small mammals, reptiles, butterflies
J. Bayliss, L. Sabão	Nov 2007	small mammals, reptiles, butterflies
C. Bento, R. Demey	May-June 2007	bird observations
F. Dowsett-Lemaire, T. Mzumara	Nov 2007	bird observations & recording
K. Cook	Nov 2007	bird ringing & collecting
A. Gardiner, B. Wursten	Apr 2008	butterflies, plants

Other significant collections have been made by the South Africans Larry Leach and Edward Schelpe in 1962, who were particularly interested in succulents and ferns respectively. And, more recently, by Peter Bruyns, who described new *Euphorbia* and Asclepiadaceae from Namuli and surrounding areas (Bruyns 2006a,b).

The recent expeditions under this Darwin project represent the most comprehensive botanical survey to date, with 725 numbered collections from a range of montane habitats over two seasons.

On the zoological side, there do not appear to have been any records after Vincent's trip in 1932 until the expedition from the Percy Fitzpatrick Institute for Ornithology in Cape Town in November 1998 (Ryan 1999a), which revisited some of his localities. They found the Namuli Apalis and other species of conservation interest still common, and gave an estimate of the extent of montane forest – for the first time recording that it was more extensive than had previously been thought. More detail on previous ornithological work is given later.

Two other significant zoological trips were by the Field Museum of Natural History (Chicago) in July–August 2003, during which 200 bird specimens were collected, and a trip by Julian Kerbis and Esteban Sarmiento (Chicago Field Museum and American Museum of Natural History, respectively) in 2004, who spent a number of weeks camped on the edge of Manho forest on the Muretha plateau collecting small mammals and birds. However, the results from these latter collections are still not published. There is a collection of around 200 bird specimens from Namuli and Mt Chiperone in spirit at AMNH still awaiting labels and identification.

4. VEGETATION

4.1 Previous Studies

Although the Namuli massif is relatively small at a regional level, it is still clearly depicted on the Flora Zambesiaca vegetation map of Wild and Barbosa (1967) as an area of Moist Evergreen Medium-altitude Forest (Type 1) encompassing a small area of Dry Coniferous Montane Forest (Type 8). Both designations unfortunately do not reflect what is present, which is more akin to Moist Broadleaved Montane Forest (Type 7) surrounding a small area of sub-montane *Themeda* grassland (Type 68). The Dry Coniferous Forest probably refers to an assumed area of *Widdringtonia*, which is in fact absent from Namuli, although present in similar situtions on Mt Mulanje. The pediments immediately below are shown as *Brachystegia spiciformis* (high rainfall) Woodland (Type 21) surrounded by drier *Brachystegia spiciformis–Julbernardia* Woodland (Type 23) further away. Frank White (1983) in his study of vegetation Africa-wide, depicts the montane forest on Namuli as being allied to the East African coastal mosaic (Type 16b), similar to that on other montane massifs in northern Mozambique, and surrounded by Wetter Zambesian miombo woodland (Type 25). However, the forests on Namuli show very little affinity to those of the lower coastal areas and are much closer to what he terms Afromontane Forest, certainly at above 1600 m altitude.

Earlier studies include Barbosa's (1952) study on the vegetation of Zambézia Province. He describes the vegetation of the Namuli massif, along with that on other massifs such as Mt Mabu and Morrumbala, as Unit 1 – Moist Tropical Montane Forest (rain and clouds). In general trees are said to be evergreen, 18–20 m high with 3 or 4 strata, and forest is only found at over 1200 m altitude. The herbaceous layer is poor, but ferns are common. He also points out that additional moisture is available to these forests through clouds being formed as the prevailing moist south-easterly airflow is forced over the mountains and cools. Above a certain (unspecified) altitude it is sufficiently cool that a xerophytic thicket vegetation is encountered dominated by species from the Ericaceae and Proteaceae families. Typical moist forest species mentioned by Barbosa and found on Namuli include: *Albizia gummifera*, *Anthocleista grandiflora*, *Harungana madagascariensis*, *Macaranga* spp., *Maesa lanceolata*, *Newtonia buchananii*, *Oxyanthus speciosus* and *Parinari excelsa*, although these are rarely found together and do not define a vegetation type. He also mentions that large areas of this forest type have been cleared in the Gurué area for tea plantations, and makes a plea for the conservation of at least some of the forested areas.

Pedro & Barbosa (1955) produced a map of the vegetation of Mozambique, which later formed the basis of the Mozambique section of Wild & Barbosa's Flora Zambesiaca map. Surprisingly, they do not give details of vegetation in our study area as apparently this was only seen from afar, but they state that vegetation at 1000–1800 m is part of Complex 79 (Montane zones of Zambézia–Niassa), while those parts above 1800 m fall into Complex 80 (Subalpine zones of Zambézia). Areas below 800 m are described as open or closed woodland, characterised by *Brachystegia* species and *Uapaca*, depending on geomorphology and soil type.

4.2 Vegetation Types

From our study, the vegetation of the Namuli massif above 1200 m altitude can be broadly categorised into six main groups – forest, woodland, scrub, grassland, thin mats or patches on rocky slopes, and cultivated/heavily disturbed areas. Although these six categories are generally self-evident, there is substantial variation within some and the boundaries are not always clear-cut. This is particularly the case with the woodland and scrub, which in a

number of instances would appear to have been derived from forest or grassland by disturbance and/or fire. Undoubtedly woodland was extensive before settlement in the area, but it would seem that it is this vegetation type that has been the most modified by human activity.

The main vegetation types are characterised and described below in terms of their structure (height, cover, etc), species composition and ecology. This was done using ground-based fieldwork and aerial photos. Vegetation records were taken from samples around 0.5 ha in extent, placed subjectively in what were considered to be representative spots across the study area. A GPS point was recorded for each. The descriptions and ecological notes below are based on extensive field observations by J. Timberlake and F. Dowsett-Lemaire, and data from the vegetation sample plots. A more detailed account of the forest types is given in Dowsett-Lemaire (2008).

Most emphasis during the study was placed on forest vegetation and grassland, as these are the two species-rich types that are of greatest conservation interest. Lesser attention was given to vegetation patches on rock slopes, rocky outcrops and seepages, although they are also of interest. Woodland, scrub and cultivated areas were not looked at in much detail. Most of the study focussed on vegetation above 1700 m, with the addition of the Ukalini forest (1550–1800 m) and areas above the Cascata de Namuli in the upper Licungo and Namparro valleys (1000–1400 m).

a) Forest

The area under moist evergreen forest on the Namuli massif is surprisingly extensive, estimated at around 1250 ha, with about 1115 ha of this being found at an altitude of 1600–1900 m (see section 4.3 and Table 4). There is about 50 ha of forest between 1950 and 2200 m on the slopes of Mts Pesse and Pilani, and around 135 ha of medium-altitude forest below 1600 m. The main blocks of forest, which are more-or-less continuous, lie in broad valleys and on the less-steep slopes of the plateau, trending in a SW–NE direction. Some forest areas are in deeper valleys, such as the Ntapatata valley below the southern slopes of Mt Namuchuruvu and Mt Pesse, or in moister areas such as the Ukalini forest nestled below the peaks of Mt Namuli itself. Most of the present survey work was carried out in Manho forest at the eastern end of the massif and in Ukalini forest.

Based on altitude and composition, there are three main types of forest, described separately below.

Montane Forest: This forest type is found from around 1600 m to 2200 m, with the main area of development at 1700–1800 m. The canopy is closed at around 20–25 m high, with emergents to 30 or even 40 m (Figure 12). In smaller patches on the Muretha plateau, or on steeper slopes flanking the peaks, the canopy is lower at 15–20 m with emergents to 25 m. Epiphytes and ferns are common, indicating the high year-round humidity derived from frequent low cloud and rain outside of the main rainy season. Although trees can be tall, there are not many of large girth (i.e. greater than 60 cm diameter). Stem density is fairly high.

In Manho forest (Figure 13) the main emergent trees are *Faurea wentzeliana* (Tchetchere, the only species exploited for timber), *Cryptocarya liebertiana*, *Olea capensis* (Evaca) and *Ekebergia capensis*. Common canopy trees, in addition to the emergent species, are *Albizia gummifera, Anthocleista grandiflora* (near edges or in gaps), *Aphloia theiformis*, *Apodytes dimidiata*, *Bersama abyssinica*, *Cassipourea malosana*, *Canthium vulgare*, *Cussonia spicata* (gaps), *Drypetes gerrardii*, *Eugenia capensis*, *Garcinia kingaensis* (common), *Ilex mitis* (along streams), *Macaranga capensis*, *Maytenus acuminata*, *Podocarpus latifolius*, *Polyscias*

fulva, *Prunus africana*, *Rapanea melanophloeos*, *Schefflera umbellifera* and *Tabernaemontana stapfiana*. Below 1700 m *Chrysophyllum gorungosanum* appears, with *Myrianthus holstii* in the understorey.

Understorey trees and woody shrubs include: *Alchornea hirtella* (common), *Allophylus chaunostachys*, *Canthium oligocarpum*, *Carissa bispinosa*, *Chassalia parvifolia*, *Diospyros natalensis*, *Dracaena laxissima*, *Erythroxylum emarginatum*, *Ixora scheffleri, Lasianthus kilimandscharicus* (very common), ?*Metarungia pubinervia*, *Mimulopsis solmsii*, *Mostuea brunonis*, *Ochna holstii*, *Oxyanthus speciosus*, *Pauridiantha paucinervis*, *Peddiea africana*, *Psychotria zombamontana*, *Rawsonia lucida*, *Rytigynia uhligii*, *Tricalysia* sp. and *Xymalos monospora*. Large woody lianas are characterised by *Schefflera goetzenii*, and *Rutidea orientalis* is also very common. Perhaps the commonest plant in the herb layer is *Anisotes pubinervis*. The fern flora is diverse, both in terrestrial and epiphytic species.

The Ukalini forest (see front cover) has a somewhat different composition being at a slightly lower altitude, and probably a bit warmer. Although essentially Afromontane, it has elements of medium-altitude forest at its lower margins. The most luxuriant section of the forest, 25–30 m tall, lies in a saddle at 1600–1750 m; two broad 'wings' ascend to the SW and NW up to 1900 m. The emergents are much the same as in Manho, but larger canopy trees include: *Albizia gummifera, Anthocleista grandiflora, Aphloia theiformis, Apodytes dimidiata, Canthium vulgare*, *Chrysophyllum gorungosanum, Cryptocarya liebertiana, Drypetes gerrardii, Ekebergia capensis, Faurea wentzeliana, Ficus scassellatii*, *Garcinia kingaensis, Ilex mitis* (streams), *Macaranga capensis, Ochna holstii, Ocotea kenyensis, Olea capensis, Polyscias fulva, Prunus africana, Rapanea melanophloeos*, *Strombosia scheffleri, Syzygium guineense* and *Tabernaemontana stapfiana*. A few strangling *Ficus scassellatii* occur from 1600–1700 m, and *Strombosia scheffleri* is found at around 1600 m. *Chrysophyllum* and *Myrianthus* are found up to 1750 m. At the forest margin *Trema orientalis* is common.

Figure 12. Montane forest, Manho (JT).

Understorey trees and woody shrubs include: *Alchornea hirtella*, *Aulacocalyx diervilloides*, *Canthium oligocarpum*, *Cassine aethiopica* (stream), *Chassalia parvifolia*, *Diospyros natalensis*, *Dracaena laxissima*, *Englerophytum magalismontanum*, *Erythroxylum emarginatum*, *Garcinia volkensii*, *Ixora scheffleri*, *Lasianthus kilimandscharicus*, *Myrianthus holstii*, *Peddiea africana*, *Psychotria zombamontana*, *Rawsonia lucida*, *Rytigynia uhligii*, *Tricalysia acokantheroides* and *Vepris stolzii*. Lianas include *Canthium gueinzii*, *Landolphia buchananii*, *Mussaenda arcuata*, *Rutidea orientalis*, *Schefflera goetzenii* (dominant), *Secamone alpini*, *Toddalia asiatica* and *Urera hypselodendron*.

On the Muretha plateau at 1850–1900 m there are numerous small forest patches, ranging in size from 30 m^2 to several hectares with a canopy at around 15–20 m and emergents to 20–25 m (Figure 14). These patches are more exposed to fires and contain more secondary, partly fire-resistant species. The most apparent species here are those from forest margins, including

Aphloia theiformis, *Maesa lanceolata*, *Peddiea africana* and, especially, *Morella* (*Myrica*) *serrata*. Other common trees include *Cassipourea malosana* (emergent), *Cryptocarya liebertiana* (emergent), *Ekebergia capensis* (emergent), *Faurea wentzeliana* (emergent), *Macaranga capensis*, *Nuxia congesta*, *Olea capensis* (emergent), *Podocarpus latifolius*, *Prunus africana*, *Rapanea melanophloeos*, *Schefflera umbellifera*, *Syzygium cordatum* and *S. guineense* subsp. *guineensis*. In proximity to streams, *Ilex mitis* is common.

Figure 13. Manho forest (montane) and peaks (JT).

Medium-altitude Forest: This forest type, really only found below 1600 m, has a less-even but often higher canopy, although similar to that of montane forest. The main species difference is in the increased presence of *Albizia gummifera* and *Newtonia buchananii*, *Ficus* spp. and various Sapotaceae trees such as *Chrysophyllum gorungosanum, Englerophytum magalismontanum* and *Synsepalum* sp.

Only one patch of medium-altitude forest was visited up on the Namuli massif, situated along the upper reaches of the Manho river between 1450–1600 m before it falls into the Malema valley. Species composition here changed markedly at around 1600 m.

Riverine Forest: Lower down, along larger watercourses such as the Namchili river, a tributary of the Malema, well-developed riparian forest or woodland is found, although the extent appears to be significantly less than in Vincent's day. He camped and collected birds in these areas. On the Malema valley side, Dowsett-Lemaire (2008) records that *Albizia adianthifolia* is common (1250–1450 m), along with *Bersama abyssinica*, *Parinari excelsa* and *Newtonia buchananii*. Slightly higher up at 1450–1500 m, *Bridelia micrantha*, *Tetradenia riparia*, *Maesa lanceolata*, *Schrebera alata*, *Nuxia congesta*, *P. excelsa* and *S. cordatum* were noted, with *Trema orientalis* in gaps.

In the Licungo valley on the western side of the massif at 1000–1250 m, narrow strips of tall riverine forest is found, comprising *Breonadia salicina*, *Parinari excelsa*, *Ficus* sp., *Syzygium* sp. and *Englerophytum magalismontanum*, with tea plantations immediately adjacent. These are remnants, and it is not clear if they still represent viable populations.

Figure 14. Mosaic of grassland and montane forest, Muretha plateau (JT).

b) Woodland

Woodland vegetation is primarily found at altitudes below 1800 m, i.e. just off the plateau, on the margins of true forest, but primarily on the lower slopes below 1700 m. There is no figure for its total extent. Vegetation sampling was limited, as are details on species composition.

On forest margins from 1800–2000 m, *Erica* (*Phillipia*) *benguelensis* is common, often as tall trees up to 20 m high, forming a type of woodland. This type is much affected by fire, and could be considered as either a derivative from moist forest, or a seral stage towards it.

No miombo woodland (that is, woodland characterised by species of *Brachystegia* or *Julbernardia*) was seen, although a very few small shrubs of *Brachystegia spiciformis* were noted on the NE slopes of Mt Namuli at 1650 m.

Another type of woodland, found on slopes that have been partially cleared and cultivated and frequently burnt, is characterised by evergreen trees of *Syzygium cordatum*. The intervening trees have either been cut out, or have failed to regenerate owing to fire. Presumably *S. cordatum* is long-lived and fire-tolerant. Dowsett-Lemaire (2008) mentions this type at medium altitude (1200–1500 m), but with some at higher altitude (1800–1900 m) on forest margins.

c) Scrub

Typically this vegetation type comprises bracken (*Pteridium aquilinum*), small shrubs such as *Kotschya recurvifolia* and *Tetradenia* (*Iboza*) *riparia*, and woody herbs such as *Dissotis* sp., climbing *Desmodium*, purple-flowered *Tephrosia aequilata* and various Lamiaceae, Acanthaceae, Asteraceae and *Cyperus* species. The stands of bracken, which can be quite extensive, are from 0.5–1.5 m high (Figure 15), while clumps of shrubs can exceed 2.5 m in height and cover a hectare or more.

This vegetation type appears to be secondary, derived by fire or disturbance from grassland and the drier margins of forest. Burning is fierce and regular. Scrub is found above 1750–1800 m up to 2000 m at the margins of montane forest in more fertile or better-drained sites within grassland, especially close to rocky outcrops, ridges or on footslopes, and also below the plateau. The total extent has not been determined, but it is unlikely to exceed 200–300 ha.

Figure 15. Bracken scrub under patch of montane forest destroyed by fire, Nachona plateau (JT).

With increased fire frequency and scattered clearance for potato cultivation, this vegetation type is likely to increase in extent. It does not have any particular conservation significance, and has few nectar-producing flowers for birds (Dowsett-Lemaire 2008).

d) Grassland

There are three main grassland areas on the plateau, with an overall extent of around 300 ha between 1850 and 2000 m. The main area, of around 170 ha, is the Muretha (or Moretxa) plateau (1850–1900 m) above the Maleme valley (Figures 16, 17), and is where the main campsite was situated. The other large area, the Nachona plataeu flanking the western slopes of Mts Pilani and Pesse, covers around 95 ha from 1900–2000 m and is moderately heavily grazed. The third area, around 32 ha at 1850–1900 m, lies at the head of the Licungo valley and to the east, overlooking the upper Niúiri valley to the north-east.

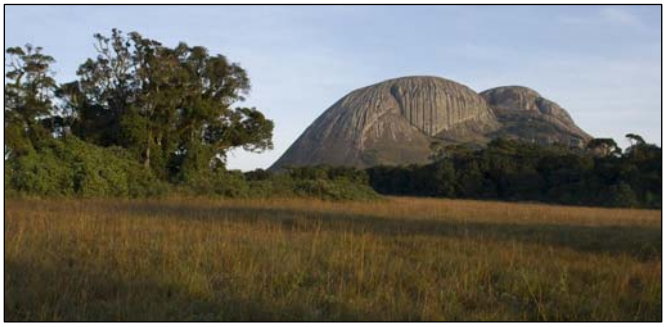


Figure 16. Mt Pesse across Muretha plateau grassland (JT).

Figure 17. Grassland, Muretha plateau (JT).

Much of the grassland on the Namuli massif, particularly that on the Muretha plateau, is found on deep peat deposits, presumably built up through waterlogging and acidic conditions, whilst other areas are on deep moist soils. It is probable that marked seasonal waterlogging is the factor that inhibits invasion by forest or scrub vegetation, and causes grassland to develop. In places on the Muretha plateau the peat is very deep and the area is very boggy with numerous water-filled holes, especially in lower-lying areas. The grasses are tussocky, primarily *Loudetia simplex* at 50–100 cm high, with *Themeda triandra* and *Eragrostis* species being more common on better-drained sites. Closer to rock outcrops shorter grasses to 20 cm are found, and the vegetation changes gradually to one more typical of rocky areas. Across the plateau, herbs, both short and tall, are common, with many having root storage organs such as rhizomes. Among the most characteristic are *Euphorbia depauperata*, *Helichrysum* spp., *Crotalaria* sp. and various ground orchids. The density of the latter is estimated to average 1 plant/m^2. Locally a leafy *Kniphofia* is found, the leaves of which are used to make baskets. A few small *Protea* trees (*P. petiolaris*, *P. welwitschii*) were found in one area in the north. Scattered tree ferns (*Cyathea dregei*) are found on gully edges.

Figure 18. Mts Pesse and Pilane with montane forest patch and Muretha plateau grassland (JT).

Near forest margins, or where soils are better drained, areas of *Pteridium aquilinum* with tall woody herbs (*Dissotis* sp., *Tephrosia aequilata*) and low shrubs such as *Kotschya recurvifolia* and *Tetradenia riparia* are common, described above under scrub vegetation. This assemblage could be a response to frequent burning (many of the species are fire-tolerant) or a result of better drainage status and higher soil fertility.

Figure 19. Grassland, Nachona plateau (JT)

Across many of the grassland areas, small patches of moist forest can be found, ranging in size from 30 m^2 to a few hectares. These are described above in the section on forests. These patches provide refuge to birds and number of vertebrates and invertebrates.

The northern and western grasslands are extensively grazed by cattle (Figure 37), brought up from the farms in the Namparro valley below. These stay there much of the time, and are generally not herded or handled. The grasses are significantly less tussocky than on the Muretha plateau, with a lower grass height, less waterlogging, and possibly less frequent fires. The grass *Setaria sphacelata* is common in enriched areas. Feral pigs are found across the grasslands. Goats, although not particularly common, seem to congregate close to some rocky outcrops, where they enrich the soil with their droppings. The avifauna is not considered to be of great interest. A common mammal is the burrowing African Marsh Rat.

Upland peat grasslands are a scarce vegetation type, nationally and across the region, more so than montane forest. Such areas also have a high plant diversity and possibly a high invertebrate diversity too, and support some of the known endemic species. They are of great conservation significance, with Namuli representing one of the largest extents of natural upland grassland in Mozambique, along with Mt Gorongosa and the Chimanimani Mountains.

e) Rocky slopes

Possibly the most extensive vegetation types on the massif, although of a similar order of magnitude to forest, is that found on rocky slopes and outcrops. These types cover vegetation adapted to severe drought and high diurnal temperature changes on rock faces, and also vegetation found in perennial seepages on shallow slopes adjacent to grassland. The largest expanses are found on and around the Mts Pesse–Pilane complex and on Mt Namuli.

On rock faces and steeper slopes the plant cover is typically patchy (excepting lichens), with about 20–60% plant cover confined to small thin mats in suitable places, including various mosses (Figure 20). The main species is the sedge *Coleochloa setifera*, forming strong clumps 20–50 cm high. These tufts have a strong attachment to the rock and can readily support the

weight of humans, but where other species are the main constituents the mats are very thin with poor adhesion to the rock. The vegetation generally is only 20 cm high, but locally can reach 50 cm. Common species include *Crassula globularioides*, lithophytic orchids and some short wiry grasses. On some exposed slopes the stem aloe *Aloe mawii* and *Xerophyta kirkii* up to 1.5 m high are locally found (Figure 21).

Figure 20. Rocky slopes with *Coleochloa* and *Merwillea* (flowering) (JT).

Figure 21. Rocky slopes with *Xerophyta* (JT).

In wetter sites or where there is lateral moisture seepage, the bulbous herb *Merwillea lazulina* with its beautiful show of pale mauve spring flowers to 20 cm high is abundant (density up to 10 bulbs/m^2), along with *Hypoxis nyasica* and a number of ground orchids. However, the wettest sites on permanent or semi-permanent seepages have an almost continuous vegetation cover consisting of thin mats held together by fibrous roots which are readily destroyed by pigs or natural erosion (Figure 22). These areas appear to be fairly acidic and peat-like, and support finer-leaved grasses and sedges with annual or short-lived herbs such as *Xyris* and *Drosera*. Less acidic and more base-rich areas contain 'softer' grasses such as *Panicum inaequilatum*.

Figure 22. Namuli peak from side, showing extensive rocky slopes (JT).

Figure 23. Seepages and grassland, Muretha plateau (JT).

Such vegetation is very variable both in density and in composition, depending on slope, moisture availability and, partly, on aspect or degree of shelter or exposure. Although vegetation cover is low, fires are frequent and many areas get burnt every one or two years. Hence most of the species found are probably fire-tolerant, with any less tolerant species

confined to protected sites in gullies.

In favourable sites with somewhat deeper soils, especially close to grassland, the vegetation is scrub-like (see Scrub above) and various woody plants are found, including *Kotschya recurvifolia*, *Tephrosia* sp. and patches of bracken (*Pteridium aquilinum*), with *Tetradenia riparia* in the most favoured spots. While where goats congregate on ledges there is a lusher, more palatable plant cover with *Setaria sphacelata* (primarily on the western side), *Panicum* sp. and various Asteraceae (Compositae) herbs.

f) Cultivated areas

This broad category consists of vegetation that is secondary or planted, and which is mostly found below 1200 m on the western side and 1400 m on the eastern side. In the Licungo valley, tea has been planted extensively in most suitable areas up to about 1200 m. Interspersed and on the margins of the plantations the workers have small fields, mostly with cassava. Narrow fringes of riparian woodland or forest remain along the larger watercourses. In the Malema valley in the east, cultivation of cassava, maize and sweet potato is more widespread, and there are no tea plantations. Locally some *Eucalyptus alba* trees have been planted along roadsides. There are fairly extensive areas of fallow, of various ages, up to about 1400 m, and owing to tall grass growth (mostly *Hyparrhenia* species) fires are both fierce and frequent (Figure 24). Very little of what would probably have been the original vegetation is left, although it is suspected this would have been dry to moist woodland, depending on position and soil depth.

No detailed survey was made of these cultivated and disturbed areas,. The biodiversity conservation value is considered to be low, except for the riparian woodlands, and given the growing human population, any conservation management would not be easy to institute.

Figure 24. Mt Namuli from Malema valley, showing clearance and cultivation on slopes (JT).

4.3 Vegetation Mapping

Vegetation mapping, in particular the determination of the extent of moist forest and upland grassland, was carried out using two separate techniques, and supported by ground-based vegetation recording. The two methods were (a) manual interpretation of historical air photos, and (b) the supervised classification of Landsat ETM+ imagery.

Forest is here defined as a continuous stand of trees with interlocking crowns, mostly over 10 m in height. This differs from the FAO definition, which covers most stands of woody plants including what we here term woodland.

In order to characterise the vegetation types, 67 vegetation samples were recorded at what were regarded visually as characteristic or good examples of the major types. At each recorded point a GPS reading was made, the structure recorded, the main environmental attributes (e.g. soil type, slope, fire or disturbance), and the major species present along with an indication of their cover-abundance. From the vegetation samples and notes, 181 GPS points with clear vegetation categorization were used for classification of the digitally-analysed Landsat imagery.

a) *Manual Interpretation*

The only available air photos are from October 1969 at a scale of around 1:43,000, although subsequent analysis and measurements from the 1:50,000 map sheets suggest that at the altitude of the Namuli plateau (1800 m) the scale is actually around 1:35,500.

Air photos of Mt Namuli, 1:43,000 scale, 1969 – row 3014/ 001–005
row 3014/ 081–087
row 3014/ 091–096

Manual interpretation of forest extent was carried out from the air photos using field knowledge. Unfortunately, the overlap between adjacent rows of photos is not large (about 15%) leading to area distortion in places, hence areas could be overestimated. Area determinations were done using a 1:50,000 scale dot planimeter and applying a correction factor of × 0.5041 as the actual photo-scale was close to 1:35,500.

The total forested area is approximately 1250 ha (Table 4), the majority being montane forest at an altitude of 1700 m or higher, including the extensive Manho forest where much of the survey work was focussed. The only other figure available, from Ryan et al. (1999), also based on the same air photos, gave a total forested area of around 1300 ha. Of particular interest for conservation is what is here called medium-altitude forest, that is forest at 1600 m altitude or below. Very little of this was noted on the photos when used in conjunction with the topographic map – a patch of 8 ha on the eastern ramparts, a more extensive area of 77 ha along the base of the southwest-trending valley below Mt Pesse, part of a continuum to higher altitude forest on the slopes above, and around 50 ha in the west-facing gorges above the Licungo valley.

The area of Ukalini forest, nestled below the main Namuli peaks, was estimated at around 80 ha from the 1969 airphotos (including the 'wings' extending up gullies to the north and to the NE along the base of the peaks), all from 1500–1850 m altitude. Interestingly, the Ukusini forest, where Vincent camped in 1933 and which he implies was then moderately extensive, is only visible as a very narrow riparian fringe in the 1969 photos.

The extent of upland grassland on peat (as opposed to short grassland or sedges on shallow rock) is difficult to determine from the airphotos, but is estimated at about 300 ha scattered across three blocks (Table 4), the largest being on the Muretha plateau (170 ha). There were no apparent changes between 1969 and 2007.

Much of the Malema valley was not wooded or forested in 1969, but covered in what was probably bracken or secondary bush. A significant proportion is now cultivated. However, there is little evidence for significant clearance of forest cover from 1969 to 2007, just small patches having disappeared or margins pushed back slightly, such as at the "mouth" of the Ukalini forest.

Table 4. Extent of vegetation types from airphoto interpretation.

	extent (ha)
Montane forest >1600m	1115
Forest <1600m	135
Total forest area	1250
Grassland	300

b) *Landsat Analysis*

A vegetation map of Mt Namuli was developed using a Landsat ETM+ image from July 2005 (path/row 166-071, 30 m resolution), registered to UTM Zone 37S (WGS84) with radiometric and geometric corrections performed (Figure 25). No further radiometric normalisation was done and an analysis was made using digital number rather than converted radiance values. The image was displayed using different band combinations enabling it to be analysed visually and to determine spectral characteristics of the different vegetation types.

The normalised difference vegetation index (NDVI) was computed to separate areas of dense green vegetation and shading due to topographic effects in the image. An unsupervised classification was also done to determine which vegetation types could or could not be spectrally separated.

Results from this first pre-classification analysis, along with a set of 181 ground control points and expert knowledge of the area, were used to extract a training data set representative of the vegetation types of interest. A supervised classification procedure was then applied to the image using a maximum likelihood algorithm built in ERDAS Imagine software. Six bands of the Landsat TM image were used, excluding the thermal band from the original set. A majority 3 x 3 statistical filter was applied to the classified image to smooth the results and remove noise.

The supervised classification aimed to discriminate four major vegetation types: montane forest, bare rock and grassland, plantation, and open woodland/secondary vegetation. The extent of these four vegetation types is shown in Table 5 and Figure 26.

A contingency matrix using spectral signatures was developed to assess classification accuracy based on spectral characteristics alone. The main forest vegetation type (Montane forest) proved to have high spectral separability, with over 90% of correctly classified forest pixels, giving good thematic accuracy to the map. The minimum values were for open woodland. It proved too difficult to separate out grassland from vegetation on shallow soils and low bushland up on the plateau.

The discrepancy in results of forest extent between the two methods might be thought to be due to forest loss, but careful comparison in the field of the air photos with forest margins seen in 2007 showed few significant differences. It is far more likely due to either a differing definition of forest used in airphoto analysis compared to the algorithm used in the digital analysis, or to an over-estimation of forest due to inclusion of forest gaps and indented margins in "forest" when using a dot planimeter. However, the difference is large, and shows that caution must be exercised in determining change detection using different methods.

Table 5. Extent of main vegetation types in Namuli area as determined from 2005 Landsat imagery.

	extent (ha)
Montane forest	964
Bare soil/grassland	5,062
Plantation/cultivation	674
Open woodland/secondary	11,906

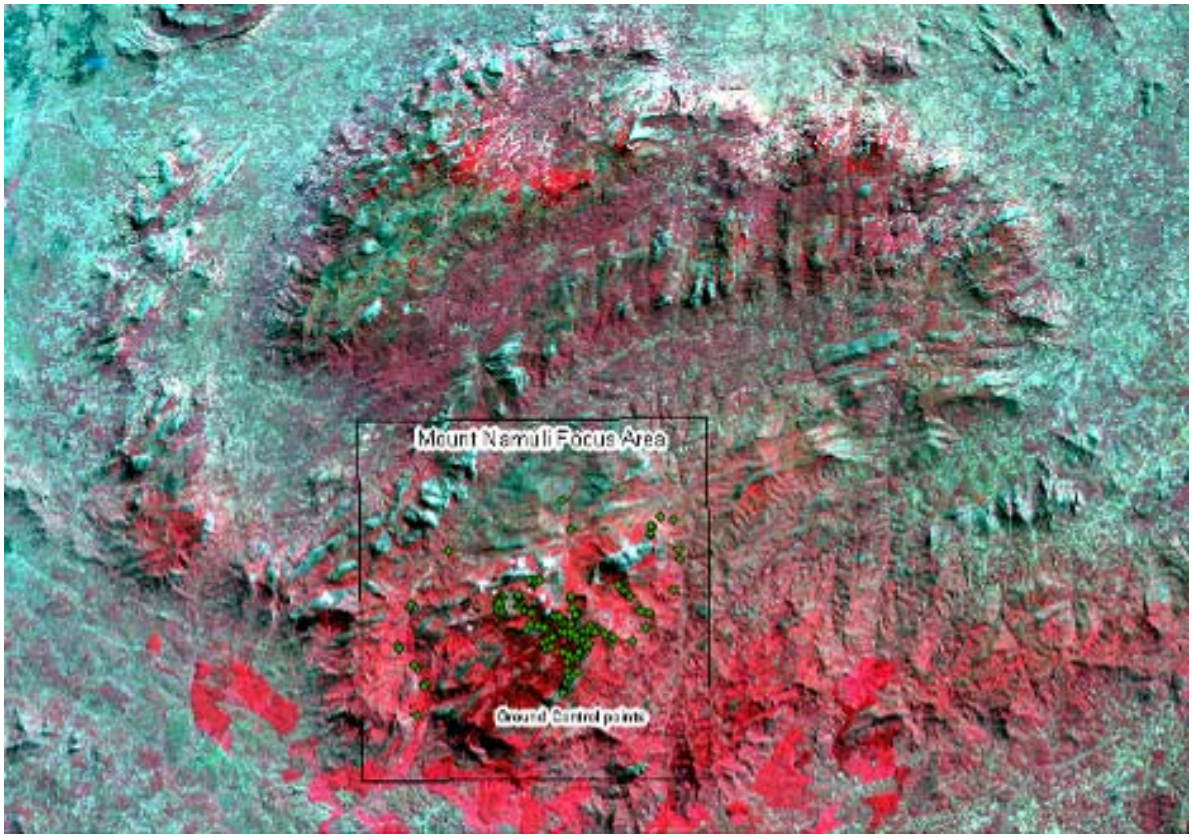


Figure 25. Corrected Landsat image showing broad project area. Green dots indicate vegetation recording localities.

c) *Change Detection*

Historical satellite data for Mt Namuli was acquired in order to explore possible changes in the extent of montane forest. A Landsat MSS image (60 m resolution) from September 1972 was visually compared with the July 2005 Landsat TM image used to create the vegetation map (Figure 27). Cloud cover in the earlier image limits interpretation on the north-western area, but the eastern and southern boundaries are seen to be similar over the 33 year period with no significant differences observed.

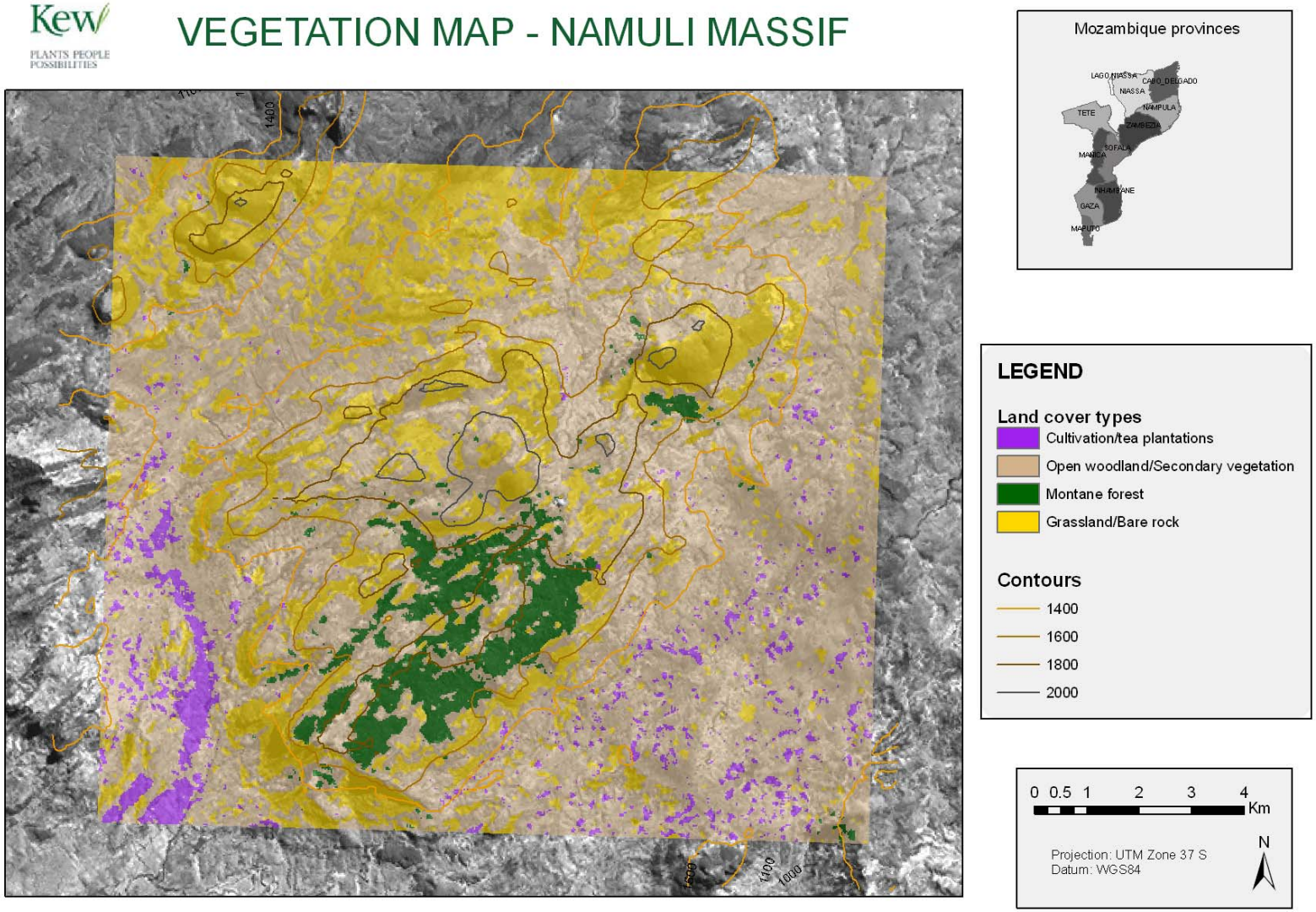
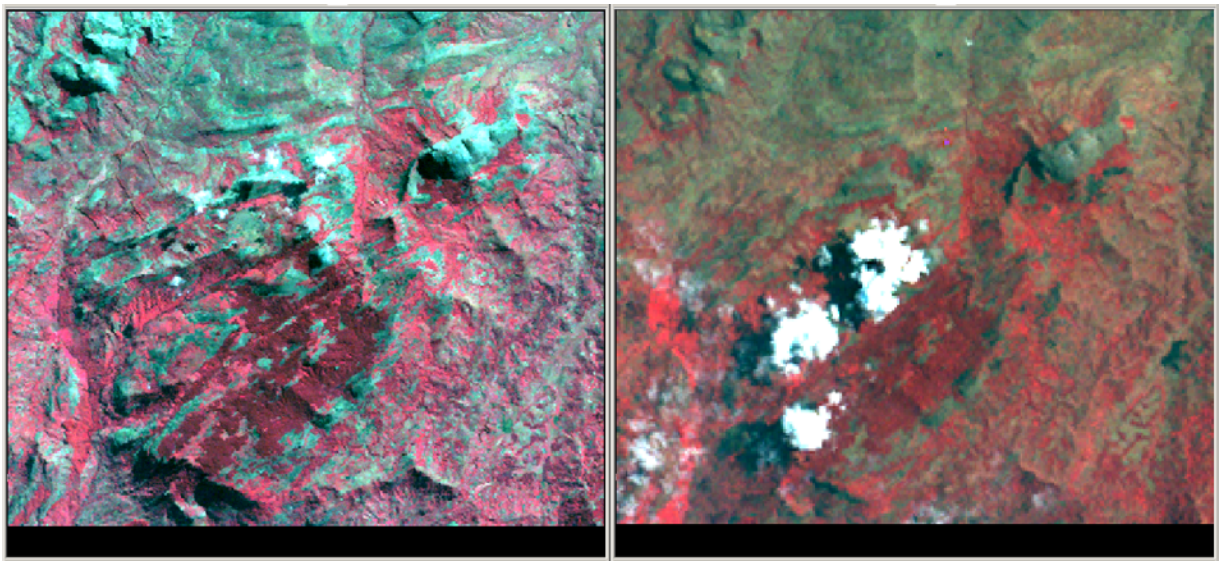


Figure 26. Vegetation map of Namuli area from Landsat TM interpretation.



Landsat TM image - July 2005 *Landsat MSS image - 1972*

Figure 27. Landsat imagery of Namuli massif over 33 years, showing forest extent.

5. PLANTS

5.1 Introduction

During the two Darwin expeditions fertile plant specimens were collected from forest, grassland, shrubland, wetland and rocky habitats across much of the northern part of the Namuli massif. There was no particular collecting strategy, other than to gather as comprehensive a collection as possible of fertile identifiable material from the full range of accessible habitats. In addition, numerous sterile specimens were also collected for vegetation classification purposes, particularly from the forest. An indication of the collecting localities is given in Figure 29 showing GPS waypoints from both trips. The Muretha plateau and Manho forest were particularly well-covered, but areas below 1700 m were little-collected.

The total of numbered collections with notes was 725, most with three duplicates. Complete sets are deposited in the National Herbarium in Maputo (LMA) and at Kew, while a third and fourth (incomplete) set are deposited in herbaria at the Universidade Eduardo Mondlane (LMU) and Zomba (MAL).

Figure 28. *Pavetta* sp., a possible new species of shrub from Namuli (TH).

A list of species recorded on the Namuli massif above 1300 m during the two project expeditions is given in Annex 2, with an altitudinal lower limit of 1000 m on the western side of the massif. This includes own sight records from the vegetation survey. The total number of taxa recorded is 420, of which 147 are trees or shrubs. This total comprises 24 Pteridophytes (ferns and fern-allies), 1 Gymnosperm, 82 monocotyledons and 313 dicotyledons. There are an additional 52 species of Pteridophyte, 15 monocotyledons and 47 dicotyledons listed in Flora Zambesiaca as being from the Serra de Gurué or Namuli areas (Annex 3), bringing the possible total species list to over 530. However, these additional species are not included in Annex 2 (apart from the known endemics) as it was not always clear where each were found or at what altitude.

5.2 New and Endemic Species

Five collections made on these trips are believed to represent taxa new to science (*Isoglossa* sp. nov. (Acanthaceae), *Crotalaria* sp. nov. near *C. argyrobioides*, *Indigofera* sp. nov. near *I. longipedicellata* (both Fabaceae: Papilionoideae) and the parasite *Englerina* sp. nov. near *E. longiflora* (Loranthaceae). A collection of a *Pavetta* (from a different part of the genus to *Pavetta gurueensis*) is also being studied to determine whether it represents a new species (Figure 28). However, taxonomic studies have not yet been carried out to determine exact taxonomic status and formal description is awaited.

Three of the new species (*Isoglossa*, *Crotalaria*, *Indigofera*) come from genera well known for montane endemics. *Isoglossa* species tend to be found in forest and undergo periodic but infrequent mass flowering, where the whole population flowers together. Such a trait reduces the chances of making a fertile collection and may be why this species had not been located before. It is proabable that these three new species are endemic to Namuli, and perhaps immediately-adjacent mountains.

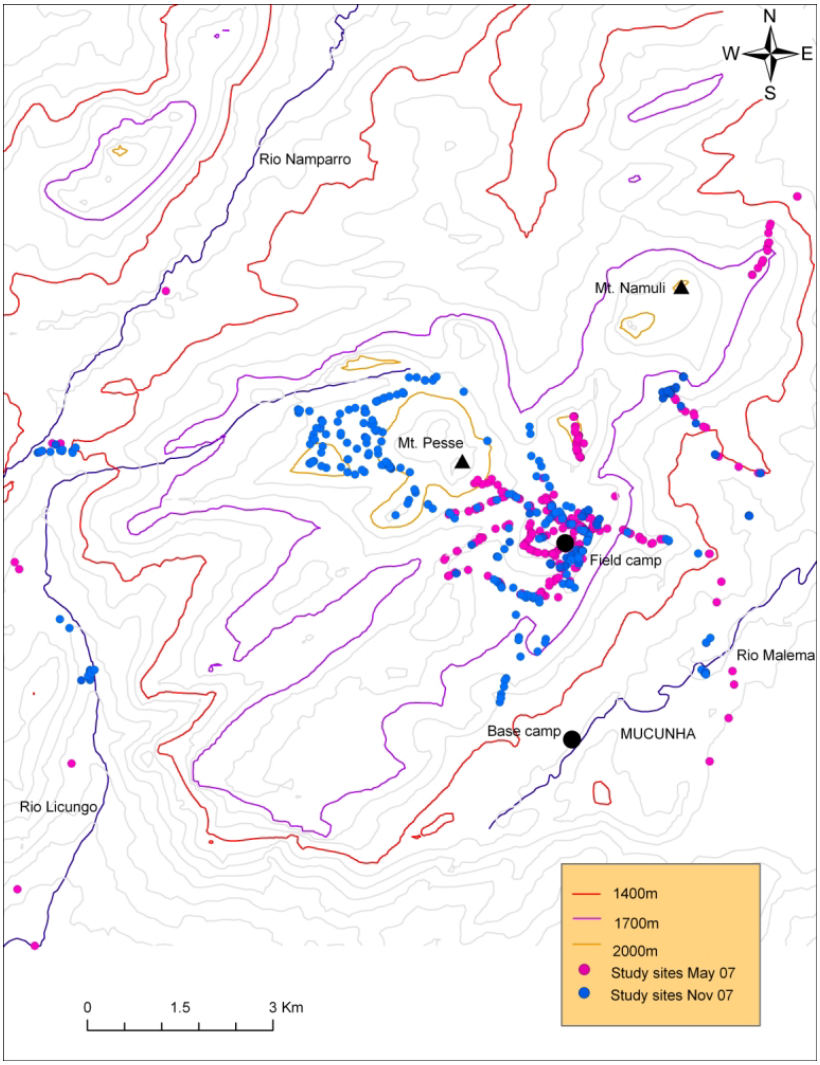


Figure 29. Namuli massif showing 2007 collecting localities.

Including the putative new species, there are now 16 taxa thought to be endemic to Mt Namuli and the immediately surrounding area (Table 6). Two of the endemics are succulents (*Aloe torrei* and *Euphorbia namuliensis*, although the latter has only been found at lower altitudes), three are woody plants (both *Pavetta* spp. and *Dombeya lastii*), whilst six are Papilionoid legumes. Only four of the previously recorded endemics were found on these expeditions, which may be due to the restricted altitude range we collected in. *Crotalaria torrei* and *Rhynchosia torrei* were locally abundant on the plateau. Specimen of the grass *Alloeochaete namuliensis* were found on rocky ridges on the plateau; this species was previously only known from a single type collection. *Plectranthus guruensis* was collected from a narrow patch of riverine forest on the Rio Licungo west of the plateau. *Aloe torrei*, *Crotalaria torrei*, *Rhynchosia torrei* and *Alloeochaete namuliensis* had previously been collected from the rocky grassland plateau and some lower slopes, *Rhynchosia cliviorum* subsp. *gurueensis* was collected from the margins of high-altitude streams, *Dombeya lastii* from woodland at lower altitudes, *Plectranthus guruensis* from the Malema valley, and

Euphorbia namuliensis had been collected amongst low-altitude granite outcrops. A field identification guide for these and other range-restricted species from Namuli has been made (Harris 2008).

Table 6. Endemic plant species from the Mt Namuli and Gurué area.

Family	Species	date coll.	Notes
Acanthaceae	Isoglossa sp. nov.	2007	to be described
Acanthaceae	Sclerochiton hirsutus *Vollesen*	1979	
Aloaceae	Aloe torrei *I.Verd. & Christian*	1962	
Euphorbiaceae	Euphorbia namuliensis *Bruyns*	2004	
Fabaceae: Papilionoideae	Crotalaria torrei *Polhill*	1943, 2007	
Fabaceae: Papilionoideae	Crotalaria sp. nov. near C. argyrobioides	2007	to be described
Fabaceae: Papilionoideae	Indigofera sp. nov. near I. longipedicellata, but ovary hairy	2007	to be described
Fabaceae: Papilionoideae	Rhynchosia clivorum *S.Moore* subsp. gurueenis *Verdc.*	1944	
Fabaceae: Papilionoideae	Rhynchosia torrei *Verdc.*	1941, 2007	also coll.1968
Fabaceae: Papilionoideae	Tephrosia whyteana *Baker f.* subsp. gemina *Brummitt*	1944	
Lamiaceae	Plectranthus guruensis *Paton*	1979, 2007	in press
Loranthaceae	Englerina sp. nov. near E. longiflora	2008	to be described
Poaceae	Alloeochaete namuliensis *Chippendall*	1943, 2007	
Rubiaceae	Pavetta gurueënsis *Bridson*	1944	
Rubiaceae	Pavetta sp. nov?	2007	uncertain status
Sterculiaceae	Dombeya lastii *K.Schum.*	1883	

A preliminary listing shows over 30 type specimens from Namuli (Table 7), specimens from which a species was first described. Many (21) were collected by Joseph Last in 1886 (see Figure 30), with significant additions from the collections made by Torre between 1940 and 1966. A detailed listing, obtained by going through various databases, has not yet been done.

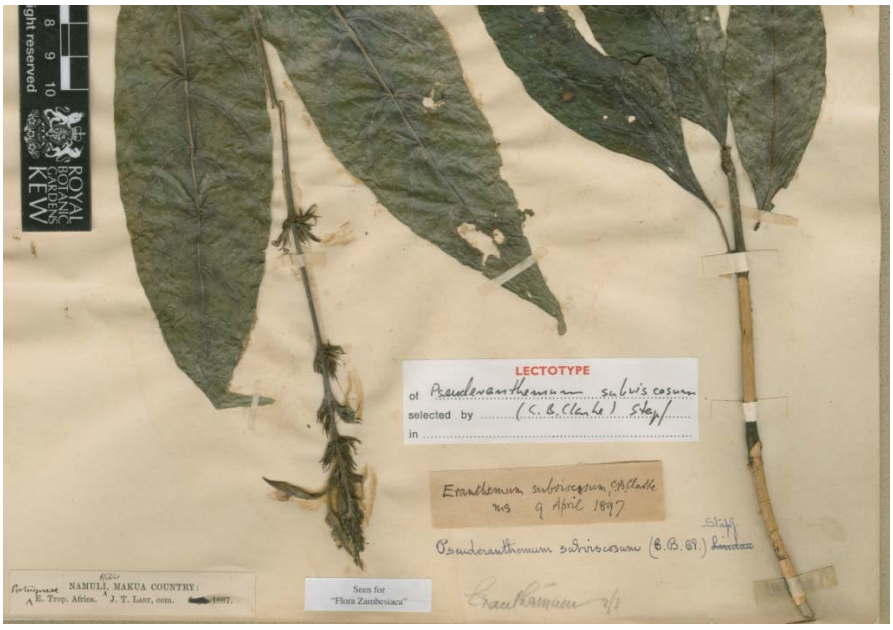


Figure 30. Original herbarium collection (Kew, partial image) of *Pseuderanthemun viscosum*, collected by Joseph Last from Mt Namuli in 1886.

5.3 New Species Records for Mozambique

When the species list in Annex 2 was compared with the Sabonet national checklist for Mozambique (Da Silva, Izidine & Amude 2004), which however reflects only collections at the National Herbarium (LMA) and University herbarium (LMU) in Maputo, it was found that 40% of them were not on the national list. After comparing Annex 2 with both the Sabonet checklist and with specimen citations from Flora Zambesicaca treatments (published or in press), 26 new records for Mozambique were noted (Table 8), many representing significant range extensions. Northern Mozambique is known to be poorly-known botanically and patchily collected, which is part of the justification for the present study.

Table 7. List (incomplete) of plant type specimens originally collected from Mt Namuli area.

Family	**Species**	**date coll.**	**notes**
Aspleniaceae (fern)	Asplenium brevisquamulosum *Hieron.*	Last 1886	?? good name
Cyatheaceae (fern)	Cyathea mossambicensis *Baker*	Last 1886	
Acanthaceae	Brillantaisia subulugurica *Burkill*	Last 1886	now synonym of *B. cicatricosa* Lindau
Acanthaceae	Pseuderanthemum subviscosum *(C.B.Clarke) Stapf*	Last 1886	
Acanthaceae	Sclerochiton hirsutus *Vollesen*	de Koning 1979	
Aloaceae	Aloe torrei *I.Verd. & Christian*	Torre 1944, 1962	
Anthericaceae	Chlorophytum brevipes *Baker*	Last 1886	now synonym of *C. comosum* (Thunb.) Jacq.
Asclepiadaceae	Brachystelma nutans *Bruyns*	Bruyns 2004	
Asclepiadaceae	Ceropegia namuliensis *Bruyns*	Bruyns 2004	
Asteraceae	Helichrysum brassii *Brenan* var. aggregatum *Brenan*	Last 1886	
Asteraceae	Helichrysum lastii *Engl.*	Last 1886	not clear what this is now
Asteraceae	Sphacophyllum lastii *O.Hoffm.*	Last 1886	now synonym of *Anisopappus chinensis* (L.) Hook.& Arn. var. *dentatus* (DC.) Ortiz, Paiva & Rodr.Oubina
Asteraceae	Vernonia pterocarpa *Oliv.& Hiern*	Last 1886	Last specimen on same sheet as type
Crassulaceae	Kalanchoe laurensii *Raym.-Hamet*	Last 1886	now synonym of *K. elizae* Berger
Euphorbiaceae	Euphorbia namuliensis *Bruyns*	Bruyns 2004	
Fab: Papilionoideae	Crotalaria torrei *Polhill*	Torre 1943, 1968	
Fab: Papilionoideae	Lotus namulensis *Brand*	Last 1886	
Fab: Papilionoideae	Rhynchosia clivorum *S.Moore* subsp. gurueenis *Verdc.*	Mendonça 1944	
Fab: Papilionoideae	Rhynchosia torrei *Verdc.*	Torre 1941	
Fab: Papilionoideae	Tephrosia whyteana *Baker f.* subsp. gemina *Brummitt*	1944	
Gentianaceae	Swertia lastii *Engl.*	Last 1886	now synonym of *S. abyssinica* Hochst.
Iridaceae	Aristea paniculata *Pax* / A. lastii *Baker*	Last 1886	now synonym of *A. ecklonii* Baker
Lamiaceae	Plectranthus guruensis *A.J.Paton*	de Koning 1979, 2007	Paton, in press
Ochnaceae	Pleuroridgea lastii *Tiegh.*	Last 1886	now synonym of *Brackenridgea zanguebarica* Oliv.
Orchidaceae	Mystacidium pedunculatum *Rolfe*	Last 1886	Last specimen one of 3 syntypes. Now synonym of *Angraecopsis parviflora* (Thouars) Schltr.
Orchidaceae	Angraecopsis parviflora *(Thouars) Schltr.*		
Poaceae	Alloeochaete namuliensis *Chippendall*	Torre 1943	
Rubiaceae	Oldenlandia oliveriana *K.Schum.*	Last 1886	now synonym of *O. rupicola (Sond.) O.Kuntze* var. *rupicola*
Rubiaceae	Pavetta gurueënsis *Bridson*	Mendonça 1944	
Rubiaceae	Tricalysia lastii *K.Schum.*	Last 1886	now synonym of *T. coriacea* (Benth.) Hiern subsp. *nyassae* (Hiern) Bridson
Scrophulariaceae	Buchnera lastii *Engl.*	Last 1886	
Scrophulariaceae	Buchnera namuliensis *Skan*	Last 1886	
Sterculiaceae	Dombeya lastii *K.Schum.*	Last 1886	
Xyridaceae	Xyris makuensis *N.E.Br.*	Last 1886	

Xyris peteri and *Helixanthera* cf. *verruculosa* (if confirmed) are new records for the Flora Zambeziaca area, while the collection of *Erica simii* may represent the northernmost extent of that species' range. This is unusual as for most species collected on Namuli, if their ranges extend further south they usually also extend into East or West Africa.

It is interesting to note that five species previously believed to be endemic to Mt Mulanje were collected on Namuli during the two expeditions (Table 8), indicating both the linkages between these montane areas and the extent of under-collection on mountains in Mozambique compared to Malawi. However, their floras are by no means identical as 91 plant species collected on Namuli have not been collected from Mulanje (Strugnell 2006). Five out of the six *Erica* species found on Namuli are not recorded for Mulanje; there are twice as many *Crotalaria* species recorded for Namuli as for Mulanje, and eight out of the ten *Crotalaria* species found on Namuli are not known from Mulanje. Two species of *Rinorea* are found on Namuli compared to only one on Mulanje, possibly indicating an influence of lower altitude forest with the marginally greater proximity to the coast. Both Mt Mulanje and Mt Namuli have substantial numbers of mountain-endemic species.

Table 8. Taxa collected under this project representing new records for Mozambique according to Flora Zambesiaca or recent literature. Taxa previously thought to be endemic to Mt Mulanje in Malawi are also shown.

Family	Species	previously Mt Mulanje endemic
Acanthaceae	Asystasia malawiana *Brummitt & Chisumpa*	
Acanthaceae	Brachystephanus africanus *S. Moore*	
Apiaceae	Pimpinella mulanjensis *C.C.Towns*	√
Asphodelaceae	Kniphofia splendida *E.A.Bruce*	
Asteraceae	Bothriocline cf. glomerata *(O.Hoffm.& Muschl.) C.Jeffrey*	
Asteraceae	Senecio peltophorus *Brenan*	√
Ericaceae	Erica silvatica *(Engl.) Beentje*	
Euphorbiaceae	Drypetes gerrardii *Hutch.* var. grandifolia *Radcl. Sm.*	
Fab: Papilionoideae	Argyrolobium rupestre *(E.Mey.) Walp*. subsp. aberdaricum *(Harms) Polhill*	
Fab: Papilionoideae	Kotschya recurvifolia *(Taub.) F.White* subsp. recurvifolia	
Lamiaceae	Micromeria imbricata *(Forssk.) C.Chr.* var. imbricata	
Lamiaceae	Plectranthus mandalensis *Baker*	√
Lamiaceae	Stachys didymantha *Brenan*	√
Loranthaceae	Englerina kwaiensis *(Engl.) Polhill & Wiens* – new record for FZ area	
Loranthaceae	Erianthemum schelei *Tiegh.*	
Loranthaceae	Helixanthera cf. verruculosa *Wiens & Polhill*	
Orchidaceae	Epipactis africana *Rendle*	
Orchidaceae	Jumellea usambarensis *J.J.Wood*	
Orchidaceae	Polystachia transvaalensis *Schltr.*	
Orchidaceae	Roeperocharis bennettiana *Rchb. f.*	
Poaceae	Panicum wiehei *Renvoize*	
Proteaceae	Faurea wentzeliana *Engl.*	
Urticaceae	Laportea alatipes *Hook.f.*	
Urticaceae	Pilea rivularis *Wedd.*	
Velloziaceae	Xerophyta splendens *(Rendle) N.Menezes*	√
Xyridaceae	Xyris peteri *Pollens.* – new record for FZ area	

Over the years it has often been speculated that the Mulanje cedar, *Widdringtonia whytei*, belived to be endemic to Mt Mulanje in Malawi, may also be found on some mountains in adjacent parts of Mozambique. Mts Chiperone and Namuli have sometimes been mentioned in this regard. However, no sign of either *Widdringtonia* species was found on these massifs.

5.4 Red Data Status

Preliminary global conservation assessments were carried out in 2005/6 by the Kew Millennium Seed Bank enhancement team of species believed to be under threat on Mt Mulanje in Malawi. This was done using IUCN Red Data guidelines, GIS and specimen data available at Kew. Thirteen of these species that also occur on Namuli are shown in Table 9, although four were not recorded from Mozambique prior to the Darwin expeditions. These range extensions may affect the species' global status once reassessed.

In 2008, after the Darwin expeditions, six species were preliminarily evaluated at Kew for global conservation status by MSc Conservation students from Imperial College, London using the same methods, bringing the total number of species evaluated to 20. These assessments show *Alloeochaete namuliensis*, *Crotalaria torrei* and *Plectranthus guruensis* all as Critically Endangered under criteria B1 or B2, while *Aloe torrei*, *Senecio peltophorus* and *Exacum zombense* were considered Endangered, again under criterion B1. *Plectranthus gurueënsis* is particularly restricted, being known from only two sites, one of which has been converted to agriculture and the other is a narrow strip of riverine forest with farming activities on three sides. *Crotalaria torrei*, while restricted to the grassland plateau, is relatively abundant within this habitat.

Table 9. Global conservation assessments for taxa from Mt Namuli.

		MSB 2005[1]	Kew 2008[2]
Aloaceae	Aloe torrei		Endangered B1a
Anacardiaceae	Rhus acuminatissima	Near threatened	
Apiaceae	Peucedenum nyassicum	Near threatened	
Apiaceae	Pimpinella mulanjensis	[3] Critically Endangered	
Asteraceae	Senecio peltophorus		Endangered B1a
Campanulaceae	Lobelia blantyrensis	Endangered	
Crassulaceae	Crassula globularioides	[3] Near threatened	
Fab: Papilionoideae	Crotalaria torrei		Critically Endangered B1a
Fab: Papilionoideae	Indigofera lyallii subsp. nyassica	Near threatened	
Gentianaceae	Exacum zombense		Endangered B1a
Iridaceae	Dierama formosum	Near threatened	
Lamiaceae	Plectranthus guruensis		Critically Endangered B1a
Lamiaceae	Plectranthus mandalensis	[3] Endangered	
Molluginaceae	Corrigiola drymarioides	Near threatened	
Poaceae	Alloeochaete namuliensis		Critically Endangered B2a
Proteaceae	Faurea racemosa	Endangered	
Rubiaceae	Coffea mufindensis subsp. australis	Vulnerable	
Sapotaceae	Synsepalum muelleri	Critically Endangered	
Thymelaeaceae	Gnidia chapmanii	Endangered	
Velloziaceae	Xerophyta splendens	[3] Endangered	

1. Global conservation assessment carried out on threatened species from Mt Mulanje by Millennium Seed Bank enhancement team (Kew) 2005, prior to recent Namuli records.
2. Global conservation assessment done by MSc students at Kew, 2008.
3. Taxa since found in Mozambique, representing significant range extension.

Only one of the species listed (*Erica pleiotricha*, VU D2) appears on the Mozambique Red Data List (Izidine & Bandeira 2002); the conservation assessment is national.

Pigs kept on the mountain tend to uproot plants in the seepage areas, which could be a minor threat to taxa restricted to seepage habitats such as *Exacum zombense*, only known from N Mozambique and S Malawi.

5.5 Use of Plant Species on Namuli

There was limited evidence of harvesting of plant materials on the mountain. *Kniphofia splendida* in the grassland was harvested to make matting and baskets, there was evidence of selective felling of *Faurea wentzeliana* for timber, and *Nuxia congesta* is used for hut construction. The bark of *Protea welwitschii* is collected as a medicinal treatment of hernias, although there was no evidence of this affecting its population, while a bark infusion from *Bersama abyssinica* was also used medicinally. Species of *Hypoxis* were said to be collected as medicine. The fruits of both *Syzygium guineense* and *Syzygium cordatum* are eaten.

6. BIRDS

6.1 Historical Background

Mt Namuli and Mt Mulanje are at the southern end of the Tanzania–Malawi montane subgroup, with several bird species reaching their southern limits here. Most of what we know of the avifauna of Namuli dates from 1932, when Jack Vincent spent three weeks collecting birds for the British Museum (Vincent 1933a, 1933–36). The area was not revisited until 1998, when Ryan *et al*. (1999a) spent a week there. Most of northern Mozambique remains very poorly known with many areas completely unexplored. By contrast, the avifauna of adjacent Malawi has been studied by many people over more than 100 years, and a detailed ecological account of its avifauna and its distribution has been published recently (Dowsett-Lemaire & Dowsett 2006).

Vincent camped on Namuli in the winter months from 21 July to 10 August 1932 when some intra-African migrants are totally absent. He used a single forest base camp at 1400 m (4600 feet) on the Nanchili stream, just below the Ukalini cliff and forest. From there he collected mainly at higher altitudes from 1370 m to nearly 2000 m on the Murukuni ridge (Figure 10). About 68 different bird species were recorded, of which 53 were represented by a collection of some 250 specimens; full details were published in *Ibis* in 1933–36.

He collected two bird species new to science – the enigmatic Dapple-throat *Modulatrix orostruthus* (initially placed in a bulbul genus *Phyllastrephus* and more recently either in *Modulatrix* or in its own genus *Arcanator*, probably a babbler), and the Namuli Apalis *Apalis lynesi* (Figure 31). The latter is endemic to Namuli but is a close relative of Bar-throated Apalis *A. thoracica*, a forest species of eastern and southern Africa with many geographical races. He also discovered populations of the endangered Cholo Alethe *Alethe choloensis* (a species endemic to SE Malawi and adjacent N Mozambique, Figure 32) and of the race *belcheri* of Green Barbet *Stactolaema olivacea*, shared with Thyolo Mountain in S Malawi, which is now almost totally deforested (Dowsett-Lemaire & Dowsett 2006).

Figures 31 & 32. Namuli Apalis (left) and Thyolo Alethe (right) (M. Melo, F. Dowsett-Lemaire).

Peter Ryan and five colleagues spent a week on the mountain from 27 November to 4 December 1998 (Ryan *et al.* 1999a), spending more time at lower altitudes on the Nanchili stream in "Ukusini" Forest (with camps at 1250 m near the bridge, and down to 1160 m) and just three days on the lower edge of Ukalini Forest (at "1550 m", more likely 1580 m). On one day they visited the Muretha Plateau and some of Manho Forest. They also spent a few hours

exploring a small patch of relict forest at 1300–1400 m on the drier slopes just above Gurué. Some 115 species were recorded from 1200 m and above, excluding birds of secondary habitat on the lower slopes or around Gurué town. Mist-netting was carried out in Ukalini and Ukusini; 64 birds of 16 species were caught, but apparently not ringed. Three participants carried out 72 point counts, from which exceptionally high estimates of densities of the commoner bird species were proposed.

Martim P. de Melo and two colleagues paid a short visit to Namuli in December 2001 (Melo *et al*. 2001). Walking all the way from Gurué, they spent two days in Ukalini Forest (2–4 December) and two days on Muretha (4–6 December). A limited amount of mist-netting was done, ringing 22 of the 37 birds caught. The number of bird species they identified at Ukalini and Muretha is about 46.

The Field Museum of Natural History, Chicago collected birds on Namuli in July–August 2003 from a base camp at 1707 m (apparently at the edge of Manho Forest) and another in the Malema Valley at Murabue (1111 m), outside our study area. A joint expedition with the American Museum of Natural History in November 2004 also collected bird specimens, but these have not yet been identified and details are not available.

The present Darwin project has had two expeditions to Namuli. During the first expedition, two weeks was spent on the mountain from 22 May–5 June 2007 by Ron Demey (for BirdLife International) and Carlos Bento (Natural History Museum Maputo, 1 week only). The main base camp was on the Muretha Plateau at 1860 m with another camp next to the Malema river bridge at 1250 m. Demey explored the Muretha Plateau and parts of Manho Forest (Demey 2007), with a few hours in Ukalini Forest and a few days around the Rio Malema (1250 m and below). Taking 1200 m as a lower altitudinal limit, he noted some 94 species. Bento concentrated on netting and measuring birds from a site at the edge of Manho Forest.

Both the 2001 visit by Melo and that by Ron Demey in 2007 were either too short or ill-timed to study bird densities. One of the main purposes of the second survey in November 2007 was to re-evaluate densities of a number of key species for which the conservation of Namuli is especially important, and search for other forest or grassland bird species that might have been overlooked in previous visits.

This second expedition comprised Françoise Dowsett-Lemaire (for BirdLife International), Tiwonge Mzumara (for MMCT) and Katrina Cook (Natural History Museum, Tring, UK). Although the same two base camps were used, more extensive visits were made through the Manho Forest area, and two days were spent in the Ukalini Forest. Dowsett-Lemaire and Mzumara noted bird observations and behaviour, while Cook had two nets set up near the main camp from which bird specimens were collected. A list of net captures and measurements is given in Annex 4. Of particular interest was the recapture in November 2007 of what was probably a male Yellow White-eye, caught and ringed as an adult in December 2001 (Melo *et al.* 2001). Wing and weight measurements were very similar to those from six years earlier, and give an indication of longevity.

6.2 Methods

In addition to opportunistic observations, particular attention was paid to the location of key species such as Cholo Alethe or Green Barbet. Many species were tape-recorded, and playback of pre-recorded tapes was used to provoke a few species into song (e.g. Eastern Green Tinkerbird, flufftails). With the help of tape playback, exact territory size was measured for Namuli Apalis and other species in several small patches on the Muretha

plateau. In the short time available it seemed more important to establish real densities of species than use indirect quantitative measures such as point-counts that could not be tested against verified densities. Nomenclature follows that of the recent Birds of Malawi (Dowsett-Lemaire & Dowsett 2006); scientific names are given in Annex 3.

6.3 Annotated Bird List

An annotated list is given of all bird species that have been recorded within the study area above 1200 m altitude (Annex 3). Combined with earlier surveys, starting with Vincent (1933–36), about 155 species have been recorded. Dowsett-Lemaire and Mzamara noted 130 species in November 2007; species not recorded then but mentioned in earlier surveys are shown in square brackets. Notes on species distribution and ecology from earlier surveys are also included, along with the threat status of species on the Red Data list (BirdLife International 2004). The chorological status of species restricted to a single biome is indicated, i.e. Afromontane, Eastern or Zambesian.

The Chicago Field Museum's web site (http://fm1.fieldmuseum.org/collections/search.cgi dest=birds) contains a list of all 120 bird specimens collected by them on Namuli in 2003, including 50 specimens of 17 species taken at 1707 m (apparently Manho Forest), and 70 specimens of 34 species taken at Murabue (Malema Valley). Although their collections add little to what is already known (the main three species collected were 7 *Cossypha anomala,* 6 *Andropadus milanjensis*, 6 *Modulatrix orostruthus*), there are two new records for the massif from lower down: Cape Grass Owl (a rare species of dambos and montane shrubland) and Grey-olive Bulbul. Four montane species were collected in riparian forest below their normal breeding altitude, which indicates altitudinal migration in the off-season (early August): 2 *Alethe choloensis*, 1 *Pogonocichla stellata*, 3 *Elminia albonotata*, 2 *Nectarinia mediocris*. As Murabue is outside our study area, these details are not included in the combined list given in the Annex.

Ryan *et al.* (1999a) include a table of species recorded on the mountain at three altitudinal levels, but some errors crept into this table (J. Graham, pers. comm.). These include White-throated Nicator, apparently recorded from riparian forest at 1250 m (in fact around 1160 m), and the mention of this bulbul as being common around 1250 m (Ryan *et al.* 1999b) was in error. On the southern slopes of Mt Mulanje, this species does not ascend above 800 m and in the whole of SE Malawi has not been recorded above 1100 m (in the Thyolo area, Dowsett-Lemaire 1989). Similarly, the Purple-crested Turaco was not recorded from Mt Namuli as indicated, but from the surroundings of Gurué (see under rejected species). The following annotated list does not include Red-billed Quelea (ticked for 1250 m in Ryan's table) as this is possibly an error, and if not would be no more than an abnormal vagrant.

6.4 Bird Breeding Records

Below are a series of bird breeding records from November 2007, back-dated as far as possible to the month of egg-laying.

Rock Kestrel — two fledglings fed mid-Nov suggests egg-laying Aug (or very early Sept).

Red-chested Cuckoo — female calling on 15 and 23 Nov (egg-laying Nov). A female collected by Cook was about to lay (Nov).

Scarce Swift — aerial mating 20 Nov.

African Black Swift — 4 pairs feeding nestlings 20 Nov, thus egg-laying Oct. Presence of many recently fledged young in flocks suggests much laying activity in Sept–Oct.

White-eared Barbet — feeding noisy nestlings on 26 Nov, suggests egg-laying Oct.
Olive Thrush — one collected by Cook had an active brood patch (and gonad activity showed it was preparing a replacement clutch, mid-Nov).
Cholo Alethe — two females netted by Cook in Ukalini on 26 Nov had active brood patches (one rather fat, other had lost fat but was still watery, thus probably respectively on eggs and chicks); egg-laying both in Nov.
Starred Robin — many pairs feeding nestlings or recently fledged young. At least 9 records were back-dated to month, 7 laying in Oct, 2 in Nov.
Stonechat — local pair at Muretha had full-grown, partly independent fledglings, having laid Sept.
African Yellow Warbler — pair feeding (at nest) 24 Nov, egg-laying Nov.
Yellow-throated Warbler — pair feeding two fledglings (Manho, 16-20 Nov), thus egg-laying Oct.
Wailing Cisticola — two pairs feeding at nest in grass tuft mid- and late Nov (egg-laying Oct and Nov). One feeding a full-grown fledgling 22 Nov (eggs Sept/Oct.), and one nest-building 22 Nov.
Singing Cisticola — two different pairs feeding small fledglings, 16-23 Nov (eggs Oct).
Namuli Apalis — one pair taking small prey to nest (in bush at forest edge) 23 Nov, eggs Oct or Nov.
Black-headed Apalis — pair taking small prey to location in canopy (nest?) 25 Nov, eggs Oct or Nov.
Cape Batis — didn't see any young out of nest, but many females begging and fed by males (sign of incubation of eggs or very small chicks) from mid–late Nov; egg-laying Oct (1), Nov (6).
Mozambique Batis — male feeding female, 15 and 27 Nov (eggs Oct, Nov).
Black-throated Wattle-eye — male feeding big fledgling, 26 Nov (eggs probably Sept)
White-tailed Crested Flycatcher — several pairs feeding a fledgling at different stages of growth: eggs Sept (3) and Oct (3). Other pairs behaved as if with occupied nest.
Brown-headed Tchagra — nest-building 27 Nov.
Red-winged Starling — pair feeding at nest (rock crack), 20 Nov (eggs Oct); pair feeding noisy fledglings 24 Nov (eggs Sept).

There are some additional records from earlier workers.

Scaly-throated Honeyguide — two females preparing eggs in early Aug (Vincent)
Cardinal Woodpecker — female collected on 29 July was in "full breeding condition" (Vincent).
Black-headed Apalis — some females were "in the act of laying" late July-Aug (Vincent).
Namuli Apalis — one female caught had a well-developed brood patch (late Nov or early Dec, Ryan *et al*.); one nest under construction 29 Nov (4 m high) was later abandoned.
Yellow-bellied Sunbird — nest in bracken, with 2 young leaving it on 25 July (Vincent), thus eggs in late June.
Dapple-throat — one of two birds netted in Ukalini sometime between 27 Nov–4 Dec had a brood patch, no further details; the other had commenced primary moult, suggesting it had completed breeding (Ryan *et al.*).

Melo *et al*. (2001) report active brood patches in 5 mist-netted females of 4 species (Eastern Mountain Greenbul, Namuli Apalis, Cape Batis and two White-eyes), all on 6 Dec (eggs probably laid in Nov for most of them).

6.5 Densities of Forest Species

Bird counts were tried in Ukalini Forest but were dropped as it was felt that the distance estimate was inadequate. Instead, exact territory sizes of birds present in some small patches on Muretha Plateau were measured. It is easier to measure this in an area of fragmented forest as territorial boundaries are more easily defined. A total of 12 hours were spent on two mornings in three forest patches (of 1.0, 1.4 and 1.5 ha, measured by GPS), where all territorial birds were identified. Results are shown in Table 9. Additional information on selected species was obtained in a few other patches on different mornings. Birds were very active in the early morning and counter-singing between neighbouring pairs was frequent. Tape playback was used in some cases to confirm territorial boundaries.

Table 10. Territory sizes of 14 bird species measured in small patches on Muretha Plateau.

Species	Area (ha)	No. records
Livingstone's Turaco:	4–5	2 pairs
Eastern Mountain Greenbul	1–1.5	4 pairs
Stripe-cheeked Greenbul	1–1.5	4 pairs
Cabanis's Bulbul	1–1.5	4 pairs
Olive Thrush	2.9	1 unmated bird
Cholo Alethe	1.5	1 unmated bird
Starred Robin	0.7–1	5 pairs
Olive-flanked Robin	1–1.5	4 pairs
Evergreen Forest Warbler	0.7–1.5	4 pairs
Namuli Apalis	0.7–1.5	4 pairs
Black-headed Apalis	1–1.5	3 pairs
Cape Batis	0.7–1.5	5 pairs
White-tailed Crested Flycatcher	1–1.5	3 pairs
Dapple-throat	2.5	1 pair

Compared with data from a study for the same or closely-related species on the Nyika Plateau in N Malawi, comprising over 90 forest patches and a 25 ha portion of a larger forest at over 2100 m (Dowsett-Lemaire 1983), these figures are very close.

Nyika densities of Cape Batis average 1 pair/ha, although territory sizes can be smaller in fragmented forest where the extensive edge increases the habitat; those of White-tailed Crested Flycatcher are slightly lower, and those of Starred Robin slightly higher. Thus the 25 ha section of forest contained 36–40 pairs of Starred Robin (average of 0.6–0.7 ha/pair). In fragmented forest, pairs of Bar-throated Apalis occupied on average 0.6 ha in patches of round forest, and 0.4 ha in narrow, elongated patches with more edges; patches as small as 0.12–0.15 ha were occupied by one pair. The density of Namuli Apalis on Muretha was found to be lower than this, i.e. one pair in each of four patches of 0.7–1.5 ha.

Another very common bird on the Nyika, the Eastern Mountain Greenbul, occurred at an overall density of 2 pairs/ha, but this is in the absence of its congener and competitor, the Stripe-cheeked Greenbul. Where both species occur, the densities of either are about half. This was verified on Muretha Plateau where four patches of 1.0–1.5 ha have only one pair of each. For most species, territory sizes are smaller in fragmented forest than in larger blocks due to the edge effect or inherent aggressive behaviour (Dowsett-Lemaire 1983), thus it would be wrong to transfer the densities observed on Muretha to the larger Ukalini and Manho Forests. If pairs of Namuli Apalis can occupy patches as small as 0.5–0.7 ha (with some adjacent bracken scrub), they still will not tolerate a neighbouring pair in patches of 1.5 ha, and it is unlikely that there would be more than one pair in 2 ha of continuous forest. Apalis spend much time feeding at sunny edges, as do flycatchers (e.g. Cape Batis), and space themselves out more in larger blocks of forest.

For Schalow's Turaco (a close relative of Livingstone's) on the Nyika, the figure of 4 ha/pair was arrived at by observing the whereabouts of individual pairs over three breeding seasons. In all, 39 pairs occupied 43 patches totalling 157 ha.

Birds with a more specialized diet occur at still lower densities. On the Nyika the ant-following specialist White-chested Alethe can breed exceptionally in patches as small as 0.5–0.6 ha (two cases in three years) when an ant colony moves in, but overall densities are low, with 2 pairs in 8–10 ha of larger forest blocks. A 25 ha forest patch contained 5 to 6 pairs. In S Malawi, densities of Cholo Alethe in optimal habitat (mid-altitude forest) have been estimated at 2 pairs/10 ha (similar to White-chested), and densities in Ukalini are probably close to this. Alethes are especially difficult to count as several pairs and unpaired individuals congregate at ant swarms, where territorial boundaries break down.

Ryan *et al*. (1999a) counted birds from 72 points for 5 minutes each and estimated the distances at which the birds had been heard or seen (under or over 20 m), in both lower-altitude forest (c.1250 m near Nanchili bridge) and in Ukalini, and individual counts were at least 100 m apart. Figures were then transferred into a formula of a "two counting band" method (Bibby *et al*. 1992) to give actual densities. They recognized partly the risk (Ryan *et al.* 1999a: 320) saying "these density estimates are rather crude and should be treated with caution, because many birds were recorded by song, where distance to the bird is very hard to estimate. If observers actually placed birds within 30 m into the "close" category, it would result in the estimated densities falling by more than half." Despite this, a table was produced giving densities for 18 species, dropping species counted less than 10 times. (Surprisingly, the Olive-flanked Robin, one of the noisiest and commonest birds on Namuli, is not listed). Although they write number of "birds/ha", these figures must often mean number of pairs/ha, as most birds were recorded by sound, and singing, territorial owners are normally paired.

Figures for various common small passerines are of the order of 5–10 birds or pairs/ha (e.g. 12.6 in Namuli Apalis, 10.6 in Stripe-cheeked Greenbul, 9.7 in White-tailed Crested Flycatcher, 8.6 in Cholo Alethe, 8.4 in Starred Robin). Even for a large non-passerine such as Livingstone's Turaco, they recorded as many as 5.6 birds/ha. Compared to territory sizes measured on Muretha and in the intensive Nyika study, these figures are 5 to 30 times higher, and are way above anything that has ever been found for forest birds elsewhere. This suggests an inherent problem with the methodology and not just a problem of measuring distances, and shows the danger of relying on complicated calculations in the absence of control against actual figures. Some other factors may also contribute to this over-estimation, including over-crowding of birds induced by recent deforestation, and (for a few species) higher densities than in higher-altitude forest areas that were not visited.

For other passerines, Ryan *et al.* obtained exceptionally high density figures for Cholo Alethe, based partly on counts made at low altitude (1250 m) in an area suffering from deforestation. In November 2007 it was evident that a problem of over-crowding was happening in the vicinity of the Nanchili bridge, as several sections of forest bordering the stream had just been cleared by villagers to plant maize. Birds of several species called unusually frequently or even gave chase to each other; there was little doubt that for many species their home range had suddenly been reduced by at least half. Birds that had recently lost their territories were trying to hang on, on the margin of others.

Cholo Alethes do not occur evenly at different altitudes or in different microclimates. Although densities in Ukalini Forest are close to their optimum of perhaps 2 pairs/10 ha, they are very much lower in the larger and cooler block of Manho Forest, and the same comment applies to Green Barbet. In Manho both species have territories spaced out by 500–700 m or

more. The lack of ant activity in Manho was indeed striking, as opposed to many signs of ant activity in the warmer Ukalini Forest.

In the case of the four species of conservation importance, Ryan *et al.* estimated total populations for the whole of Namuli. They proposed a minimum of 5000 pairs for Namuli Apalis, over 1000 pairs for Cholo Alethe, "low thousands" for Dapple-throat, and probably more than 100 pairs for Green Barbet. Given the available evidence, the first three appear far too high, while the figure for Green Barbet is also too high by a factor of perhaps 2. The figure for Cholo Alethe is inflated by at least three different causes – inherent methodological problems (as for all species); the fact that Ryan *et al*. did their counts at lower altitudes where there is a problem of deforestation and over-crowding; and the location in Ukalini where the microclimate is noticeably warmer than in Manho.

For Namuli Apalis, it is likely that in degraded habitat or thin riparian strips some forest territories are very small, but these birds also exploit secondary growth around forest. Territory sizes as small as 0.02 ha given by Ryan *et al*. appear however abnormally small and one is tempted to suppose that there was a problem in measuring distances in the field. The smallest occupied territories on the Nyika (by Bar-throated Apalis) in three years of study are still 7–10 times bigger, and the Namuli Apalises of Muretha Plateau are definitely more spaced out than their relatives on the Nyika.

For Dapple-throat, Ryan *et al*. give densities of 2.4 pairs/ha. Their overall estimated totals of several thousand pairs are way above estimates from Dowsett-Lemaire, as one territory studied on Muretha measured exactly 2.5 ha and densities in larger forest seem to approach 3–5 pairs/10 ha. The species is not uniformly distributed in forest, as it is partial to certain sections of the understorey.

6.6 Biogeographical Considerations

Afromontane biome. Of Afromontane endemic or near-endemic bird species, 27 are known to occur on Namuli, which compares favourably with 31 on the larger Mt Mulanje. One is found only on Namuli (Dapple-throat), whereas Namuli Apalis is replaced by another form of the same super-species on Mulanje. The Moustached Green Tinkerbird is only found on Mulanje, but is replaced on Namuli by an Eastern endemic (the Eastern Green Tinkerbird). The four species missing from Namuli are Red-tailed Flufftail, Blue Swallow, Cinnamon Bracken Warbler and Olive Bush Shrike. Possible reasons for some of these absences are discussed below.

Within the Tanzania–Malawi group Afromontane avifaunas are characterized by a general impoverishment from north to south (Dowsett-Lemaire 1989). Four Afromontane species reach their southern limits of range on Namuli, Chiperone and in adjacent SE Malawi – Bar-tailed Trogon, Olive-flanked Robin, Evergreen Forest Warbler and Eastern Double-collared Sunbird. Another three, all present on Namuli, go no further than Thyolo Mountain in Malawi and do not reach Mt Chiperone (although the weaver has recently been found on Mt Mabu, Spottiswoode *et al.* 2008) – Cabanis's Bulbul, Bertram's Weaver and African Citril. Eastern Mountain Greenbul, a bird of high altitudes only, occurs on just three mountains south of the Viphya Plateau – Zomba (and Malosa), Mulanje and Namuli. The Afromontane Moustached Green Tinkerbird reaches its southern limit on Mulanje, where it is very local. It and the "Eastern endemic" Eastern Green Tinkerbird are completely allopatric. The presence of the latter on Namuli precludes the occurrence of the other, but one green tinkerbird remains to be identified on Chiperone (Benson 1950). Finally, the Mulanje population of Cinnamon Bracken Warbler is very isolated (the only location south of the N Viphya Plateau), but it is

common there in the rich bracken-briar on the high plateaux. It is a high-altitude species and its absence from Namuli may be due to both the floristic poverty of this habitat and the more moderate altitude of the massif.

The only bird species occurring on Namuli but completely absent from Malawi is the Dapple-throat, a most mysterious relic as the only other populations are in the Udzungwa and Usambara Mountains of central and northern Tanzania. It presumably extended down the eastern side of the Rift but it is doubtful that there are now any populations between Namuli and Tanzania, given the lower elevation and distribution of forest. The African Hill Babbler is a far more widespread montane species that reaches Mangochi and the Namizimu Hills in Malawi, but does not occur further south, including on Namuli. On the other hand one montane species from southern Africa, the Olive Bush Shrike, that ascends northwards to Mulanje, Zomba and the Kirk Range, does not reach Namuli. It is so noisy as to be inescapable, and its absence this far east must be considered as genuine.

As Vincent (1933a) visited in the winter months, he missed a few of the montane intra-African migrants like Scarce Swift. One notable grassland absentee, however, is Blue Swallow, which also arrives in late August or September to leave in April. Its breeding range encompasses the montane grasslands of SW Tanzania to South Africa; it is common over montane grassland in Malawi, even over small areas of degraded habitat as in the Kirk Range. Although common on Mulanje, all studies have failed to find it on Namuli, although visits were at the right time of year. The swallow is not cryptic and appears to be genuinely absent, probably due to the nature of the grassland. It nests in natural holes (such as those of warthog) but especially under overhangs of streams. However, the rocky and peaty nature of the soils on Muretha means that water immediately runs off and fills every ditch and stream bank, thus making the place very unsafe for swallows' nests. Probably the Red-tailed Flufftail is absent for the same reasons.

Eastern biome. Of Eastern endemic or near-endemic species, 6 occur on Namuli, 5 in forest (3 are barbets and 2 apalises) and one in bracken scrub (Lesser Seedcracker). One obvious absentee occurring locally in SE Malawi is Green-headed Oriole, a bird of well-developed mid-altitude *Newtonia* or *Albizia* forest. It is also absent from the slopes of Mt Mulanje, perhaps owing to rainfall being too high, although other species of mid-altitude forest, such as Green Barbet, do occur. This oriole is known elsewhere in N Mozambique from Mt Chiperone (Benson 1950) and has recently been discovered on Mt Mabu (C. Spottiswoode, pers. comm.).

Zambezian biome. Only two Zambezian species have been recorded so far, Rufous-bellied Tit and Miombo Double-collared Sunbird. This is not surprising as most Zambezian endemics are inhabitants of miombo or mopane woodland, which is not found on Namuli. But this tit can be found in other broad-leaved woodland and has obviously adapted to the forest tree *Syzygium cordatum*. The sunbird has a broad niche including bracken scrub.

6.7 Conservation Issues

The Namuli massif is considered to be an Important Bird Area (IBA) based on the presence of globally significant populations of the endemic Namuli Apalis, Cholo Alethe and Dapple-throat (Parker 2001), and now also Spotted Ground Thrush and White-winged Apalis. The nearby Mt Chiperone is also an IBA (Parker 2001). Namuli forms part of the Tanzania–Malawi mountains Endemic Bird Area (EBA) as three of the seven species of this EBA occurring in Mozambique were recorded from here, although these figures have changed

somewhat in light of more recent research. It also forms part of the Afrotropical Highlands biome.

Vincent's base camp was at an altitude of 1400 m, and he refers to birds he collected in the immediate vicinity as being in "primeval" or "high forest", giving the impression that the area was thickly forested in 1933. Some of the birds he collected there (like Bar-tailed Trogon and Dapple-throat) could not be present in the thin riparian strips left today. The few photographs he published in 1933 unfortunately do not include his base camp nor the lower slopes.

From observations of forest regrowth (by *Harungana* in particular) a long way from the present forest edges, or of scattered forest trees (even strangling figs) dying or regrowing amid fields, there is no doubt that the extent of mid-altitude forest on the eastern slopes has been considerably reduced. Some important sections of the forest near the Nanchili bridge and the Malema bridge had just been cleared (2007) for growing maize. Aerial photos of the late 1960s however already show that mid-altitude forest was largely confined to riparian strips, although broader than today. Human settlements are a fairly recent phenomenon, but there is little doubt that mid-altitude forests suffered from recurrent fires before they were actually cleared for gardens. Vincent (1933a) mentions iron-smelting as an important activity in the area, which would also have caused some forest losses.

Some bird species of conservation concern occur at higher densities at medium altitude and have had their populations seriously reduced by deforestation at that level, e.g. Cholo Alethe, and probably Green Barbet. The fate of White-winged Apalis (a bird absent from montane forest altogether) depends on the protection of some strips of riparian forest on the lower slopes. The species has little chance of surviving on Namuli otherwise. Further surveys are needed to establish where the main population of this bird resides, as it seems to be very uncommon on the wet south-eastern slopes.

On the other hand, other birds are confined to Afromontane forest, and the future of Dapple-throat in particular should be fairly secure if the main blocks of Manho and Ukalini Forests are preserved. The Namuli Apalis is common at both high and medium elevations, and protection of forest above 1500 m will certainly save a substantial population of this bird, despite habitat loss lower down. Figures of a few dozen pairs of Cholo Alethe and Green Barbet proposed for the populations above 1500 m are low, but in all evidence this is enough for a viable population as these two species have survived for several decades when mid-altitude forest was already reduced. The rare Spotted Ground Thrush occurs in both Ukalini and Manho, and this discovery is especially encouraging. The discovery of Spotted Ground Thrush on Namuli in the breeding season is the first indication that the species breeds in the mountains of Mozambique, and this discreet bird could (should) be more widespread.

Ryan *et al*. (1999a, 1999b) reported that there was no forest encroachment above 1500 at the time of their visit (i.e. that the forest at Ukalini was completely intact). This is not quite so now, as about 5 ha of forest have been cleared at the lower edge of Ukalini, and there is a problem of *Faurea* extraction in both Ukalini and Manho. In Ukalini the number of felled *Faurea* is particularly high, creating many gaps in the canopy. In Manho, two small areas of forest at 1700 m or just above were also clear-felled in recent months to plant potatoes. The opening of gaps in the canopy is of course detrimental for bird species of shaded understorey, among them Cholo Alethe and Dapple-throat.

Although not on the Red List, two species occur on Namuli only in very small numbers and need special attention. In SE Africa the Olive Thrush is usually very localized, preferring small patches at the highest altitudes. Only a few pairs occur on Muretha (and probably a few

more in fragmented high-altitude forest elsewhere). The fact that one male remained unmated for the whole duration of our stay means that there were very few surplus individuals in the area. When surplus birds of a species are present, individuals whose mate has suddenly been displaced can re-mate by the next day, as shown by translocation experiments on the Nyika Plateau (Dowsett & Dowsett-Lemaire 1986). In Malawi, some populations of Olive Thrush on the top of mountains can be so tiny as to be at risk from extinction (Dowsett-Lemaire & Dowsett 2006).

Another species with a tiny population on Namuli is Eastern Mountain Greenbul. It is more common than Olive Thrush, as pairs occur at densities of 1 per ha, but would nevertheless be vulnerable to any amount of disturbance or collecting. The thrush and the bulbul are interesting cases of small, isolated populations at risk of extirpation.

7. OTHER VERTEBRATES & INVERTEBRATES

7.1 Previous Studies

This section covers all remaining vertebrate and invertebrate groups, with the exception of birds. Wherever possible the data and lists incorporate previous findings. Much of the previous collecting and survey history of the Namuli area has been outlined in earlier sections of the report. Relevant additions to these are given below.

During Vincent's 1932 trip to Namuli to collect birds, he also made some collections of a number of small mammals (his notebooks mention only 11 specimens). This included five specimens of a new species of endemic squirrel, Vincent's Bush Squirrel (*Paraxerus vincenti*).

More recently, on Melo et al's brief birding trip in 2001, one of the participants, K.D. Dijkstra, collected a number of Odonata (dragonflies) from the Namuli massif. Soon after, in November 2004, Julian Kerbis and Esteban Sarmiento (from the Chicago Field Museum and American Museum of Natural History, respectively) collected small mammals and birds from the Malema valley, Muretha plateau, Manho and Ukalini forests. Data from both these trips have not yet been published.

Since then, K. Tolley and S. van Noort visited the Sarl tea estate in May 2006 (Van Noort *et al.* 2007) and collected several specimens of what turned out to be a new species of dwarf chameleon (*Rhampholeon* sp., Branch *et al*. in press). The first specimen of this new species, however, was collected opportunistically by Ryan et al. during an ornithological expedition in December 1998. In July 2006 Ara Monadjem collected bats from the foothills of Mt Namuli, identifying 11 species.

On the two expeditions in 2007 under the Darwin project and during an earlier reconnaissance in 2005, Julian Bayliss opportunistically collected Lepidoptera, bats, herps and small mammals (the latter two with Lucas Sabão). These results are presented in full here.

7.2 Local Hunter Records

Local hunters are a valuable resource when investigating the fauna of an area. They have knowledge of where traps are located, are expert in navigation in forest, and are generally very knowledgeable on the vertebrates found in the area. Comprehensive field guides with good clear photographs are useful to determine what species are present.

Two local hunters were interviewed in the field – Ernesto and Zito Pedro – both employed as guides on the expeditions. The main line of investigation centred on "what animals do you eat and how to you catch/trap them?", followed by "what other animals have you seen in the area?"

Different animals merit different kinds of trapping. The main method of trapping is with gin traps, a trap that has a pressure pad ‘platform’ that when stepped upon triggers the shutting of a toothed jaw-like mechanism around the limb of the animal (Figure 33). Although a small to medium-sized gin trap reputedly costs 100–150 Mt in Gurué, they are apparently not used up on the plateau, not least in that they would injure domestic livestock. Bows and arrows are also not used in hunting, although the use of spears is sometimes employed to hunt monkeys in trees.

According to Ernesto and Zito Pedro, the last lion (*Panthera leo*) found in the Malema valley

was killed in 1987, although lions are believed to be still present in the Inago mountain range to the north. Leopards (*Panthera pardus*) used to be hunted, but were not eaten if caught. The last one seen in the area was in 1990, supporting the report by Ryan et al. (1999a) that it had been hunted to extinction. Serval cats (*Felis serval*) are hunted during the day using dogs (not trapped) and are eaten if caught. Table 10 lists other mammals that were identified as being hunted or known. As the species were identified using pictures in field guides, identifications should be regarded as not confirmed.

Table 11. Animals trapped or hunted by local hunters in the Namuli area.

Common Name	**Scientific name**	**Notes**
Large-spotted Genet	*Genetta tigrina*	Hunted with dogs; eaten if caught
Small Grey Mongoose	*Galerella pulverulenta*	Found in forest. Hunted with dogs; eaten if caught
Banded Mongoose	*Mungos mungos*	Hunted with dogs; also gin trap. Eaten if caught. Skin collected from locals
Striped Polecat	*Ictonyx striatus*	Animal smells. Hunted with dogs; will sell skin
Striped Weasel	*Poecilogale albinucha*	Animal smells. Hunted with dogs; will sell skin.
Sun Squirrel	*Heliosciurus mutabilis*	In montane forest. Trapped (sprung snare) or chased
Vincent's Bush Squirrel	*Paraxerus* (*palliatus*) *vincenti*	In montane forest. Trapped (sprung snare) or chased
Bush Squirrel	*Paraxerus cepapi*	Found more frequently in valley. Will set traps (sprung snare)
Blue Monkey	*Cercopithecus mitis*	Trapped on ground using bananas as bait; bows and arrows not used. Sometimes speared if in trees
Vervet Monkey	*Cercopithecus aethiops*	Trapped on ground using bananas as bait; bows and arrows not used. Sometimes speared if in trees
Klipspringer	*Oreotragus oreotragus*	Eaten. Hunt with dogs and also trap
Red Duiker	*Cephalophus natalensis*	Eaten. Hunt with dogs and also trap
Blue Duiker	*Philantomba monticola*	Eaten. Hunt with dogs and also trap
Yellow-spotted Rock Hyrax	*Heterohyrax brucei*	Eaten. Hunt with dogs and also trap
Rock Hare	*Pronolagus rupestris*	In Malema valley. Gin traps or hunted with dogs
Bushbaby	*Galagoides granti*	
Bushbuck	*Tragelaphus scriptus*	Haven't been seen for a while, but used to hunt
Porcupine	*Hystrix africaeaustralis*	Not found locally, but known
Striped Mouse	*Rhabdomys pumilio*	Found in valley. Caught with small gin traps
Namaqua Rock Mouse	*Aethomys namaquensis*	Caught using small traps
African Marsh Rat	*Dasymys incomtus*	Often caught in grassland using dogs
Gerbil sp.	*Gerbillus* sp.	Found in bananas, but not eaten as they give you a headache
Silvery Mole Rat	*Heliophobius argenteocinereus*	Found in the ground where sweet potatoes grow. Not hunted or eaten

7.3 Small Mammals

In 1932 Vincent was the first biologist to note various mammals while undertaking an ornithological survey of Namuli. During this time he collected several species, including a new species of squirrel *Paraxerus vincenti* (Vincent's Bush Squirrel) now listed as Critically Endangered (CR B1ab(iii,v)) in the IUCN 2007 Red Data List. So far it is only known from Namuli above 1000 m, alhough it is probable that it occurs nearby but has not been found. It is similar to the widespread Red Squirrel, *P. palliatus*, but is slightly larger in size. The squirrel was observed on several occasions inside Manho forest. Local hunters claim that they trap and eat squirrels, hence *P. vincenti* is threatened, although the exact level of threat is not known. A population study needs to be done.

Figure 33. Black-tipped mongoose in gin trap on lower slopes (JB).

During the two Darwin expeditions in 2007, J. Bayliss and L. Sabão opportunistically collected small mammals. Bucket pitfall traps were positioned in different habitat types ranging from wet valley grassland (Malema valley) to open grassland (Muretha plateau) and forest edge (Manho forest). Specimens collected were sent to Peter Taylor at the Durban Natural Science Museum, South Africa for formal identification. A full list of the 38 small mammal species recorded or collected from the Namuli area is given in Annex 5, including 15 species of bat, 10 rodents, 3 Carnivora, 2 primates and 1 ungulate.

The capture of the African Marsh Rat, *Dasymys incomtus*, in the Muretha grasslands was of interest. It is common and often trapped for bush food. Also of interest was the repeated capture of *Praomys delectorum*, a species not generally regarded as a southern African rodent.

Skins of a Banded Mongoose (*Mungos mungo bororensis*) and a Large Spotted Genet (*Genetta tigrina*) were collected off local people. The skins were observed being worn as a type of shoulder bag where the animal had been skinned longitudinally ('sock-like') to form a pouch.

The first dedicated bat-collecting foray to Mt Namuli was by Ara Monadjem in 2006, which focused on the foothills and did not include any high altitude habitat. During the two Darwin expeditions in 2007, J. Bayliss carried out minimal mist netting in Manho and Ukalini forests (1600–1800 m), with specimens sent to P. Taylor in Durban for formal identification.

Of particular note was the capture of what was thought to be *Pipistrellus rusticus*, mist-netted in Manho forest. This is the first record of this species for Mozambique, although it is known from Zomba in southern Malawi. Normally associated with a dry savanna habitat, finding it at 1700 m in wet montane forest is very unusual (A. Monadejm, pers. comm.), and DNA analysis on the specimen is recommended. Very little information is available on montane bat communities, therefore unusual records such as this are expected. *P. rusticus* is listed as Lower Risk, least concern on the IUCN Red Data List (Baillie *et al*. 2004).

The bat *Eptesicus hottentotus*, also caught in mist nets in Manho forest, is the second record for Mozambique. The first record was in 1964 at Chiota, north of Lake Chilwa, although it is also known from Mt Mulanje in Malawi.

In November 2008, Michael Curran and Mirjam Kopp carried out a short but intensive survey of bat assemblages in Ukalini forest at around 1650 m (3 nights) and in riverine forest at base camp along the Rio Malema at 1200 m (1 night). This was the first dedicated survey of the high altitude bat fauna of Mt Namuli, and included ground nets, harp traps, acoustic monitoring (using a bat detector to record ultrasonic bat calls, which can sometimes be used to identify to species), and a canopy net fixture held at 10 m above the ground. A particularly rich and abundant bat assemblage comprising 7 species at 1200 m and 9 species at 1650 m was found. In comparison, Mt Mulanje and Mt Mabu yielded far fewer species at similar altitudes at a similar time of year, once corrections were made for differences in number of sampling nights (Kopp & Curran, unpublished). Findings from this recent trip include a species of horseshoe bat (family Rhinolophidae) caught at both the base camp and Ukalini forest that, referring to recent checklists (Monadjem & Reside 2007, Broner *et al.* 2003, Happold & Happold 1997) does not resemble any known species from either Mozambique or Malawi. Other species netted by J. Bayliss during this visit await identification and include *Rhinolophus* and *Pipistrellus*.

Table 12. Bat sampling locations and effort, Namuli November 2008.

Locality	Latitude	Longitude	Altitude (m)	6m net hrs (ground)	6m net hrs (canopy)	Trap hrs
Base camp	-15.405933	37.067006	1200	8.125	–	53.5
Ukalini Forest	-15.369250	37.061361	1650	44.25	10.5	9.5

Currently, 18 bat species are recorded for Mt Namuli above 600 m. A longer and more intensive investigation of the bat fauna, particularly at higher altitudes, would certainly reveal many more.

7.4 Reptiles and Amphibians

In general the herpetofauna of northern Mozambique has been very poorly studied, with the earliest studies mainly in the lower Zambezi and lower Shire (Peters 1882, Broadley 1963).

Figure 34. Dwarf chameleon from Manho forest (JB).

The first herpetological records from the Namuli area come from the ornithological survey by Ryan *et al.* in 1998. Three lizards were opportunistically collected, two of which represent significant additions to Mozambique's herpetofauna (Branch & Ryan 2001). One was a pigmy

chameleon, initially identified as *Rhampholeon platyceps* and collected from Ukalini forest at 1550 m. Dijkstra on the Melo expedition in 2001 also collected a pigmy chameleon, which he sent to a Swiss taxonomist, but no formal identification was received (Dijkstra, pers. comm.). In 2006 Krystal Tolley and Simon van Noort collected several more specimens of the same species from the Sarl tea estate at 840 m (Van Noort *et al*. 2007), while the current Darwin project has collected several others (Figure 34, Table 13). Resulting from this, the *Rhampholeon* taxonomic group on Mts Mulanje (Malawi), Namuli, Chiperone and Mabu is being revised, and the Namuli specimens are soon to be named formally (Branch *et al.*, in prep.).

Table 13. Reptiles and amphibians collected from the Namuli region.

	no.	**Date**	**Site**	**Alt. (m)**	**Notes**
AMPHIBIANS					
Arthroleptidae					
Arthroleptis francei	1	3/6/07	Ukalini Forest	1600	forest leaf litter
Arthroleptis francei	1	30/5/07	Manho Forest	1650	forest leaf litter
Bufonidae					
Bufo gutturalis	2	1/6/07	Muretha Plateau	1600	grassland, forest edge
Bufo sp. (metamorph)	1	25/11/08	Manho Forest	1500	
Hyperoliidae					
Hyperolius sp.	1	5/6/07	?	1300	Eucalyptus/shrub
Hyperolius marmoratus	8				
Hyperolius puncticulatus	1				
Hyperolius nasutus	1				
Ranidae					
Ptychadena sp.			?		
Amnirana sp.	1		?		
Strongylopus fuelleborni	2	30/5/07	Muretha Plateau	1800	grassland
Strongylopus fuelleborni	1	16/11/07	Muretha Plateau camp	1900	grassland
Strongylopus ?	3	25/11/08	Manho Forest	1500	
Notophryne broadleyi	3	2/6/07	Manho Forest	1700	forest
Notophryne broadleyi	2	20/11/07	Manho Forest		seepage at rock face
REPTILES					
Chamaeleonidae					
Rhampholeon sp. nov.	1	27/5/07	Muretha Plateau		forest edge
Scincidae					
Trachylepis varia	1	27/5/07	Muretha Plateau	1800	grassland
Trachylepis varia	1	5/6/07	Malema Valley		grassland/scrub
Trachylepis varia	1		Muretha Plateau		grassland
Trachylepis sp.	1	26/11/08	Muretha Plateau	1900	
Mabuya varia		11/1998	Muretha Plateau		rock
Gekkonidae					
Lygodactylus cf. *bonsi*	1	11/1998			
Lygodactylus cf. *bonsi*	1	27/5/07	Muretha Plateau		exfoliating rock
Viperidae					
Atheris sp. nov.		11/2008	Manho forest	1500	forest floor
Natricinae					
Natriciteres sylvatica	1	4/6/07	Malema Valley	1250	grassland/scrub
Psammophylax variablis	1				

Note: all specimens collected by J. Bayliss, except *Atheris* (C. Congdon), *Mabuya* and one *Lygodactylus* (P. Ryan).

On the two Darwin expeditions, reptiles and amphibians were collected opportunistically, either by hand or through the use of bucket pitfall traps which were situated on the Muretha plateau, Manho forest edge and in the Malema valley. Results show the occurrence of a number of Mt Mulanje endemics such as *Lygodactylus rex*/*R. bonsi*, *Notophryne* sp.,

Strongylopus fulleborni and *Arthroleptis francei*, thus confirming the biogeographical link between Mulanje and Namuli.

Of particular interest was the discovery, in November 2008, of an undescribed species of forest viper (*Atheris* sp. nov.) in Manho Forest that had, until then, been thought to be endemic to Mt Mabu, some 130 km to the south-west. The species is still awaiting formal description. This discovery shows the linkages between the various forests.

7.5 Lepidoptera

In November 2005 Julian Bayliss carried out the first collecting trip to the Namuli region, when butterflies above 1000 m altitude were collected opportunistically. Subsequently, Alan Gardiner collected in 2006 and 2008 in lower-lying areas, but his results have not yet been written up. Butterflies above 1200 m were again collected by Bayliss during May and November 2007. A further visit was made in dry conditions in November 2008 with Colin Congdon, Ivan Bampton and Martin Hassan. These visits have enabled a reasonably representative species list to be compiled, although it is far from complete. Particular emphasis was placed on high altitude grasslands (e.g. Muretha Plateau) and montane forest habitats. Although the species collected represent an upland habitat assemblage, it is not typical of the Eastern Arc Mountains. The list contains elements both of the Vumba Mountains in Zimbabwe (*Neptis swynnertoni*), and more strongly of the Shire Highlands in Malawi (e.g. *Papilio echerioides shirensis* and *Papilio phorcas nyikanus*), but generally represents an 'old' assemblage (Steve Collins, pers. comm.).

In all, 126 species were found above 1200 m (see Annex 6), including five new species and two new subspecies, although final confirmation is still awaited. Species on Namuli and previously thought to be Mulanje endemics include *Alaena lamborni*, *Axiocerses bamptoni* and *Charaxes margaretae* – Mt Mulanje now only has two known endemic butterfly species. In addition, several other species previously believed to be endemic to Mulanje have since been found on neighbouring Mozambican mountains as a result of this project's trips, including *Cymothoe mlanjae* (Mt Chiperone) and *Baliochila woodi* (Mt Mabu) (Bayliss & Congdon, in prep.).

A new species of montane *Cymothoe* (Nymphalidae) was caught both in Khara forest (situated below Manho forest at an altitude of 1500 m) and in Ukalini (Figure 35), one of a group of species found along the length of Moreau's (1966) Montane Chain from the Taita Hills in Kenya to Mt Mulanje in Malawi. Males were commonly found, but only three females were caught. Eggs were found on plants of *Rawsonia lucida* (Flacourtiaceae), and larvae were successfully raised to the adult stage. Most of the adults seen in the wild were in the lower part of the forest, below 1600 m. However, the altitude preference does not seem to be related to food plant as *Rawsonia* is found throughout the larger forest areas, which suggests that the species' original range included forests at lower elevation now under cultivation (e.g. Malema valley). Members of this species group characteristically reside in forest clearings; they are relatively sedentary and generally do not move between forest patches if separated by a significant distance.

A new Lycaenid, a large *Uranothauma*, was originally thought to be a race of *U. confusa* from Mulanje and Zomba (Figure 35). However, subsequent examination of collected material suggested it should be raised to full species status. The butterfly has a much paler underside than the Malawi/Tanzania races; specifically the female has a much paler ground colour on the recto surface. The new *Uranothauma* was found primarily inside Manho forest in small grassland clearings at c.1700 m. Eggs and larvae were found on the plant *Choristylis rhamnoides* (Escalloniaceae), often a component of vegetation flanking rocky streams.

Figure 35. *Cymothoe* sp. nov. (left) and *Uranothauma* sp. nov. (right) (JB).

Another new Lycaenid, an *Epamera* sp. in the *nolaensis/silanus* species group, was found in forest below 1600 m in Khara forest, although unfortunately no male was found. Other members of this group have been found on the Upper Sangha River, Congo Republic, on the Usambara, Nguru and Udzungwa Mountains in Tanzania, and on the Mafinga Mountains in N Malawi and neighbouring Zambia, as well as in coastal Tanzania. The Namuli species has bolder black lines on the underside, and a black spot near the base of the hindwing underside, missing in other members of the group, features indicating that this is a full species. Females were observed to lay on *Actinanthella menyharthii* (Loranthaceae), a plant known from Zimbabwe, Zambia and Mozambique between the Ligonha and Limpopo rivers (Polhill & Wiens, 1998).

A Lycaenid butterfly in the *Philiolaus crawshayi* species group was found sparingly. It may also represent a previously unknown species, related to *P. stewarti*. A larva was found on *Erianthemum schelei* (Loranthaceae), a common hemiparasite on the abundant *Morella pilulifera* so characteristic of small forest patches in the Muretha peat grasslands.

Specimens of a montane 'black' *Charaxes* that appears to be close to the Mulanje endemic *C. margaretae* (Nymphalidae) were also collected. Also identified was a probable new subspecies of *Papilio pelodurus* (Papilionidae), the larvae of which feed on *Cryptocarya liebertiana* (Lauraceae). The first three larval instars are aposematic as the laurels are full of alkaloids. Males were collected which show differences from their Malawi counterparts; the Namuli males have a complete yellow forewing band and most are missing the orange tornal spot on the hindwing. A larger series including the female is needed before determining its exact status as the Malawi race is somewhat variable. This species was seen flying at canopy level in the Manho and Khara forests, and mud puddling along the banks of the Rio Malema.

Neocoenyra bioculata subsp. nov. (subfamily Satyrinae) is a species of open rocky areas with *Xerophyta* species. It is not a forest butterfly, nor is it found in the peaty tussock grasslands, although the larvae will almost certainly be grass-feeders. It is a weak flyer, keeping close to the ground. This subspecies differs from the Malawi race (type from "Tsenga Mountains, Mwanza, southern Nyasaland" in SW Malawi) in having yellowish forewing ocelli.

Of particular note was the recording of *Anthene lasti* (Lycaenidae), originally described in 1894, commonly known as Last's Ciliate Blue. It was collected by Joseph Last (see section 3 of this report) from the Kenya coast between 1889 and 1894 (Larsen, pers. comm.).

Finally, a solitary female of a new species of *Pseudathyma* was taken in Khara forest. Members of this genus are uncommon, local or rare. There are no *Pseudathyma* known from

South Africa, Zimbabwe or Malawi, and the nearest relatives of the Namuli one would appear to be *P. plutonica* from western Tanzania or *P. lucretioides* from coastal forests in Tanzania, but is certainly not either of these. Larvae are known to feed on Sapotaceae, several species of which were abundant in the forest.

Overall, Namuli is a very important site for butterflies. In addition to those mentioned above, a number of new records for Mozambique were recorded during the short visits, largely in the two main montane forests (Manho and Ukalini). In all, 26 taxa have been added to the national butterfly list, about one in five of those found on Namuli. Based on the relatively few days spent collecting butterflies, it is certain that more new species will be found, with an estimate of between 150 and 200 butterfly taxa above 1200 m. In comparison, the total species list for Mt Mulanje (Malawi) is approximately 260 from between 600 and 3000 m, of which 3 are endemic and 5 near-endemic, compared to a possible 6 endemic and 2 endemic subspecies on Namuli.

7.6 Odonata

Odonata (dragonflies and damselflies) from the Namuli region have only been studied and collected on one occasion, by Klaas-Douwe Dijkstra during a birding trip by Melo in 2001. During this survey he compared the Odonata of Mts Namuli, Mulanje and Zomba (Malawi), and found that all three mountains had a relatively similar species assemblage. Each mountain contained the Eastern Arc relict *Nepogomphoides stuhlmanni*. However, unlike Namuli, Mt. Mulanje does not have the mountain marsh specialists such as *Africallagma sinuatum* and *Proischnura subfurcata*, possibly due to the coarse, gravel-like soils of Mulanje's upland plateau. A total of 41 species of Odonata were recorded from the Namuli region (Table 14 and Dijkstra 2004).

Table 14. Odonata collected by Dijkstra from the Namuli region in 2001.

Family / subfamily	Species	Altitude (m)	Habitat
ZYGOPTERA			
Calopterygidae	*Phaon iridipennis*	610–1130	streams
Chlorocyphidae	*Chlorocypha consueta*	610–1630	forest streams
	Platycypha caligata	690–1130	streams
Synlestidae	*Chlorolestes elegans*	1630–2050	montane forest streams
Lestidae	*Lestes virgatus*	690–1890	marsh and pools
Coenagrionidae	*Africallagma sinuatum*	1860–1890	montane marsh
	Ceriagrion suave	1860–1890	marsh and pools
	Proischnura subfurcatum	1735–1890	montane marsh
	Pseudagrion kersteni	730–2000	streams
	Pseudagrion spernatum	730–2230	montane streams
Platycnemididae	*Chlorocnemis marshalli*	800–1350	forest streams
Protoneuridae	*Elattoneura glauca*	680–1350	streams
ANISOPTERA			
Aeshnidae	*Aeshna ellioti*	610–2055	montane pools
	Aeshna rileyi	850–2020	montane streams
	Anax ephippiger	740–1360	marsh and pools
	Anax speratus	640–2080	streams
Gomphidae	*Nepogomphoides stuhlmanni*	690–1315	forest streams
	Paragomphus cognatus	680–1470	streams
Corduliidae	*Phyllomacromia monoceros*	670–1225	forest streams
Libellulidae	*Atoconeura biordinata*	1000–2100	montane streams
	Bradinopyga cornuta	680–950	rock pools
	Crocothemis sanguinolenta	680–1360	streams
	Hemistigma albipunctum	800–1070	marsh and pools
	Orthetrum caffrum	1735–2100	montane marsh
	Orthetrum guineense	1200–1350	?

	Orthetrum hintzi	655–1735	marsh
	Orthetrum julia	610–2070	streams, marsh, pools
	Orthetrum machadoi	975–1350	?
	Orthetrum macrostigma	655	marsh
	Palpopleura jucunda	655–1070	marsh and pools
	Palpopleura lucia	610–1090	marsh and pools
	Pantala flavescens	730–1930	pools
	Rhyothermis semihyalina	1000–1735	marsh
	Tramea basilaris	690–1950	pools
	Tramea limbata	1860–1890	pools
	Trithemis arteriosa	800–1070	marsh and pools
	Trithemis furva	680–1865	streams
	Trithemis kirbyi	800–950	rock pools
	Trithemis pluvialis	680–1130	forest streams
	Zygonyx natalensis	680–1715	streams
	Zygonyx torridus	690–730	streams

7.7 Coleoptera and Hemiptera

This brief section simply lists specimens of Coleoptera (beetles) and Hemiptera (true bugs) collected opportunistically by Julian Bayliss (2007) and Cornell Dudley (2008) (Tables 15 & 16). Unfortunately literature and a good reference collection do not exist locally, so identification to species level is not always possible. It is believed (C. Dudley, pers. comm.) that collecting at a different time of year may result in an additional 3 or 4 species of scarab beetle being found.

Specimens were all identified by Cornell Dudley (Malawi), and will form part of his personal collection until further notice. It is hoped that the preliminary list might help future entomologists.

Table 15. List of Coleoptera opportunistically collected from Namuli (2007–8).

Family	Species	Notes
Rutelidae [Leaf Chafers]	*Poppilia browni* Kolbe	common
Rutelidae	*Popillia ?chirundana* Péringuey 1908	Common. Also on Mulanje & Dedza mtns.
Tenebrionidae: Alleculinae	genus/species?	
Curculionidae	genus/species? 3 spp	many thousands of species, most unknown
Coccinellidae	genus/species?	common; no named material for comparison.
Staphylinidae	genus/species?	many thousands of species, most unknown
Elateridae	*Calais* sp.	
Melyridae	genus/species?	common, no named material for comparison.
Cerambycidae: Lamiinae	*Thercladodes kraussi* (White)	
Gyrinidae	genus/species?	unable to identify; unlikely to be new.
Cetoniidae: Cetoniinae [Flower Chafers]	*Diplognatha* (*D.*) *gagates* (Forester 1771)	very common species throughout tropical Africa (Holm & Marais 1992).
Cicindelidae [Tiger Beetles]	*Lophyra* (*Stenolophyra*) *s. saraliensis* (Guérin 1849)	widespread in West & Central Africa; many subspecies (Werner 2000).
Scarabaeidae: Scarabaeinae [Dung Beetles]	*Onthophagus* sp.	probably a new species; matches specimens collected on Zomba and Mulanje mtns, at present undescribed. Genus is large and difficult.
Scarabaeidae: Scarabaeinae [Dung Beetles]	*Proagoderus* sp.	probably a new species; not recorded in either Ferreira (1968-1969) or d'Orbigny (1913, 1915). May be closely related to *P. dudleyi* Camberfort, 1980 of Nyika Plateau, Malawi.
Carabidae	genus/species?	unable to identify; a widespread species

Table 16. List of Hemiptera (Heteroptera) opportunistically collected from Namuli.

Suborder	Family	Species	Notes
Heteroptera	Plataspidae	*Coptosoma* sp.	
	Pentatomidae / Pentatominae	genus/species?	
	Pentatomidae / Phyllacephalinae	genus/species?	interesting brachypterous sp; maybe new?
Homoptera	Cicadidae	genus/species?	possibly new?
	Membracidae	genus/species?	possibly new?

8. CONSERVATION

8.1 Conservation Threats

There are a number of threats to biodiversity conservation in the Namuli area above 1500 m, which are listed and expanded upon below. The major ones are potato cultivation inside the forest, widespread and frequent wildfires, logging, and the impacts of domestic livestock (Timberlake 2007a).

Fire: Grassland / bushland fires, particularly owing to increased fire frequency, are eating slowly into the forest patches and negatively affecting some woody species in the grassland areas. Fire-tolerant species are likely to start predominating, with a parallel loss of fire-sensitive species (Figures 36, 37, 43).

The more extractive human activities there are up on the plateau, peaks and upper slopes, the greater the prevalence and frequency of fire will be. This is seen especially in the livestock grazing areas with its itinerant population of herd boys.

Figure 36. Fire spreading up rocky slope (JT).

Figure 37. Remnants of forest destroyed by fire, Nachona plateau (JT).

Grazing: Domestic livestock (cattle, goats, pigs) are disturbing vegetation on some of the open northern plateaux (Figure 38). Cattle are trampling grassland in the north-west. Herders based in the upper Namparro valley are regularly using fire to clear shrubby growth and promote new grass growth, resulting in an increase in the unusable and biologically-impoverished bracken land. Grazing is also changing hydrological patterns in the peatlands and upland wetlands. Feral/domestic pigs are digging up thinly vegetated mats on seeps and eating plant bulbs (*Merwillea lazulina* (Hyacinthaceae), *Hypoxis*, orchid tubers). This impact is widespread across the Muretha plateau. Goats are not really a problem at present, although they do have a very local enriching effect in favoured spots.

Hunting: Plateau and forest areas seem remarkably bereft of large and small mammals, probably owing to extensive hunting for meat in the recent past (30–50 years), continuing at present. Hyrax are rare, there are no wild pigs (these were reported as common by Vincent in 1932), and forest duiker are very scarce. The main grazers/browsers are now domestic livestock. There are no leopard (as seen from the lack of concern over possible loss of untended livestock), and all medium or large predators have been exterminated. In some forest areas, many shrubs are cut down to make long low brush-fences to direct elephant shrews towards small snares in the fencelines (Figure 39). This is having a local effect in opening up the forest understorey.

Figure 38. Cattle grazing on Nachona plateau (JT).

Figure 39. Spring trap for elephant shrews, Manho forest (JB).

Timber & Plant Products: The only timber extracted appears to be Tchetchere (*Faurea wentzeliana*, Proteaceae) from the accessible patches on the eastern side. Extraction is particularly prevalent in the important Ukalini forest (Figures 40, 41). This tree species is common, but there are increasingly fewer trees of reasonable size – the extraction is clearly unsustainable. There is also an associated problem of formation of forest gaps in the Ukalini Forest, leading to invasion of secondary species and loss of some forest birds (e.g. Dapplethroat, Olive-flanked Robin). Extraction of other tree species is minimal.

Figures 40 & 41. Cut stump and plank of *Faurea wentzeliana*, Ukalini forest (JT).

There is some utilization of other plant products from the plateau, such as thatching grass, *Kniphofia* leaves (Asphodelaceae, called locally *moretxa*) for weaving and medicinal plants. None of these appear to be a conservation concern at present. Honey-collecting is practiced, and the destruction of trees and subsequent wild-fires to smoke out the bees and gain access is significant locally.

Cultivation: There is increasing clearance of patches within forest and on forest margins at altitudes above 1400 m for Irish potato (batata reno) cultivation (Figure 42). There are also a few fields cleared on the forest margins for maize and rape. Over the last few years there

appears to have been a sudden increase in cutivation, perhaps related to an increasingly monetarised economy and need for cash income. On a subsequnet visit in November 2008, the extent of forest clearance compared to the year before was alarming (J. Bayliss, pers. comm.) and it may only be a matter of time before people start settling in the forest next to these fields. Potatoes are sold in Gurué and in surrounding villages – they are primarily a cash crop, not a subsistence crop.

Figure 42. Potato cultivation in clearing below Manho forest (JB).

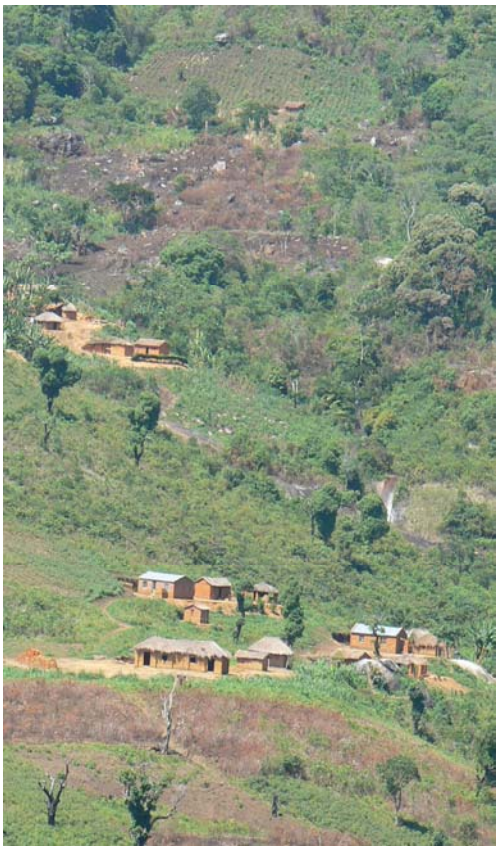


Figure 43. Settlement and cultivation on slopes of Muretha plateau, Namuli (JT).

Tea plantations: Within the tea plantations in the Licungo valley (Figure 44), the cutting of remaining narrow riparian forest strips by operations to get more area or better access poses a threat locally. Edges are 'hardened' and regeneration is impaired. These narrow strips need to be protected for their biodiversity, for soil erosion control and for tourism (i.e. Cascata de Namuli). Continuity of habitat and local movement/migration for forest species is required.

Figure 44. Tea plantation in Licungo valley, below Namuli massif (JT).

8.2 Conservation Issues

A list of the main conservation issues is given below that, it is suggested, need to be borne in mind when developing a conservation management programme.

- Private cattle farmers (privados, criadores) are utilizing common resources (upland grazing) for private gain. Their enterprises are not at subsistence level, and there is no communal benefit.

- There is an increase in logging and Irish potato cultivation coming in with the increasing development in Gurué related to tea rehabilitation, infrastructural development, and monetarisation of the local economy. Potato cultivation in particular is rapidly expanding.

- Resource grabbing for short-term gain is increasing as development in the area rapidly accelerates and opportunities open up. Regulatory controls are weak, resulting in something of a "wild west" economy.

- There are strong pressures for expansion of the tea plantations in the future, and certainly expansion of the cattle grazing areas. For example, a recent proposal was being promoted locally by a Nampula businessman to establish cattle grazing in the populated Malema valley and push/resettle the people up on the Muretha plateau. The political weight of large local business people is significant, and can override that of the local population.

- Local education is needed to reduce fire incidence and the wide-scale use of fire.

- With improvement of the Malema road there will be a greater demand for cash and a more rapid monetarisation of the local economy, with an increased number of local stores and trading links. There will also be a probable influx to the Malema area of people from outside, and hence greater pressure on the resource base. At present all transport, e.g. of tomatoes and cassava, seems to be on foot, both in the Malema and Licungo valleys. Thought should be given to possible controls on access for exploitation.

- Continuity of forest habitat. Altitudinal ranges or sequences of forest habitats, necessary for altitudinal seasonal movement of birds and similar species, should be conserved where possible. The ability of plant species to move attitudinally in response to climate change (whether in temperature or precipitation) is an important conservation consideration.

- There is a need to conserve forests in gullies, ravines, deep valleys and along watercourses as a protection against soil erosion and for a more even stream flow. Such gully forest can easily be damaged by fierce and hot fires roaring up from below, fanned by heat and locally-generated winds.

- Development of scenic places for local tourism could be promoted, especially the Cascata de Namuli and the water sheet on the upper Licungo. Other tourist possibilities are camps up on the Muretha plateau for wildlife/walking tourists, at the base of Mt Namuli for hiking, and in the Ukalini and similar forests of particular ornithological interest. Developments on Mt Mulanje may offer a model for this.

9. RECOMMENDATIONS

Management

1. There should be a move towards getting the massif above c.1500 m altitude recognized and protected as a conservation area. The protection mechanism/s need to be thought through, but should involve the surrounding local population. Mechanisms do not have to exclude a moderate level of consumptive utilization.

2. Moves towards promoting the area for ecotourism, such as wilderness trails and bird-watching, should be encouraged. In this regard, the recent initiative by a Mozambican company – Moçfer – for conservation through tourism and use of carbon-credits on Namuli is most welcome.

3. There should be strong controls on the levels of domestic livestock (cattle, goats, pigs) allowed up on the plateau. The grassland and wetland ecology is being detrimentally changed by cattle grazing and pig-rooting.

4. All clearance of forest or forest margins for potato and vegetable cultivation should be halted.

5. Wildfires across the plateau need to be controlled. This should be coupled with an education programme pointing out the hazards, possibly through the use of locally-employed conservation / fire scouts.

Research

6. More surveys of birds are required to define the range of various threatened species, on the lower slopes of Namuli peak itself and beyond. The most visible area lies about 5 km to the SE on the other side of the Malema valley at about 1120 m, with high ground beyond rising to 1500 m, much of it covered by mid-altitude forest.

7. Although this study was restricted to a relatively small area around Namuli peak, the rest of the upland area (50 × 40 km) also supports patches of forest, and there are many other peaks nearby with forest, for example Inago (1961 m) 45 km to the NE and Serra Cucuteia (1922 m) 45 km to the NNW. Given that the broad ecological requirements of many montae species and endemics, including the Namuli Apalis, are likely to be common throughout this area, such species are likely to be quite widespread. This needs to be investigated further as it has a significant bearing on Red List status and conservation targetting

8. More detailed surveys are required of woody and herbaceous plant species from the forest areas on Namuli. Findings should be compared to those from other mountains in south-central Africa. Survey work so far has been restricted in extent of coverage. This will hopefully support the development of a granite inselberg ecoregion across the region, and help develop the ideas of a transfrontier conservation initiative between Malawi and Mozambique.

9. The status of plant endemics, especially those from grassland areas, needs to be much better determined. Such species are international priorities for Mozambique under the Convention on Biological Diversity.

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ANNEX 1a. Participants on Mt Namuli expedition, May/June 2007.

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Ron Demey, ornithologist, The Hague, Netherlands.

Jorge R. Francisco, GIS Unit, Land & Water Department, IIAM, Maputo, Mozambique.

Tim Harris, Herbarium, RBG Kew, London, UK.

Rogério Mauro da Costa Jamice, Station Manager, Madonge Forest Research Station, IIAM, Chimoio, Mozambique.

Andrew McRobb, photographer, RBG Kew, London, UK.

Hassam Patel, botanist, Mulanje Mountain Conservation Trust, Mulanje, Malawi.

Lucas Sabão, taxidermy technician, Museu de História Natural, Universidade Eduardo Mondlane, Maputo, Mozambique.

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ANNEX 1b. Participants on Mt Namuli expedition, Nov 2007.

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Katrina Cook, bird collector/ taxidermist, Natural History Museum, Tring, UK.

Francoise Dowsett-Lemaire, ornithologist/ ecologist, Suméne, France.

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Tim Harris, Herbarium, RBG Kew, London, UK.

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ANNEX 2. Plant checklist for Mt Namuli above 1300 m (above 1000 m on western side).

T-tree; S-shrub; H-herb; c-climber; ep-epiphyte. Altitudinal ranges rounded to nearest 10m.

Family	Name	L/F	Altitude	Habitat	Notes
PTERIDOPHYTA					
Aspleniaceae	Asplenium dregeanum *Kunze*	ep	1850	montane forest	
Aspleniaceae	Asplenium mannii *Hook.*	ep	1880	montane forest	
Aspleniaceae	Asplenium megalura *Hieron.*	ep	1870	forest/grassland margin	
Aspleniaceae	Asplenium rutifolium *(Bergius) Kunze*	H	1880	montane forest patch	
Aspleniaceae	Asplenium sandersonii *Hook.*	H	1880	montane forest	
Aspleniaceae	Asplenium stuhlmannii *Hieron.*	ep	1880	montane forest	
Blechnaceae	Blechnum tabulare *(Thunb.) Kuhn*	H	1860	forest margin	
Cyatheaceae	Cyathea dregei *Kunze.*	T	1970	grassland	
Cyatheaceae	Cyathea manniana *Hook.*	T	1890	grassland	
Dennstaedtiaceae	Pteridium aquilinum *(L.) Kuhn* subsp. aquilinum	H	1800	grassland, forest margin	
Dryopteridaceae	Dryopteris inaequalis *(Schltend.) Kuntze*	H	1890	woodland margin	
Hymenophyllaceae	Hymenophyllum kuhnii *C.Chr.*	H	1900	montane forest	
Hymenophyllaceae	Hymenophyllum sibthorpioides *(Willd.) Kuhn*	ep	1830	montane forest	
Lomariopsidaceae	Elaphoglossum acrostichoides *(Hook.& Grev.) Schelpe*	H	2050	rock outcrop	
Lycopodiaceae	Huperzia dacrydioides *(Baker) Pic.Serm.* subsp. dacrydioides	ep	1590-1870	riverine & montane forest	previously Lycopodium
Lycopodiaceae	Huperzia ophioglossoides *(Lam) Rothm.*	ep	1870	montane forest	previously Lycopodium
Lycopodiaceae	Huperzia verticillata *(Lf.) Trevis.*	ep	1870	montane forest	previously Lycopodium
Lycopodiaceae	Selaginella sp. - not matched	H	1860	grassland	
Marattiaceae	Marattia fraxinea *J.F.Gmel.* var. salicifolia *(Schrad.) C.Chr.*	H	1890	montane forest	
Oleandraceae	Nephrolepis undulata *(Sw.) J.Sm.*	H	1910	rock outcrop	
Oleandraceae	Oleandra distenta *Kunze*	H	1620	montane forest	
Polypodiaceae	Loxogramme abyssinica *(Baker) Price*	ep	1880	montane forest	
Polypodiaceae	Pleopeltis macrocarpa *(Willd.) Kaulf.*	ep	1880	forest/grassland margin	
Vittariaceae	Vittaria isoetifolia *Bory*	H	2020	montane forest patch	
GYMNOSPERMS					
Podocarpaceae	Podocarpus milanjianus *Rendle*	T	1810-1870	montane forest	
MONOCOTYLEDONS					
Aloaceae	Aloe mawii *Christian*	H	1860-1950	rocky outcrop	

Family	Name	L/F	Altitude	Habitat	Notes
Aloaceae	Aloe torrei *I.Verd.& Christian*	H	1500-1600	rocky grassland	Namuli endemic. Not collected in 2007
Amaryllidaceae	Cyrtanthus welwitschii *Baker*	H	1030-1970	grassland	1st record for Moz
Anthericaceae	Chlorophytum paucinervatum *(Poelln.) Nordal*	H	1870	rocky grassland	
Anthericaceae	Chlorophytum sphacelatum *(Baker) Kativu* subsp. milanjianum *(Rendle) Kativu*	H	1880	montane forest	
Anthericaceae	Chlorophytum stolzii *(K.Krause) Kativu*	H	1870-1900	rocky grassland	
Asphodelaceae	Kniphofia splendida *E.A.Bruce*	H	1860-1890	grassland, forest margin	1st record for Moz
Behniaceae	Behnia reticulata *(Thunb.) Didr.*	c	1750-1980	forest	
Commelinaceae	Aneilema hockii *De Wild.*	H	1840	grassland	
Commelinaceae	Commelina africana *L.*	H	1870-1900	rock outcrop	
Commelinaceae	Cyanotis lanata *Benth.*	H	1340	rock outcrop	
Commelinaceae	Cyanotis speciosa *Hassk.*	H	1840-1960	grassland	
Commelinaceae	Murdannia simplex *(Vahl) Brenan*	H	1180-1860	woodland, grassland	
Dracaenaceae	Dracaena laxissima *Engl.*	H	1840-1890	montane forest	
Eriocaulaceae	Eriocaulon zambesiense *Ruhland*	H	1870	grassland	1st record for Moz
Hyacinthaceae	Drimia calcarata *(Baker) Stedje*	H	2000	rocky grassland	1st record for Moz Z:
Hyacinthaceae	Merwillia lazulina *(Wild) Speta*	H	1600-2030	rocky grassland, rock outcrop	
Hypoxidaceae	Hypoxis nyasica *Baker*	H	1810-1900	rocky grassland	
Iridaceae	Aristea ecklonii *Baker*	H	1840-1860	grassland, streamside	
Iridaceae	Crocosmia aurea *(Hook.) Planch* subsp. aurea	H	1720-1890	montane forest	
Iridaceae	Dierama formosum *Hilliard*	H	2000	forest margins	
Iridaceae	Dietes iridioides *(L.) Klatt*	H	1160	riverside	
Iridaceae	Gladiolus atropurpureus *Baker*	H	1350	grassland	
Iridaceae	Gladiolus crassifolius *Baker*	H	1870	rocky grassland	
Iridaceae	Gladiolus dalenii *Van Geel* var. dalenii	H	1870	grassland	
Iridaceae	Gladiolus zimbabweensis *Goldblatt*	H	1850	grassland	1st record for Moz Z:
Iridaceae	Moraea schimperi *(Hochst.) Pic.Serm.*	H	1620	rocky grassland	
Juncaceae	Juncus lomatophyllus *Spreng.*	H	1870	swamp	
Orchidaceae	Angraecopsis parviflora *(Thouars) Schltr.*	H	1800	forest	Type locality
Orchidaceae	Bulbophyllum scaberulum *(Rolfe) Bolus*	ep	1250	forest patch	
Orchidaceae	Disa welwitschii *Rchb.f.*	H	1790-1820	grassland	
Orchidaceae	Epipactis africana *Rendle*	H	1750	forest patch, regenerating	1st record for Moz
Orchidaceae	Eulophia horsfallii *(Bateman) Summerh.*	H	1620	forest	
Orchidaceae	Eulophia milnei *Rchb.f.*	H	1880	grassland	

Family	Name	L/F	Altitude	Habitat	Notes
Orchidaceae	Eulophia speciosa *(Lindl.) Bolus*	H	1600	grassland	
Orchidaceae	Eulophia streptopetala *Lindl.*	H	1310	grassland	
Orchidaceae	Eulophia zeyheri *Hook.f.*	H	1950	grassland/forest patch edge	
Orchidaceae	Habenaria malacophylla *Rchb.f.*	H	1570	forest	
Orchidaceae	Herschelianthe baurii *(Bolus) Rauschert*	H	1850-2090	grassland	
Orchidaceae	Jumellea usambarensis *J.J.Wood*	ep	1840-2000	grassland	1st record for Moz?
Orchidaceae	Polystachya transvaalensis *Schltr.*	ep	1870	montane forest	1st record for Moz?
Orchidaceae	Polystachya zambesiaca *Rolfe*	H	1880	riparian forest	
Orchidaceae	Roeperocharis bennettiana *Rchb.f.*	H	1880	grassland	1st record for Moz?
Orchidaceae	Satyrium breve *Rolfe*	H	1870	grassland	
Orchidaceae	Satyrium chlorocarys *Rolfe*	H	1890-2010	seepage areas	
Orchidaceae	Satyrium neglectum *Schltr.*	H	1690	grassland	
Poaceae	Alloeochaete namuliensis *Chippind.*	H	1850-2060	rocky grassland	Namuli endemic
Poaceae	Andropogon eucomus *Nees* subsp. huillensis *(Rendle) Sales*	H	1860	grassland	
Poaceae	Andropogon schirensis *Hochst.*	H	1820	grassland	
Poaceae	Digitaria maitlandii *Stapf & C.E.Hubb.*	H	1890-1970	grassland/woodland	
Poaceae	Eragrostis nindensis *Ficalho & Hiern*	H	1890	grassland	
Poaceae	Eragrostis racemosa *(Thumb.) Steud.*	H	1860	grassland	
Poaceae	Eragrostis volkensii *Pilg.*	H	1990	grassland	
Poaceae	Eriochrysis pallida Munro	H	1880	grassland	
Poaceae	Exotheca abyssinica *Anderss.*	H	1870	grassland	
Poaceae	Festuca costata Nees	H	1840	rocky grassland	
Poaceae	Heliotrichon milanjianum *(Rendle) C.E.Hubb.*	H	1740-1850	grassland, forest margin	
Poaceae	Hyparrhenia cymbaria *Stapf*	H	1540	grassland	
Poaceae	Hyparrhenia sp.	H	1170-1520	grassland	
Poaceae	Loudetia simplex *(Nees) C.E.Hubb.*	H	1790-1860	grassland	
Poaceae	Melinis repens *(Willd.) Zizka*	H	1860	rocky grassland	
Poaceae	Panicum cf. inaequilatum *Stapf & C.E.Hubb.*	H	1970	wet grassland	
Poaceae	Panicum wiehei *Renvoize*	H	1880	montane forest	1st record for Moz?
Poaceae	Panicum sp.	H	1810	forest margin	
Poaceae	Pennisetum unisetum *(Nees) Benth.*	H	1870	montane forest	
Poaceae	Phacelurus schliebenii *(Pilg.) Clayton*	H	1860	grassland	
Poaceae	Rhytachne rottboellioides *Ham.*	H	1860	wet grassland	
Poaceae	Rytidosperma davyi *(C.E.Hubb.) Cope*	H	1830-1850	wet rock outcrops, forest margin	

Family	Name	L/F	Altitude	Habitat	Notes
Poaceae	Setaria sphacelata *(Schumach.) Moss*	H	1860-2060	grassland, rocky grassland	
Poaceae	Sporobolus mauritianus *(Steud.) T.Durand & Schinz*	H	1960	wet grassland	Poaceae
Poaceae	Spoprobolus pyramidalis *P.Beauv.*	H	1960	forest gap	Poaceae
Poaceae	Stereochlaena cameronii *(Stapf) Pilg.*	H	1860	grassland	
Poaceae	Themeda triandra *Forssk.*	H	1280-1900	grassland	
Restionaceae	Restio mahonii *(N.E.Br.) Pillans*	H	1880	rocky grassland	1st record for Moz
Smilacaceae	Smilax anceps *Willd.*	c	1420	bushland	
Velloziaceae	Xerophyta kirkii *(Hemsl.) L.B.Smith & Ayensu*	H	1620-1920	rocky outcrop in grassland	
Velloziaceae	Xerophyta splendens *(Rendle) N.L.Menzes*	H	1670	rocky outcrop in grassland	1st record for Moz. Previously thought to be Mulanje endemic
Velloziaceae	Xerophyta viscosa *Baker*	H	1910-1980	rocky outcrop in grassland	1st record for Moz
Xyridaceae	Xyris congensis *Büttner*	H	1870	grassland seepages	1st record for Moz Z:
Xyridaceae	Xyris makuensis *N.E.Br.*	H	1890	grassland seepages	Type locality. Confined to Namuli & Mulanje?
Xyridaceae	Xyris peteri *Pollen.*	H	1810-1860	grassland seepages	1st record for FZ area
Zingiberaceae	Aframomum alboviolaceum *(Ridley) K.Schum.*	H	1030	slopes	
DICOTYLEDONS					
Acanthaceae	Anisotes pubinervis *(T.Anderson) Heine*	H	1730	montane forest	
Acanthaceae	Asystasia gangetica *(L.) T.Anderson*	H	1300	grassland	
Acanthaceae	Asystasia malawiana *Brummitt & Chisumpa*	H	1730	forest margins	1st record for Moz
Acanthaceae	Brachystephanus africanus *S.Moore*	H	1720-1740	montane forest	1st record for Moz
Acanthaceae	Hypoestes aristata *(Vahl) Roem.& Schult.*	H	1860	grassland	
Acanthaceae	Isoglossa sp.	H	1890	montane forest	new species?
Acanthaceae	Justicia striata *(Klotzsch) Bullock*	H	1870	montane forest & margins	
Acanthaceae	Mimulopsis solmsii *Schweinf.*	H	1850	montane forest & margins	
Acanthaceae	Sclerochiton hirsutus *Vollesen*	H			Namuli endemic. Not collected in 2007
Amaranthaceae	Achyranthes aspera *L.*	H	1830-1940	montane forest & margins	
Amaranthaceae	Cyathula cylindrica *Moq.*	H	1870	forest margins	
Anacardiaceae	Rhus acuminatissima *R.& A.Fernandes*	S/T	1980	grassland	
Anacardiaceae	Rhus sp.	S	1660	montane forest	
Annonaceae	Annona senegalensis *Pers.*	T	1280	woodland	
Apiaceae	Alepidea peduncularis *A.Rich.*	H	1580-1830	grassland	
Apiaceae	Heteromorpha arborescens *(Spreng.) Cham.& Schltdl.* var. montana *P.J.D.Winter*	S/T	1710-1780	grassland	
Apiaceae	Lefebvrea grantii *(Hiern) Droop*	H	1850	grassland seepages	

Family	Name	L/F	Altitude	Habitat	Notes
Apiaceae	Peucedanum eylesii *Norman*	H	1850	grassland	
Apiaceae	Peucedenum nyassicum *H.Wolff*	H	1860-1890	rocky grassland	but close to P. eylesii
Apiaceae	Pimpinella mulanjensis *C.C.Towns.*	H	1890-1920	rocky grassland	1st record for Moz. Previously thought to be Mulanje endemic
Apocynaceae	Carissa bispinosa *(L.) Brenan* subsp. zambesiensis *Kupicha*	S/T	1720-1880	montane forest, riverine forest	
Apocynaceae	Carvalhoa campanulata *K.Schum.*	S	1300	bushland	
Apocynaceae	Mussaenda arcuata *Poir*	c	1060	riverine forest	
Apocynaceae	Tabernaemontana stapfiana *Britton*	T	1610-1830	montane forest & patches	
Aquifoliaceae	Ilex mitis *(L.) Radlk.*	T	1720-1990	forest margins, streambanks	
Araliaceae	Cussonia spicata *Thunb.*	T	1980	forest margins	
Araliaceae	Polyscias fulva *(Hiern) Harms*	T	1590	forest margins	
Araliaceae	Schefflera goetzenii *Harms*	T	1460-1840	forest margins	
Araliaceae	Schefflera umbellifera *(Sond.) Baill.*	T	1870	montane forest patch	
Asclepiadaceae	Sarcostemma mulanjense *Liede & Meve*	H	1340	rock outcrop	
Asclepiadaceae	Sarcostemma viminale *(L.) R.Br.*	H	1340	rocky woodland	
Asclepiadaceae	Secamone alpini *Schult.*	H	1820	montane forest patch	
Asclepiadaceae	Trachycalymma cristatum *(Decne.) Bullock*	H	1860-1880	forest margin, grassland	
Asclepiadaceae	Xysmalobium undulatum *(L.) Aiton f.*	H	1730	grass patch in forest	
Asteraceae	Ageratum conyzoides *L.*	H	1870	forest margins	
Asteraceae	Anisopappus chinensis *(L.) Hook.& Arn.* var. buchwaldii *(O.Hoffm.) S.Ortíz, Paiva & Rodr.Oubiña* var. dentatus *(DC.) S. Ortiz, Paiva & Rodr.-Oubiña*	H	1870	rocky grassland	
Asteraceae	Anisopappus kirkii *(Oliv.) Brenan*	S	1830	forest margin	
Asteraceae	Bothriocline cf. glomerata *(O.Hoffm.& Muschl.) C.Jeffrey*	H	1610	river margin	1st record for FZ; large range extension
Asteraceae	Bothriocline longipes *(Oliv.& Hiern) N.E.Br.*	H	1870	grassland	
Asteraceae	Crassocephalum crepidioides *(Benth.) S.Moore*	H	1870-1890	rock outcrop	
Asteraceae	Crassocephalum montuosum *(S.Moore) Milne-Redh.*	H	1900	montane forest	
Asteraceae	Crassocephalum rubens *(Jacq.) S.Moore*	H	1900	rock outcrop	
Asteraceae	Emilia decipiens *C.Jeffrey*	H	1940	rock outcrop	
Asteraceae	Gerbera viridifolia *(DC.) Sch.Bip.*	H	1940-1960	grassland	
Asteraceae	Helichrysum adenocarpum *DC.*	H	1870	grassland	
Asteraceae	Helichrysum buchananii *Engl.*	H	1860-1920	grassland	
Asteraceae	Helichrysum sulphureofuscum *Baker*	H	1860-1940	grassland	
Asteraceae	Lactuca inermis *Forssk.*	H	1680	grassland	
Asteraceae	Senecio erubescens *Aiton*	H	1840-1860	grassland	
Asteraceae	Senecio milanjianus *S.Moore*	H	1920	rocky grassland	

Family	Name	L/F	Altitude	Habitat	Notes
Asteraceae	Senecio peltophorus *Brenan*	H	1840-2070	grassland & rock outcrops	1st record for Moz. Previously thought to be Mulanje endemic
Asteraceae	Senecio picridifolium *(DC.) S.Moore*	H	1860	forest margin	
Asteraceae	Senecio tabulicola *Baker*	H	1860	grassland	
Asteraceae	Solanecio mannii *(Hook.f.) C.Jeffrey*	S	1370	forest margin	
Asteraceae	Tagetes minuta *L.*	H	1870	forest margin	
Asteraceae	Tolpis capensis *(L.) Sch.Bip.*	H	1870	grassland	
Asteraceae	Vernonia natalensis *Walp.*	H	1390	grassland	
Asteraceae	Vernonia wollastonii *S.Moore*	S	1850	forest by river	
Balsaminaceae	Impatiens oreocallis *Launert*	H	1800	forest margin	
Balsaminaceae	Impatiens sylvicola *Burtt Davy*	H	1734-1960	forest margin, streambank	
Balsaminaceae	Impatiens zombensis *Baker*	H	1800	forest margin	
Balsaminaceae	Impatiens sp. - not matched	H	1860	grassland	
Bignoniaceae	Tecomaria capensis *(Thunb.) Spach* subsp. capensis	S/T	1620-1830	forest margin, rock outcrop	
Cactaceae	Rhipsalis baccifera *(J.Mill) W.T.Stearn*	ep	1030	forest	
Campanulaceae	Cyphia lasiandra *Diels*	H	1890-1940	rock outcrop	
Campanulaceae	Lobelia blantyrensis *E.Wimmer*	H	1940	rock outcrop	2nd collection for Moz
Campanulaceae	Lobelia goetzei *Diels*	H	1840-1900	rocky grassland	
Campanulaceae	Lobelia trullifolia *Hemsl.* subsp. trullifolia	H	1865	rock outcrop	
Campanulaceae	Wahlenbergia abyssinica *(A.Rich.) Thulin*	H	1350	rock outcrop	
Campanulaceae	Wahlenbergia virgata *Engl.*	H	1970-1980	grassland	
Celastraceae	Maytenus acuminata *(L.f.) Loes.* var. acuminata	T	1720-1890	montane forest & forest patch	
Celastraceae	Maytenus undata *(Thunb.) Blakelock*	T	1720-1840	montane forest & forest patch	
Celastraceae	Mystroxylon aethiopicum *(Thunb.) Loes.*	T	1620-1850	montane forest	
Celastraceae	Pterocelastrus echinatus *N.E.Br.*	T	1720-1900	montane forest	
Chrysobalanaceae	Parinari curatellifolia *Benth.*	T	1280	woodland	
Chrysobalanaceae	Parinari excelsa *Sabine*	T	1040	riverine woodland	
Clusiaceae	Garcinia kingaensis Engl.	T	1570-1835	montane forest	
Clusiaceae	Harungana madagascariensis Poir.	S	1310	bushland	
Clusiaceae	Hypericum peplidifolium *A.Rich.*	H	1950	grassland	
Clusiaceae	Psorospermum febrifugum *Spach*	T	1520	woodland	
Convolvulaceae	Cuscuta cassytoides *Engelm.*	c	1800	grassland clearing	
Convolvulaceae	Ipomoea involucrata *Beauv.* var. operosa *(C.H.Wright) Verdc.*	H	1860	rock outcrop	
Crassulaceae	Crassula globularioides *Britten*	H	1830-2060	rock outcrop	1st record for Moz

Family	Name	L/F	Altitude	Habitat	Notes
Crassulaceae	Crassula sarcocaulis *Eckl.& Zeyh.*	H	1740	rock outcrop in grassland	
Crassulaceae	Crassula setulosa *Harv.*	H	2120	rock outcrop in grassland	
Crassulaceae	Crassula schimperi *Fisch.& Mey.* subsp. transvaalensis *(Kuntze) R.Fern.* var. denticulata *(Brenan) R.Fern.*	H	2080	rock outcrop in grassland	
Cucurbitaceae	Oreosyce africana *Hook.f.*	c	1860-1890	grassland	
Cucurbitaceae	Peponium vogelii *(Hook.f.) Engl.*	c	1380-1760	disturbed areas	
Dipsacaceae	Cephalaria pungens *Szabo*	H	1850	streambank	
Droseraceae	Drosera dielsiana *Exell & Laundon*	H	1813	seepage areas	
Ebenaceae	Diospyros mespiliformis *A.DC.*	T	1040	riverine forest	
Ebenaceae	Diospyros whyteana *(Hiern) F.White*	S/T	1980-2000	montane forest	
Ebenaceae	Euclea crispa *(Thunb.) Gürke* subsp. crispa	S	1940	rocky grassland	
Ericaceae	Agauria salicifolia *(Lam.) Oliv.*	T	1830	montane forest margins	
Ericaceae	Erica benguelensis *(Engl.) E.G.H.Oliver* var. benguelensis	S/T	1890-1930	grassland & forest margin	
Ericaceae	Erica hexandra *(S.Moore) E.G.H.Oliver*	S	1870	montane forest patch	previously Phillipia
Ericaceae	Erica mannii *(Hook.f.) Beentje* subsp. usambarensis *(Alm & T.C.E.Fr.) Beentje*	S/T	1840	rock outcrop in forest	
Ericaceae	Erica pleiotricha *S.Moore*	S	2120	rock outcrop	1st record for Moz Z: VUD2 in Sabonet Red Data List
Ericaceae	Erica silvatica *(Engl.) Beentje*	H	2120	rock outcrop in grassland	1st record for Moz
Ericaceae	Erica simii *(S.Moore) E.G.H.Oliver*	S	2060	rock outcrop in grassland	
Erythroxylaceae	Erythroxylum emarginatum *Thonn.*	T	1720-1750	montane forest	
Escalloniaceae	Choristylis rhamnoides *Harv.*	S	1880	riverine forest margin	
Euphorbiaceae	Acalypha welwitschiana *Müll.Arg.*	S	1850	forest margins	
Euphorbiaceae	Alchornea hirtella *Benth.* forma glabrata *(Prain) Pax & K.Hoffm.*	S/T	1720-1870	montane forest	
Euphorbiaceae	Antidesma vogelianum *Müll.Arg.*	S/T	1460	riverine forest	
Euphorbiaceae	Bridelia micrantha *(Hochst.) Baill.*	T	1540-1750	montane forest & grassland	
Euphorbiaceae	Clutia abyssinica *Jaub.& Spach* var. abyssinica	H	2030	rock outcrop	
Euphorbiaceae	Drypetes gerrardii *Hutch.* var. grandifolia *Radcl.-Sm.*	S/T	1730-1850	montane forest	1st record of var. for Moz
Euphorbiaceae	Erythrococca polyandra *(Pax & K.Hoffm.) Prain*	S	1940	montane forest	
Euphorbiaceae	Erythrococca trichogyne *(Müll.Arg.) Prain* var. trichogyne	T	1730	montane forest	
Euphorbiaceae	Euphorbia depauperata *A.Rich.*	H	1860-1980	grassland	
Euphorbiaceae	Euphorbia namuliensis *Bruyns.*	H	800-1500	rock outcrop	Namuli endemic. Not collected in 2007
Euphorbiaceae	Macaranga capensis *(Baill.) Sim*	T	1040-1370	riverine forest	
Euphorbiaceae	Macaranga mellifera *Prain*	T	1710-1900	montane forest & patch	
Euphorbiaceae	Phyllanthus leucanthus *Pax*	H	1900	rocky grassland	
Fab: Caesalpinioideae	Brachystegia spiciformis *Benth.*	S	1666	grassland	

Family	Name	L/F	Altitude	Habitat	Notes
Fab: Caesalpinioideae	Chamaecrista stricta *E.Mey*	H	1870	forest margins	
Fab: Caesalpinioideae	Chamaecrista sp.	H	1890	rock outcrop	
Fab: Caesalpinioideae	Senna singueana *(Delile) Lock*	S	1280	woodland	
Fab: Mimosoideae	Albizia adianthifolia *(Schumach.) W.F.Wight*	T	1490	moist forest, cultivated fields	
Fab: Mimosoideae	Albizia gummifera *(J.F.Gmel.) C.A.Sm.*	T	1540-1840	montane forest	
Fab: Mimosoideae	Newtonia buchananii *(Baker) G.C.C.Gilbert & Boutique*	T	1000	riverine forest	
Fab: Papilionoideae	Aeschynomene sp.	S	1870	forest margins	
Fab: Papilionoideae	Argyrolobium rupestre (E.Mey.) Walp. subsp. aberdaricum (Harms) Polhill	H	1950	grassland	1st record for Moz
Fab: Papilionoideae	Craibia brevicaudata *(Vatke) Dunn* subsp. baptistarum *(Büttner) J.B.Gillett*	T	1130	riverine forest	
Fab: Papilionoideae	Crotalaria caudata *Baker*	H	1880	grassland	
Fab: Papilionoideae	Crotalaria cleomifolia *Baker*	H	1320	rock outcrop	
Fab: Papilionoideae	Crotalaria goetzei *Harms*	S/T	1400-1930	montane forest & margins, grassland	
Fab: Papilionoideae	Crotalaria lachnocarpoides *Engl.*	H	1670	rocky grassland	
Fab: Papilionoideae	Crotalaria lanceolata *E.Mey.* cf. subsp. prognatha *Polhill*	H	1670-1870	grassland	
Fab: Papilionoideae	Crotalaria lanceolata *E.Mey.* subsp. exigua Polhill	H	1880	grassland	
Fab: Papilionoideae	Crotalaria natalita *Meisner* var. rutshuruensis *De Wild.*	H	1220	disturbed woodland	
Fab: Papilionoideae	Crotalaria sp. nov. near C. argyrolobioides *Baker*	H	1820-1920	grassland & rock outcrops	New species; Namuli endemic
Fab: Papilionoideae	Crotalaria spartea *Baker*	H	1610	grassland seepage area	
Fab: Papilionoideae	Crotalaria stolzii *(Baker f.) Polhill*	H	1842	grassland	
Fab: Papilionoideae	Crotalaria torrei *Polhill*	H	1830-1900	grassland & forest margins	Namuli endemic
Fab: Papilionoideae	Desmodium setigerum *(E.Mey.) Benth.*	H	1040	riverbank	
Fab: Papilionoideae	Erythrina abyssinica *Lam.*	T	1420	grassland	
Fab: Papilionoideae	Erythrina latissima *E.Mey.*	T	1280	grassland	
Fab: Papilionoideae	Indigofera sp. nov. near I. longipedicellata *J.B.Gillett*	H	1410	grassland	New species?
Fab: Papilionoideae	Indigofera lyallii *Baker* subsp. nyassica *J.B.Gillett*	S	1340-2010	rock outcrop	
Fab: Papilionoideae	Kotschya recurvifolia *(Taub.) F.White* subsp. recurvifolia	S	1850-2050	rocky grassland, forest margins, shrubland	1st record for Moz
Fab: Papilionoideae	Lotus namuliensis *Brand*	H	1980	rocky grassland	Type locality
Fab: Papilionoideae	Millettia lasiantha *Dunn*	c	1030	woodland slopes	
Fab: Papilionoideae	Mucuna poggei *Taub.* var. pesa *(De Wild.) Verdc.*	c	1210	disturbed areas	
Fab: Papilionoideae	Rhynchosa clivorum *S.Moore* subsp. gurueensis *Verdc.*	H/S	1900	river margin	Namuli endemic. Not collected in 2007
Fab: Papilionoideae	Rhynchosa torrei *Verdc.*	H/S	1840-2130	rocky grassland	Namuli endemic; 2nd collection
Fab: Papilionoideae	Sesbania macrantha *E.Phillips & Hutch.* var. macrantha	H	1540	grassland	
Fab: Papilionoideae	Tephrosia aequilata *Baker*	S	1840-2100	forest margins, rock outcrop	

Family	Name	L/F	Altitude	Habitat	Notes
Fab: Papilionoideae	Tephrosia vogelii *Hook.f.*	H/S	1220-1420	disturbed areas	
Fab: Papilionoideae	Tephrosia whyteana *Baker f.* subsp. gemina *Brummitt*	S	?		Namuli endemic. Not collected in 2007
Fab: Papilionoideae	Vigna gazensis *Baker f.*	H	1830-1840	forest margins	
Fab: Papilionoideae	Vigna vexillata *(L.) A.Rich.* var. vexillata	H	1400	slopes	
Flacourtiaceae	Aphloia theiformis *(Vahl.) Benn.*	T	1710-1860	grassland, forest margins	
Flacourtiaceae	Gerrardina eylesiana *Milne-Redh.*	S	1840	rocky slopes	
Flacourtiaceae	Rawsonia lucida H*arv.& Sond.*	S/T	1460-1840	montane forest & margins, riverine forest	
Gentianaceae	Exacum zombense N.*E.Br.*	H	1890-1920	rocky grassland	
Gentianaceae	Sebaea longicaulis *Schinz*	H	1855	forest margins	
Gentianaceae	Swertia curtioides *Gilg*	H	1860-1880	seepage area	
Geraniaceae	Geranium arabicum *Forssk.*	H	1750-2080	forest margins, shrubland	
Gesneriaceae	Streptocarpus goetzei *Engl.*	H	1490-1880	montane forest, rock outcrops	
Gesneriaceae	Streptocarpus hirtinervis *C.B.Cl.*	H	2100	rock outcrops	
Haloragaceae	Laurembergia tetrandra *(Schott) Kanitz*	H	1880-1890	grassland seepages	
Hamamelidaceae	Trichocladus ellipticus *Eckl.& Zeyh.* subsp. malosanus *(Baker) Verdc.*	T	1460	riverine forest	
Hydrostachyaceae	Hydrostachys polymorpha *Klotzsch*	H	1030	river bed	
Icacinaceae	Apodytes dimidiata *E.Mey.*	T	1710-1720	forest margins	
Lamiaceae	Aeollanthus buchnerianus *Briq.*	H	1330-1950	rocky grassland	
Lamiaceae	Aeollanthus serpiculoides *Baker*	H	1720	rocky grassland	
Lamiaceae	Aeollanthus subacaulis *(Baker) Hua & Briq.* var. linearis *Ryding*	H	1890-1900	grassland	
Lamiaceae	Aeollanthus ukamensis *Gürke*	H	1340	grassland	
Lamiaceae	Clerodendrum cephalanthum *Oliv.*	S	1620-1830	montane forest	
Lamiaceae	Haumaniastrum villosum *(Benth.) A.J.Paton*	H	1900	rocky grassland	
Lamiaceae	Leucas milanjiana *Gürke*	H	1250	forest patch	1st record for Moz Z:
Lamiaceae	Micromeria imbricata *(Forssk.) C.Chr.* var. imbricata	H	1680-1940	grassland	1st record for Moz
Lamiaceae	Ocimum obovatum *Benth.*	H	1950	grassland	
Lamiaceae	Platostoma rotundifolium *(Briq.) A.J.Paton*	H	1730	forest margins	1st record for Moz Z:
Lamiaceae	Plectranthus alboviolaceus *Gürke*	H	1800	forest margins	
Lamiaceae	Plectranthus guruensis *A.J.Paton*	H	1030	riverside	Namuli endemic
Lamiaceae	Plectranthus laxiflorus *Benth.*	H	1750-1870	montane forest patch	
Lamiaceae	Plectranthus mandalensis *Baker*	H	1800-1860	montane forest	1st record for Moz. Previously thought to be Mulanje endemic
Lamiaceae	Plectranthus pubescens *Baker*	H	1860-1940	grassland, shrubland	
Lamiaceae	Plectranthus sanguineus *Britten*	H	2100-2120	rocky grassland	

Family	Name	L/F	Altitude	Habitat	Notes
Lamiaceae	Plectranthus stenosiphon *Baker*	H	1180-1840	rock outcrop	
Lamiaceae	Pycnostachys urticifolia *Hook.*	H	1790	montane forest	
Lamiaceae	Stachys aethiopica *L.*	H	1990	montane forest margins	
Lamiaceae	Stachys didymantha *Brenan*	H	1980-2130	rock outcrop, shrubland	1st record for Moz. Previously thought to be Mulanje endemic
Lamiaceae	Tetradenia galpinii *(N.E.Br.) Phillipson & C.F.Steyn*	S/T	1850	montane forest margins	
Lamiaceae	Tetradenia riparia *(Hochst.) Codd*	S/T	1660-1920	grassland, rocky outcrop	
Lamiaceae	Vitex payos *(Lour.) Merr.*	T	1350	grassland	
Lauraceae	Cryptocarya liebertiana *Engl.*	T	1690-1750	montane forest	
Lauraceae	Ocotea kenyensis *(Chiov.) Robyns & Wilczek*	T	?		
Loganiaceae	Anthocleista grandiflora *Gilg*	T	1530-1600	montane forest margins	
Loganiaceae	Buddleja salviifolia *(L.) Lam.*	S	1890-2060	montane forest margins, shrubland	
Loganiaceae	Mostuea brunonis *Didr.* var. brunonis	S	1710	montane forest margins	
Loganiaceae	Nuxia congesta *Fresen*	S/T	1840-1970	forest margins	
Loganiaceae	Strychnos spinosa *Lam.*	S/T	1280-1520	grassland	
Loganiaceae	Strychnos usambarensis *Gilg.*	c	1590	forest	
Loranthaceae	Actinanthella menyharthii *(Schinz) Balle*	ep	1570	montane forest margin	
Loranthaceae	Englerina inaequilatera *(Engl.) Gilli*	ep	1870-1890	montane forest	1st record for Moz Z:
Loranthaceae	Englerina kwaiensis *(Engl.) Polhill & Wiens*	ep	1720-1850	montane forest	1st record for Moz
Loranthaceae	Englerina sp. nov. near E. longiflora	ep	1700	montane forest	Suspected new species
Loranthaceae	Erianthemum schelei *Tiegh.*	ep	1870	forest streamside	1st record for Moz
Loranthaceae	Helixanthera cf. verruculosa *Wiens & Polhill*	ep	1570	montane forest margin	uncertain i/d. If correct, 1st record for FZ
Malvaceae	Pavonia columella *Cav.*	H	1850-2040	rock outcrop & forest patch	
Melastomataceae	Antherotoma naudinii *Hook f.*	H	1600-1910	rock outcrop in grassland	
Melastomataceae	Dissotis phaeotricha *(Hochst.) Hook.f.* var. phaeotricha	H	1710	grassland	
Melastomataceae	Dissotis princeps *(Kunth) Triana*	S	1880	rocky grassland	
Meliaceae	Ekebergia capensis *Sparrm.*	T	1820-2000	forest margin	7 leaflet pairs; E. capensis 4-5(6)
Melianthaceae	Bersama abyssinica *Fresen.*	T	1740-1840	montane forest & margins	
Molluginaceae	Corrigiola drymarioides *Baker f.*	H	1920	rock outcrops, shrubland	
Monimiaceae	Xymalos monospora *(Harv.) Warb.*	T	1620	forest	
Moraceae	Ficus ingens *(Miq.) Miq.*	T	1540	rocky grassland	
Moraceae	Ficus natalensis *Hochst.*	T	1190	rock outcrop	
Moraceae	Myrianthus holstii *Engl.*	T	1760	montane forest	
Myricaceae	Morella pilulifera *(Rendle) Killick*	S	1710-1870	grassland, montane forest	

Family	Name	L/F	Altitude	Habitat	Notes
Myricaceae	Morella serrata *(Lam.) Killick*	S/T	1880	montane forest patch	
Myrsinaceae	Embelia schimperi *Vatke*	S	1880	montane forest patch	
Myrsinaceae	Maesa lanceolata *Forssk.*	S/T	1240-2000	montane forest	
Myrsinaceae	Myrsine africana *L.*	S	1870-1980	montane forest patches	
Myrsinaceae	Rapanea melanophloes *(L.) Mez*	T	1870-1970	montane forest & margins	
Myrtaceae	Eucalyptus alba *Reinw.*	T	1040-1200	woodland	planted along roads
Myrtaceae	Eugenia capensis *(Eckl.& Zeyh) Sond.* subsp. nyassensis *(Engl.) F.White*	S/T	1570-1870	montane forest	
Myrtaceae	Syzygium cordatum *Krauss*	T	1310-1720	montane forest patch & grassland	
Myrtaceae	Syzygium guineense *(Willd.) DC.* subsp. guineense	T	1720-1870	montane forest patch	
Myrtaceae	Syzygium owariense *(Beauv.) Benth.*	T	1830	montane forest	
Ochnaceae	Ochna holstii *Engl.*	T	1710-1980	montane forest	
Olacaceae	Strombosia scheffleri *Engl.*	T			
Oleaceae	Olea capensis *L.* subsp. macrocarpa *(C.H.Wright) I.Verd.*	T	1620-1710	montane forest	
Oliniaceae	Olinia rochetiana *A.Juss.*	T	1920	montane forest	
Oxalidaceae	Oxalis oblinquifolia *A.Rich.*	H	1720	forest margins	
Oxalidaceae	Oxalis semiloba *Sond.*	H	1200	disturbed areas	
Passifloraceae	Passiflora edulis *Sims*	c	1910	rock outcrop	
Piperaceae	Peperomia retusa *(L.f.) A.Dietr.* var. retusa	H	1860	montane forest	
Piperaceae	Peperomia tetraphylla *(G.Forst.) Hook.& Arn.*	ep	1831	montane forest	
Piperaceae	Piper capense *L.f.* var. capense	H	1730	forest patch	
Pittosporaceae	Pittosporum viridiflorum *Sims*	T	1870-1890	montane forest patch	
Polygalaceae	Polygala adamsonii *Exell*	H	1830-2030	rocky outcrop	
Polygalaceae	Polygala virgata *Thunb.* var. decora *(Sond.) Harv.*	H	1730-1860	forest margin	
Polygonaceae	Rumex abyssinicus *Jacq.*	H	1870	forest margin	
Proteaceae	Faurea racemosa *Farmar*	T	1870	montane forest	
Proteaceae	Faurea saligna *Harv.*	T	1840	montane forest streambank	uncertain i/d
Proteaceae	Faurea wentzeliana *Engl.*	T	1620-1800	montane forest	1st record for Moz
Proteaceae	Protea petiolaris *(Hiern) Baker* subsp. elegans *Chisumpa & Brummitt*	S/T	1870-1950	grassland, rock outcrop	1st record for Moz Z:
Proteaceae	Protea welwitschii *Engl.*	S/T	1660-1950	grassland, forest margin	
Ranunculaceae	Clematis viridiflora *Bertol*	H	1870	montane forest patch	
Ranunculaceae	Thalictrum rhynchocarpum *Dill.& Rich.*	H	1920	montane forest patch	
Rhizophoraceae	Cassipourea malosana *(Baker) Alston*	T	1850-1890	grassland, forest margins	
Rosaceae	Alchemilla kiwuensis *Engl.*	S	?		
Rosaceae	Prunus africana *(Hook.f.) Kalkm.*	T	1990	forest margins	

Family	Name	L/F	Altitude	Habitat	Notes
Rosaceae	Rubus chapmanianus *Kupicha*	S	1760	streamside	
Rosaceae	Rubus pinnatus *Willd.*	S	1890	streamside	
Rubiaceae	Anthospermum welwitschii *Hiern*	H	19201980	rock outcrop, forest margins	
Rubiaceae	Breonadia salicina *(Vahl) Hepper & J.R.I.Wood*	T	1030-1050	riverine forest	
Rubiaceae	Canthium oligocarpum *Hiern*	S/T	1740-1850	montane forest	
Rubiaceae	Chassalia parvifolia *K.Schum.*	S/T	1710-1950	montane forest, streamside	
Rubiaceae	Coffea mufindensis *Bridson* subsp. australis *Bridson*	S	1730	forest margin	
Rubiaceae	Conostomium natalense *(Hochst.) Bremek.*	H	1340	grassland, disturbed areas	possibly Vulnerable
Rubiaceae	Fadogia elskensii *De Wild.* var. elskensii	H	1360	slopes	
Rubiaceae	Hymenodictyon floribundum *(Steud.) B.L.Robinson*	S	1490	forest	
Rubiaceae	Ixora scheffleri *K.Schum.& K.Krause* subsp. scheffleri	T	1720-1890	montane forest & margins	
Rubiaceae	Keetia venosa *(Oliv.) Bridson*	S	1880	rocky slopes	
Rubiaceae	Lasianthus kilimandscharicus *K.Schum.* subsp. glabrescens *Jannerup* var. glabrescens	T	1710-1900	montane forest & patches, rock outcrops	
Rubiaceae	Oldenlandia goreensis *(DC.) Summerh.*	H	2120		
Rubiaceae	Oxyanthus speciosus *DC.* subsp. stenocarpus *(K.Schum) Bridson*	S	1730-1740	montane forest	
Rubiaceae	Pauridiantha paucinervis *(Hiern) Bremek.*	S	1620-1700	montane forest, riverine forest	
Rubiaceae	Pauridiantha symplocoides *(S.Moore) Bremek.*	S	1740-1850	montane forest	
Rubiaceae	Pavetta gurueënsis *Bridson*	H/S	1200-1260	riverine forest	Namuli endemic. Not collected in 2008
Rubiaceae	Pentas zanzibarica *(Klotzsch) Vatke* subsp. milangiana *(Verdc.) Verdc.*	H	1870	forest/grassland margin	
Rubiaceae	Psychotria ealaensis *De Wild.*	c	1890-1940	montane forest	
Rubiaceae	Psychotria zombamontana *(Kuntze) Petit*	S	1840	montane forest	
Rubiaceae	Pyrostria chapmanii *Bridson*	T	2000	montane forest	
Rubiaceae	Rothmannia engleriana *(K.Schum.) Keay*	S			
Rubiaceae	Rutidea fuscescens *Hiern*	c	1040	riverine forest	
Rubiaceae	Rutidea orientalis *Bridson*	S	1720-1890	montane forest, grassland	
Rubiaceae	Rytigynia uhligii *(K.Schum.& K.Krause) Verdc.*	S	1890-1970	montane forest, streamside	
Rubiaceae	Tarenna pavettoides *(Harv.) Sim*	T	1040	slopes	
Rubiaceae	Vangueria infausta *Burch.*	S	1370	forest patch	
Rutaceae	Clausena anisata *(Willd.) Benth.*	S	1590	forest	
Rutaceae	Toddalia asiatica *(L.) Lam.*	c	1690	forest margin	
Rutaceae	Vepris nobilis *(Delile) Mziray*	T	1760	montane forest	
Santalaceae	Osyridicarpus schimperianus *(A.Rich.) A.DC.*	c	1910	rock outcrop	
Sapindaceae	Allophylus chaunostachys *Gilg*	S/ T	1880	montane forest patch	

Family	Name	L/F	Altitude	Habitat	Notes
Sapotaceae	Chrysophyllum gorungosanum *Engl.*	T	1130-1740	montane & riverine forest	
Sapotaceae	Englerophytum magalismontanum *(Sond.) T.D.Penn.*	T	1030-1620	montane & riverine forest	
Sapotaceae	Synsepalum brevipes *(Baker) T.D.Penn.*	T	1070	riverine forest	
Sapotaceae	Synsepalum muelleri *(Kupicha) T.D.Penn*	T	1460-1590	moist forest	
Scrophulariaceae	Alectra sessiliflora *(Vahl) Kuntze*	H	2120	rock outcrop	
Scrophulariaceae	Buchnera lastii *Engl.* subsp. lastii	H	1870-1890	grassland	Type locality
Scrophulariaceae	Diclis tenella *Hemsl.*	H	2100	rock outcrop	
Scrophulariaceae	Gerardiina angolensis *Engl.*	H	1810-1885	seepage area, rock outcrop	
Scrophulariaceae	Halleria elliptica *Thunb.*	S	1840-2010	rock outcrop in grassland	
Scrophulariaceae	Lindernia stictantha *(Hiern) Skan*	H	1730-1870	wet grassland	
Scrophulariaceae	Lindernia whytei *Skan*	H	1860	grassland	
Scrophulariaceae	Sopubia ramosa *(Hochst.) Hochst.*	H	1370-1930	grassland	
Scrophulariaceae	Striga angustifolia *(Don) Saldanha*	H	1900	rock outcrop	
Scrophulariaceae	Torenia thouarsii *(Cham.& Schltdl.) Kuntze*	H	1220	miombo woodland	
Solanaceae	Solanum aculeatissimum *Jacq.*	S	1940	disturbed forest	
Solanaceae	Solanum nigrum *L.*	H	1890	grassland	
Sterculiaceae	Dombya lastii *K.Schum.*	S	?	?	Namuli endemic. Not collected in 2007
Theaceae	Camellia sinensis *(L.) O.Kuntze*	S	1040	riverine forest (planted)	
Thymelaeaceae	Gnidia chapmanii *B.Peterson*	S	1870-2080	rocky outcrop	
Thymelaeaceae	Peddiea fischeri *Engl.*	T	1740-1960	montane forest margins	
Tiliaceae	Sparrmannia ricinocarpa *(Eckl.& Zeyh.) Kunze*	H	1850-1980	montane forest margins	
Ulmaceae	Trema orientalis *(L.) Blume*	T	1370	forest margin	
Urticaceae	Boehmeria macrophylla *Hornem.*	S	1550	montane forest	
Urticaceae	Laportea alatipes *Hook.f.*	H	1950	riverine forest	1st record for Moz
Urticaceae	Pilea rivularis *Wedd.*	H	1860	montane forest streamside	1st record for Moz
Urticaceae	Urera hypselodendron *(A.Rich.) Wedd.*	S/T	1760	forest margins	
Valerianaceae	Valeriana capensis *Thunb.*	H	1980	wet rock outcrop, grassland	
Violaceae	Rinorea angustifolia *(Thouars) Baill.* subsp. myrsinifolia *(Dunkley) Grey-Wilson*	T			
Violaceae	Rinorea ferruginea *Engl.*	T	1570-1750	montane forest	
Violaceae	Viola abyssinica *Oliv.*	H	1840-1950	grassland & forest margin	
Vitaceae	Cyphostemma kilimandscharicum *(Gilg) Descoings*	H	1890	woodland	

ANNEX 3. List of plant species recorded from the Gurué / Namuli area in Flora Zambesiaca, but not listed in Annex 2.

Family	Species	Stated locality	date coll.
PTERIDOPHYTES			
Anemiaceae	Mohria lepigera *(Baker) Baker*	Namuli	1887
Aspleniaceae	Asplenium atroviride *Schelpe*	Namúli	1887
Aspleniaceae	Asplenium blastophorum *Hieron.*	Namúli Mt, R. Licungo	1962
Aspleniaceae	Asplenium friesiorum *C.Chr.*	Namúli	1887
Aspleniaceae	Asplenium lividum *Kuhn*	Serra do Gúruè	1966
Aspleniaceae	Asplenium normale *D.Don*	Namúli	1887
Aspleniaceae	Asplenium preussii *Brause*	Namúli	1887
Aspleniaceae	Asplenium ramlowii *Hieron.*	Namúli Mt	1962
Aspleniaceae	Asplenium theciferum *(Kunth) Mett.* var. concinnum *(Schrad.) Schelpe*	Serra do Gúruè	1966
Blechnaceae	Blechnum attenuatum *(Sw.) Mett.*	Namúli Mt	1962
Blechnaceae	Blechnum ivohibense *C.Chr.*	Serra de Gúruè, R. Namiroé	
Cyatheaceae	Cyathea mossambicensis *Baker*	Namúli	1887
Dennstaedtiaceae	Blotiella natalensis *(Hook.) R.M.Tryon*	Namúli	1887
Dennstaedtiaceae	Hypolepis sparsisora *(Schrad.) Kuhn*	Namuli	1887
Dryopteridaceae	Didymochlaena truncatula *(Sw.) J.Sm.*	Namuli	1887
Dryopteridaceae	Dryopteris athamantica *(Kuntze) Kuntze*	Namúli Mt	1962
Dryopteridaceae	Dryopteris kilemensis (Kuhn) *Kuntze*	Namúli	1887
Dryopteridaceae	Dryopteris manniana (Hook.) *C.Chr.*	Namúli	1887
Dryopteridaceae	Polystichum zambesiacum *Schelpe*	Namúli	1887
Gleicheniaceae	Dicranopteris linearis *(Burm.f.) Underw.*	Namúli Mt, Chà Moçambique	1962
Gleicheniaceae	Gleichenia polypodioides *(L.) Sm.*	Namúli	1887
Hymenophyllaceae	Crepidomanes melanotrichum *(Schltdl.) J.P.Roux*	Namúli Mt	1962
Hymenophyllaceae	Cephalomanes rigidum *(Sw.) K.Iwats.*	Serra de Gúruè	1944
Hymenophyllaceae	Hymenophyllum capense *Schrad.*	Serra de Gúruè	1941
Hymenophyllaceae	Trichomanes erosum *Willd.* var. erosum	Namúli	1887
Lomariopsidaceae	Elaphoglossum chevalieri *Christ*	Namúli	1887
Lomariopsidaceae	Elaphoglossum macropodium *(Fée) Moore*	Namúli Mt	1962
Lomariopsidaceae	Elaphoglossum salicifolium *(Kaulf.) Alston*	Namúli Mt	1962
Lomariopsidaceae	Elaphoglossum spathulatum *(Bory) T.Moore*	Namúli Mt, R. Licungo	1962
Lomariopsidaceae	Lomariopsis warneckei *(Hieron.) Alston*	Namúli	1887
Lycopodiaceae	Lycopodiella cernua *(L.) Pic.Serm.*	Serra de Gúruè, Marrequelo	1944
Oleandraceae	Arthropteris monocarpa *(Cordem.) C.Chr.*	Namúli Mt	1962
Oleandraceae	Arthropteris orientalis *(J.F.Gmel.) Posth.*	Namúli Mt	1962
Osmundaceae	Osmunda regalis *L.*	Namúli Mt	1962
Polypodiaceae	Belvisia spicata *(L.f.) Copel.*	Namúli Mt, R. Licungo	1962
Polypodiaceae	Lepisorus schraderi *(Mett.) Ching*	Namúli Mt	1962
Polypodiaceae	Polypodium polypodioides *(L.) Watt* subsp. ecklonii *(Kunze) Schelpe*	Namúli Mt, R. Licungo	1962
Polypodiaceae	Pyrrosia rhodesiana *(C.Chr.) Schelpe*	Gúruè, R. Licungo	1943
Polypodiaceae	Pyrrosia schimperiana *(Kuhn) Alston*	Gúruè, near Pico Namúli	1949
Pteridaceae	Cheilanthes leachii *(Schelpe) Schelpe*	Namúli Mt	1962
Pteridaceae	Cheilanthes multifida *(Sw.) Sw.*	Namúli Mt	1962
Pteridaceae	Pellaea doniana *Hook.*	Namúli Mt	1962
Pteridaceae	Pellaea dura *(Willd.) Hook.*	Namúli Mt	1962
Pteridaceae	Pityrogramma calomelanos *(L.) Link* var. calomelanos	Namúli Mt, Chá Moçambique	1962
Pteridaceae	Pteris friesii *Hieron.*	Namrili Mt, Chá Moçambique	1962
Selaginellaceae	Selaginella kraussiana *(Kunze) A.Braun*	Serra de Gúruè, Marrequelo	1944
Tectariaceae	Tectaria gemmifera *(Fée) Alston*	Namúli, R. Licungo	1962

Thelypteridaceae	Christella dentata *(Forssk.) Brownsey & Jermy*	Namúli Mt, Chá Mozambique	1962
Thelypteridaceae	Christella hispidula *(Decne.) Holttum*	Namúli Mt, Chá Moçambique	1962
Thelypteridaceae	Thelypteris confluens *(Thunb.) C.V.Morton*	Namúli Mt	1962
Vittariaceae	Vittaria guineensis *Desv.* var. orientalis *Hieron.*	Namúli Mt, R. Licungo	1962
Vittariaceae	Vittaria volkensii *Hieron.*	Namuli Mt	1962
MONOCOTYLEDONS			
Asphodelaceae	Kniphofia linearifolia *Baker*	Serra Namuli	1943
Orchidaceae	Bulbophyllum josephi *(Kuntze) Summerh.*	Gurué, c.1200m	1979
Orchidaceae	Diaphananthe rutila *(Rchb.f.) Summerh.*	Gurué, c.1200m	1979
Orchidaceae	Disa hircicornis *Rchb.f.*	Gurué	1968
Orchidaceae	Liparis caespitosa *(Thouars) Lindl.*	Serra do Gurué, c.1280m	1979
Orchidaceae	Malaxis weberbaueriana *(Kraenzl.) Summerh.*	Gurué, c.1200m	1979
Orchidaceae	Polystachya lindblomii *Schltr.*	Namuli Mt, 1800m	1962
Orchidaceae	Polystachya tessellata *Lindl.*	Namuli Mt, 1150m	1962
Poaceae	Hyparrhenia newtonii *(Hack.) Stapf* var. macra *Stapf*	Picos Namuli	1943
Poaceae	Rhytachne rottboellioides *Desv.*	Rio Malema, near Picos Namuli, 1500m	1943
Poaceae	Setaria megaphylla *(Steud.) T.Durand & Schinz*	Gúruè, Licungo R.	1943
Poaceae	Trichopteryx stolziana *Henr.*	Gúrùe, near Pico Namuli	1943
Velloziaceae	Xerophyta pinifolia *Lam.*	Serra de Gurué, track to waterfall on R. Licungo	1967
Velloziaceae	Xerophyta schlechteri *(Baker) N.L.Menezes*	Junqueiro factory, slopes of Serra de Gurué, E of Picos Namuli, by R. Malema	1967
Velloziaceae	Xerophyta zambiana *L.B.Smith & Ayensu*	Cascata Namúli	1979
DICOTYLEDONS			
Begoniaceae	Begonia oxyloba *Hook.f.*	Serra do Gúruè, near R. Licungo waterfall	1944
Chrysobalanaceae	Hirtella zanzibarica *Oliv.*	Serra do Gúruè, Lucungo R. waterfall, 1300m	1967
Chrysobalanaceae	Maranthes goetzeniana *(Engl.) Prance*	Serra do Gúruè, Mt. Murrece, 1100m	1967
Clusiaceae	Garcinia volkensii *Engl.*	Serra de Gúruè, Marrequèlo	1944
Combretaceae	Combretum coriifolium *Engl.& Diels*	Gúruè, c.1800m	1966
Cucurbitaceae	Peponium chirindense *(Baker f.) Cogn.*	Gúruè, W of Picos Namuli, R. Malemo	1968
Ericaceae	Blaeria kingaensis *Engl.*	Gúruè, N of Namuli	1949
Euphorbiaceae	Cleistanthus polystachyus *Planch.* subsp. milleri *(Dunkley) Radcl.-Sm.*	Serra do Gurué	1949
Euphorbiaceae	Clutia abyssinica *Jaub.& Spach* var. pedicellaris *(Pax) Pax*	Serra do Gurué	1941
Euphorbiaceae	Phyllanthus hutchinsonianus *S.Moore*	Serra do Gurué, Namuli	1967
Euphorbiaceae	Uapaca lissopyrena *Radcl.-Sm.*	Serra do Gurué, R. Licungo	1967
Fab: Papilionoideae	Argyrolobium tomentosum *(Andrews) Druce*	Gurué, near Pico Namuli, 1500m	1943
Fab: Papilionoideae	Crotalaria recta *A.Rich.*	Montes do Gurué	1943
Fab: Papilionoideae	Dumasia villosa *DC.* var. villosa	Serra Namuli (serra do Gurué)	1949
Fab: Papilionoideae	Eriosema montanum *Baker f.*	near Pico Namuli, R. Malema	1967
Fab: Papilionoideae	Eriosema nutans *Schinz*	near Pico Namuli	1943
Fab: Papilionoideae	Eriosema rhodesicum *R.E.Fr.* var. rhodesicum	Serra Namuli (serra do Gurué)	1944
Fab: Papilionoideae	Kotschya scaberrima *(Taub.) Wild*	Serra do Gurué	1943
Fab: Papilionoideae	Macrotyloma axillare *(E.Mey.) Verdc.* var. axillare	Serra Namuli (serra do Gurué)	1979
Fab: Papilionoideae	Macrotyloma axillare *(E.Mey.) Verdc.* var. macranthum *(Brenan) Verdc.*	Namuli Peaks, west face	1962
Fab: Papilionoideae	Mucuna ferox *Verdc.*	Serra Namuli (Mts de Gurué), Rio Malema, Morope	1979
Fab: Papilionoideae	Rhynchosia clivorum *S.Moore* subsp. pycnantha *(Harms) Verdc.*	R. Licungo falls, Serra Namuli (serra do Gurué)	1944
Fab: Papilionoideae	Sesbania macrantha *E.Phillips & Hutch.* var. levis	Namuli Peaks, lower slopes near	1962

	J.B.Gillett	Gurué	
Fab: Papilionoideae	Smithia elliotii *Baker f.* var. elliotii	montes de Gurué, near waterfalls	1943
Gentianaceae	Sebaea leiostyla *Gilg*	near Namuli Peak	1943
Lentibulariaceae	Utricularia livida *E.Mey.*	Upper valley of Rio Malema, base of Serra Namuli, 1330m	1979
Loganiaceae	Nuxia floribunda *Benth.*	Sérra do Gúruè	
Melastomataceae	Dissotis johnstoniana *Baker f.* var. johnstoniana	Gurue Mt, between Nuirre & Loloe, 2100m	1944
Piperaceae	Peperomia rotundifolia *(L.) Kunth*	Serra Gurué, 3km from waterfall on Licungo R., 1200m	1966
Polygonaceae	Persicaria glomerata *(Dammer) S.Ortiz & Paiva*	Gurué, margems do R. Licungo	1943
Proteaceae	Faurea rochetiana *(A.Rich.) Pic.Serm.*	prox. do Pico Namuli	1944
Proteaceae	Protea madiensis *Oliv.* subsp. madiensis	Serra do Gurué, near Pico Namuli	1943
Rubiaceae	Anthospermum herbaceum *L.f.*	Namuli Peaks	1962
Rubiaceae	Anthospermum whyteanum *Britten*	Namuli	
Rubiaceae	Cephalanthus natalensis *Oliv.*	Serra Namuli (serra de Gurué)	1949
Rubiaceae	Heinsenia diervilleoides *K.Schum.* subsp. diervilleoides	Gurué, E of Pico Namuli near R. Malema	1960
Rubiaceae	Mussaenda arcuata *Poir.*	Serra Namuli (Serra do Gurué), 3km from R. Licungo waterfall	1966
Rubiaceae	Oldenlandia rupicola *(Sond.) Kuntze* var. rupicola	Namuli, Makua Country	1887
Rubiaceae	Otomeria elatior *(DC.) Verdc.*	near pico Namuli	1943
Rubiaceae	Pavetta johnstonii *Bremek.* subsp. johnstonii	Serra do Gurué, path up to Chá Moçambique, near source of R. Malema	1968
Rubiaceae	Pentas pubiflora *S.Moore*	Gúruè Mt	1943
Rubiaceae	Psydrax parviflora *(Afzel.) Bridson* subsp. chapmanii *Bridson*	top of serra do Gurué, near start of R. Malema	1968
Rubiaceae	Rytigynia adenodonta *(K.Schum.) Robyns* var. reticulata *(Robyns) Verdc.*	Serra do Gurué, 3km after falls on R. Licungo	1966
Rubiaceae	Sericanthe andongensis *(Hiern) Robbr.* subsp. andongensis	Serra Namuli, top of serra, between Nuirre & Lóloè	1944
Rubiaceae	Tricalysia coriacea *(Benth.) Hiern* subsp. nyassae *(Hiern) Bridson*	Namuli	
Scrophulariaceae	Lindernia nummularifolia *(D.Don) Wettst.*	serra do Gurue, c.3 km from waterfall on R. Lucungo, c.1200m	1968
Scrophulariaceae	Sopubia simplex *(Hochst.) Hochst.*	Namuli, Makua	1887

ANNEX 4. Annotated list of birds recorded from the Namuli massif above 1200 m altitude (source Dowsett-Lemaire 2008).

[**Hamerkop**, *Scopus umbretta*. One record by Demey on the Malema. Ticked for Muretha by Melo *et al*.; this would be no more than a rare vagrant this high.]

African Black Duck, *Anas sparsa*. Present on the wider forest streams: singles and a pair flying over Rio Malema. One flushed in Manho on a wide stream at 1700 m by C. Bruessow (pers. comm.). Vincent apparently flushed 3 ducks of this species in stream at base of Ukalini Forest (1550 m), but misidentified them as Hottentot Teal (see below).

Black-shouldered Kite, *Elanus caeruleus.* Two singles in open farmland at c.1300 m. Similarly recorded by others (Ryan *et al.*, Melo, Demey).

[**Black-breasted Snake Eagle**, *Circaetus pectoralis*. One record by Ryan *et al*. at c.1250 m, and a winter record by Demey on Muretha 1 Jun 07. Unlikely to be resident as high as Muretha.]

Gymnogene, *Polyboroides typus*. One seen between Muretha scarp and Ukalini (c.1600 m).

Black Goshawk, *Accipiter melanoleucus*. Pair flying around riparian and *Parinari* forest on Rio Malema (14 Nov 07).

[**Little Sparrowhawk**, *Accipiter minullus*. Adult at forest edge on the Malema, 1 Jun 07 (Demey).]

African Goshawk, *Accipiter tachiro*. One holding a territory on Muretha, singing after rain on 20 Nov 07. Captured an Eastern Mountain Greenbul in another patch (23 Nov). One singing over Ukalini Forest at dusk (25 Nov). Likely widespread throughout forest in small numbers. Demey mentions a family with 2 juveniles on the Malema, 1–5 Jun 07.

Lizard Buzzard, *Kaupifalco monogrammicus*. Noted by me only below 1100 m in farmland; its song was imitated in song of a Red-capped Robin (on Rio Nanchili, 1200 m). Demey has a winter record on edge of Malema (2 Jun 07). Species shows altitudinal movements in the cold season.

Common Buzzard, *Buteo buteo*. Palaearctic migrant: a few wintering in the area, 1200–1900 m.

Augur Buzzard, *Buteo augur*. Pair seen regularly over Muretha (and attacked frequently by Lanners whenever they entered their territory) and over towards Peseni peak.

[**Tawny Eagle**, *Aquila rapax*. One seen by Demey near the Malema on 1 Jun 07. Not a species of high altitudes or wet mountains; no more than a vagrant.]

Booted Eagle, *Hieraaetus pennatu*s. Palaearctic migrant, 1 in brown phase on 16 Nov 07, attacked by the local Lanners. One previous record by Ryan *et al*. at c.1250 m ("camp 2"), no date.

Crowned Eagle, *Stephanoaetus coronatus*. No record since Vincent in 1932. In 2007 one pair present around Manho Forest towards Peseni; singing heard twice in that area (17–18 Nov) at midday. None heard or seen over Ukalini. As defended territory is at least 10 km² and hunting range even bigger (in areas much richer in game than Namuli today), it is unlikely that Namuli holds more than one pair. Vincent says he saw the bird daily over his camp below Ukalini and on one occasion it tried to catch his pet mongoose. On another occasion he saw it capture a hare from a rocky slope.

Rock Kestrel, *Falco tinnunculus*. One pair feeding two full-grown juveniles on a small rocky outcrop above Manho Forest (15°23'44"S, 37°01'50"E), 1820 m. Another seen between Muretha and Ukalini.

Eurasian Hobby, *Falco subbuteo*. Palaearctic migrant; one seen over Muretha 16 Nov 07.

Lanner Falcon, *Falco biarmicus*. One pair occupying a territory over part of Manho Forest and adjacent grassland around a rocky pinnacle where they were probably breeding. Very aggressive towards other Lanners and raptors. Also noted lower down (Malema) by Demey on 1 Jun 07.

Peregrine Falcon, *Falco peregrinus*. One pair breeding on cliff of Namuli peak directly over Ukalini, with prey brought to noisy partner or young a few times a day. The different species of Falconidae on Namuli have apparently divided the area into separate territories to avoid competition. Ryan *et al*. (1999b) noted Peregrine in the same area.

Shelley's Francolin, *Francolinus shelleyi*. Around rocky hills (up to at least 1900 m); heard occasionally in evening or early morning.

Hildebrandt's Francolin, *Francolinus hildebrandtii*. A species of bracken scrub and forest edges, surprisingly uncommon (heard in Muretha lip and Manho only). Vincent heard or saw several in 1932 from 1500–1900 m; it is possible it has decreased through hunting.

[**Common Quail**, *Coturnix coturnix*. One record by Melo *et al*. based on song (Dec 2001) on Muretha Plateau, presumably in grassland. Locally common in montane grassland elsewhere, including Malawi, but the wet, peaty meadows of Namuli are not very suitable for this species. Status requires confirmation.]

Helmeted Guineafowl, *Numida meleagris*. Surprisingly encountered regularly in montane forest, in small patches on Muretha, edge of Manho, in Ukalini, and in riparian forest on Nanchili stream, at 1270–1900 m; a very unusual habitat. Some heard singing at dusk. Demey found feathers on the Muretha Plateau although not any live bird. Previous records (Ryan *et al*.) are from low altitudes, and Vincent did not notice any. Is it possible that Guineafowls were pushed into marginal montane habitat by hunting pressure?

Red-chested Flufftail, *Sarothrura rufa*. Probably the only flufftail species present in the Muretha Plateau grasslands, in peaty, wet meadows with fairly tall grass, at 1850–1880 m. One flufftail (probably a female) seen in flight near stream close to camp on 15 Nov 07, but not identified to species. The song of Olive Thrush alerted me when I noticed that one particular bird was often imitating the territorial call of *S. rufa* ("kuwa, kuwa...") in ending of song motif. On afternoon of 20 Nov pre-recorded cassette tape playback was used to sort out the problem: playback of Red-tailed Flufftail *S. affinis* song and call never produced any reaction (there or in other places on the plateau), but playback of *S. rufa* immediately got one bird to call back (with territorial calls). On 22 Nov more time was spent exploring the peaty meadow upstream of camp. Several Red-chested Flufftails were heard singing and calling, spontaneously or after playback, and one was tape-recorded at close range. Calls were heard near camp on two other days.

Rameron Pigeon, *Columba arquatrix*. Afromontane near-endemic and important fruit disperser. One territorial pair in a patch near our Muretha camp (occasionally up to 4 visiting the area), and a few birds in Manho Forest. Seen feeding on fruits of *Schefflera umbellifera, Prunus* (once), *Myrica* (22 Nov 07). Likely to be more numerous in years when *Olea* and *Cryptocarya* are fruiting. The absence of another favourite fruit tree *Afrocrania volkensii* and the relative scarcity of *Schefflera* (both common on Mulanje and Zomba Mts) means that Ramerons can never be as common here as on the high mountains of SE Malawi. Only one seen in two weeks by Demey (24 May 07), which is not surprising in this partial migrant.

Cinnamon Dove, *Aplopelia larvata*. Afromontane near-endemic. Widespread in small patches on Muretha and in Manho Forest, far fewer in Ukalini (only two encountered on saddle).

[**Red-eyed Dove**, *Streptopelia semitorquata*. Vincent collected one in forest at 1460 m in Aug, unusual for this woodland bird, but some individuals may visit mid-altitude forest for fruit. Noted at low altitudes by Ryan *et al.* and others, but absent in Nov 2007.]

Blue-spotted Wood Dove, *Turtur afer*. A few in farmland or secondary growth at medium altitudes, up to 1400 m.

[**Tambourine Dove**, *Turtur tympanistria*. Vincent met a few in mid-altitude forest only, up to 1460 m. Also noted by Ryan *et al*. but not since. Obviously uncommon.]

A**frican Green Pigeon**, *Treron calvus*. One in riparian forest on Rio Malema, 1250 m (15 Nov 07). Species is very fond of *Syzygium* fruit and could be more common in the area when these are in full fruit later in the rainy season. One shot by Vincent (Aug) at 1460 m.

Livingstone's Turaco, *Tauraco livingstonii*. Common throughout forest at all levels. Feeds on any fleshy fruit (often *Aphloia* in Nov). Positions of calling birds on Muretha suggest territories of 4–5 ha per pair (each pair owning several small patches), fitting well with data from the Nyika for the sibling Schalow's Turaco *T. schalowi* (Dowsett-Lemaire 1983, 1989).

Red-chested Cuckoo, *Cuculus solitarius*. Common and very noisy in small patches on Muretha Plateau, and at edges of Manho Forest. None heard inside Manho nor in Ukalini (some calling outside, in bracken scrub). A nest parasite of robins, almost certainly here of Cape Robin.

Klaas's Cuckoo, *Chrysococcyx klaas*. A few calling in riparian forest at 1200–1300 m. A resident species, also heard in June (Demey).

Burchell's Coucal, *Centropus superciliosus*. Small numbers in thick bracken scrub and at forest edges, 1200–1860 m.

[**Cape Eagle Owl**, *Bubo capensis*. Afromontane near-endemic. One record of this rare, localized species heard at 1300 m (Ryan *et al.* 1999b). Inclusion of this species with a "?" in Melo *et al.* report is based on observation of downy young in forest (Ukalini and Muretha), now considered to be Wood Owls (M. Melo, pers.comm.). It is odd that the much commoner Spotted Eagle Owl, *B. africanus* has not yet been noted on Namuli.]

Wood Owl, *Strix woodfordii*. Widespread in forest at all altitudes; breeding records obtained by Melo *et al.* (see above).

Freckled Rock Nightjar, *Caprimulgus tristigma*. Likely common around rocky outcrops, but calling season almost over by November. Song heard only below the Muretha scarp (on 23 Nov 07, 1400–1500 m). Occasionally seen or flushed up to 1900 m (Demey, C. Bruessow, J. Bayliss pers.

comm.).

Scarce Swift, *Schoutedenapus myoptilus*. Afromontane endemic. Small numbers seen over Manho Forest (any time), and over Muretha Plateau in evening, also lower down (1300 m) in late afternoon. Aerial mating observed over Manho 20 Nov 07. An intra-African migrant, absent in winter months (no records from Demey in May–June, or by Vincent in July–Aug.).

[? **Mottled Swift**, *Apus aequatorialis*. Listed by Ryan *et al*. for the surroundings of Camp 1 (below Ukalini) and Gurué town. This rock-loving swift is indeed likely to occur around some cliffs, in small numbers, but see below.]

African Black Swift, *Apus barbatus*. The most numerous swift over Namuli, seen daily and concentrating at times into hundreds. Often feeds low over the lip of Muretha Plateau, and over rock faces (Namuli, Peseni, Ukalini cliff). In poor light can be confused with Eurasian Swift but the distinctive rasping calls were heard several times daily, also the high-pitched "tititititiiti" calls of recently fledged birds. Four pairs found breeding in a cleft on a small vertical cliff above Manho (c.1840 m) feeding noisy nestlings. Curiously unrecorded by Ryan *et al.* (possibly through confusion with Eurasian or Mottled Swift), who also forgot to tick it in their table listing Vincent's records. Vincent collected them on Mulanje in Sept 1931 in breeding condition, and found them common on Namuli, seen daily around rocky faces, 1500–2100 m, even noticing the difference in calls.

Eurasian Swift, *Apus apus*. Palaearctic migrant; identified only once from its calls (no more than a few birds present in a very large flock of African Black Swift) on 17 Nov 07.

Little Swift, *Apus affinis*. 2–3 birds once over Muretha, with other swifts. No sign of breeding on the mountain.

Narina's Trogon, *Apaloderma narina*. One singing in degraded *Parinari* forest near Rio Malema (just above 1250 m) on 15 Nov 07. Must have been more widespread at low altitudes but threatened by deforestation.

Bar-tailed Trogon, *Apaloderma vittatum.* Afromontane endemic. Not uncommon in Manho Forest, especially under closed canopy, 1600–1850 m. Less so in Ukalini. Absent from Muretha, where the patches are too small (minimum territory size is around 3 ha, Dowsett-Lemaire 1989). Vincent collected 4 specimens, in "high forest" from 1400–1770 m. There is no more "high forest" at 1400 m below Ukalini suitable for this trogon, so this suggests the forest was significantly wider than today. The lower altitude birds met by Vincent may also have engaged in some altitudinal movements in the cold months, as some do in S Malawi.

Half-collared Kingfisher, *Alcedo semitorquata*. Present on large streams at lower levels (Malema and Nanchili).

Pygmy Kingfisher, *Ceyx pictus*. An intra-African migrant: two noticed at forest edge and in bush at lower levels (1250–1350 m) at the end of the trip (27 Nov 07).

Blue-cheeked Bee-eater, *Merops persicus*. Palaearctic migrant, small groups passing high over Muretha Plateau daily (from 15–22 Nov 07), flying south.

[**Eurasian Bee-eater**, *Merops apiaster*. Palaearctic migrant, noted by Ryan *et al*. below 1200 m, and by Melo *et al*. on Muretha. However, Melo *et al*. did not identify Blue-cheeked, and the timing of their visits was very late for Eurasian. Eurasian Bee-eater is a very widespread species that must pass over Namuli in season, but southward passage would be mainly around Sept–Oct. Passage of Blue-cheeked Bee-eater is significantly later. I heard imitations of Eurasian Bee-eater in the song of a Red-capped Robin at 1200 m, the bird confirming somehow that the bee-eater had been around. Neither Eurasian nor Blue-cheeked winter in montane areas.]

Crowned Hornbill, *Tockus alboterminatus*. Very small numbers in forest at all levels, but probably only a visitor to Muretha and Manho (no permanent territory identified). A pair holding a territory in Ukalini.

Silvery-cheeked Hornbill, *Bycanistes brevis*. Very small numbers: a pair flying up Rio Malema on 15 Nov 07; a single visiting Muretha on 21 Nov and flying on towards Manho; one flying between Nanchili and Malema streams on 26 Nov. Species is subject to at least local movements or migrations. It is likely the local forest flora is too poor in large fruits for this species to breed now; none seen by Vincent in July–Aug and none seen by Demey, Melo *et al*. or Ryan *et al*.; the latter saw it in the forest directly above Gurué (1400 m).

White-eared Barbet, *Stactolaema leucotis*. Eastern endemic. A group of 3 in Malema riparian forest (15 Nov 07). Several in lower section of Ukalini forest (up to 1650 m), feeding frequently on *Aphloia* fruits and on *Macaranga*. One pair was feeding nestlings in a hole in a dead tree there at a height of 12 m. Likely to be widespread in mid-altitude forest in small numbers. Demey observed

this bird earlier, up to 8 on Rio Malema, but unlikely to be a recent arrival.

Green Barbet, *Stactolaema olivacea*. Eastern endemic. This barbet occurs in a series of isolates in low, mid-altitude or lower Afromontane forest on the eastern side of Africa. The Namuli population belongs to the race *belcheri*, shared with Thyolo Mtn in adjacent Malawi. As the forest on Thyolo has in recent years been totally destroyed, Namuli has acquired added importance in the conservation of this race, which can be considered as Endangered.

In Malawi and some other forests (e.g. Ngoye in Natal), this barbet is associated with an abundance of large-fruited strangling figs at medium altitudes (Dowsett-Lemaire 1988, 1989). On Namuli none of the forest left today represents optimal habitat, but there is plenty of evidence that mid-altitude forest was more extensive in the past, and with the presence of strangling figs would have represented attractive habitat for this barbet. In this survey, Green Barbets were found in very scattered territories in Manho, with only 4 occupied territories along the "circuit route". The first two territories (above and just below the entrance) were at least 700 m apart, and the next two were even further apart, in separate gullies on either side of a high ridge. As the birds were calling frequently and always in the same area in 5 successive days, it is likely that these represented the only defended territories in the area. Thus the total population in Manho is very small, perhaps some 20 pairs. In the Ukalini saddle the density is higher, comparable to that on Thyolo Mtn in the past (perhaps as many as 1–2 pairs in 10 ha). Given the small size of the forest, the total number of pairs on Namuli today is 30–40 pairs at the most. This small population appears viable, as most of the mid-altitude forest had already disappeared by the time the aerial photos were taken in 1969. It is conceivable that the barbet occurs elsewhere on the plateau, as in the mid-altitude forest left on the other side of the big dambo to the south-east of the mountain.

Seen feeding on *Aphloia* fruit in Ukalini. Vincent collected 8 specimens from "primeval forest", without giving an altitudinal range. This was in fact from 1400–1770 m, 4 birds being taken below 1500 m (BM records, on specimens; K. Cooke, pers. comm.). Ryan *et al.* observed it in a patch above Gurué on the drier side of the mountain at c.1300 m, suggesting that it could occur elsewhere in the vicinity. Every effort should be made to locate other populations.

Eastern Green Tinkerbird, *Pogoniulus simplex*. Eastern endemic (from coastal Kenya south). A mistletoe specialist with a very small population on Namuli, discovered on this survey. One bird was heard several times in Manho on the edge of grassy clearings at the altitude of 1720 m (near 15°23'51"S, 37°02'13"E). It covered a large territory of well over 10 ha. A pre-recorded tape (from Mangochi Mt in Malawi, published in Gibbon 1991) was used to attract the bird into view on 18 Nov 07, and it was tape recorded. Another one was heard in *Parinari–Syzygium cordatum* forest on the slopes above the Nanchili stream (c.1300 m) on 27 Nov. Only one previous record from Mozambique, in coastal forest in the south (a specimen in Inhambane District, 2434C1, Clancey 1971, repeated in Parker 1999). Parker (1999, 2005) did not find it anywhere in the south or centre, but it must certainly be more widespread. The nearest population at present is on Mangochi Mtn and Namizimu Hills in SE Malawi, also the western limit of range (Dowsett-Lemaire & Dowsett 2006). A green tinkerbird on Mt Chiperone (Benson 1950) is one of two species, this or Moustached Green *P. leucomystax*. The two green tinkerbirds are allopatric and Moustached Green is an Afromontane endemic that reaches Mt Mulanje in very small numbers, at the southern limit of its range (Dowsett-Lemaire 1989, Dowsett-Lemaire & Dowsett 2006). Clearly the forest on Chiperone needs more exploration.

Yellow-fronted Tinkerbird, *Pogoniulus chrysoconus*. A woodland bird, heard in *Syzygium cordatum* woodland near the Nanchili stream (1250–1300 m).

Golden-rumped Tinkerbird, *Pogoniulus bilineatus*. Very common in all forest types from low altitude to Manho. Rather uncommon in small patches on Muretha, and apparently only as a visitor. Does not specialize on mistletoes, unlike the green tinkerbirds, but was seen prospecting mistletoe fruit in *Parinari* on the Nanchili stream.

[**Green-backed Honeyguide**, *Prodotiscus zambesiae*. Three males collected by Vincent on the edge of "high mountain forest". A white-eye nest parasite.]

[**Brown-backed Honeyguide**, *Prodotiscus regulus*. Recorded by Ryan *et al*. from c.1250 m. Normally a species of dry woodland, rather unexpected on the wet side of a mountain.]

[**Scaly-throated Honeyguide**, *Indicator variegatus*. Two females collected by Vincent on 2 & 3 Aug at c.1400 m were about to lay. Recorded by Ryan *et al*. from Ukalini. A woodpecker nest parasite.]

Lesser Honeyguide, *Indicator minor*. One seen flying into forest on the Malema. A barbet nest parasite. Collected by Vincent at c.1400 m.

Golden-tailed Woodpecker, *Campethera abingoni*. At least two territories occupied in Ukalini saddle, inside forest. Also recorded lower down on the Nanchili (Ryan *et al*.).

Cardinal Woodpecker, *Dendropicos fuscescens*. A few at forest edges and in *Syzygium cordatum* near the Nanchili stream, 1250–1350 m. Vincent collected a female in full breeding condition on 29 Jul 07 and recorded the species up to 1550 m.

[**African Broadbill**, *Smithornis capensis*. Recorded in riparian forest on the Malema and Nanchili (Ryan *et al.,* Demey).]

Black Saw-wing, *Psalidoprocne pristoptera*. Common at forest edges at all altitudes, in small numbers.

Eurasian Sand Martin, *Riparia riparia*. Palaearctic migrant. One in a large concentration of swifts and swallows on 17 Nov 07. One record by Ryan *et al.*

African Sand Martin, *Riparia paludicola*. One flying low over peaty meadow, Muretha (1850 m) on 16 Nov 07, can be no more than a wanderer this high.

Lesser Striped Swallow, *Hirundo abyssinica*. A few pairs around small rock faces at 1300–1400 m. Not recorded any higher.

Red-rumped Swallow, *Hirundo daurica*. Singles or pairs seen regularly over Muretha, Manho, and around some rock faces, sometimes mixing with flocks of African Black Swifts and House Martins. Also at lower levels (a family of 4, chattering together, 26 Nov 07 at 1350 m). Ryan *et al.* found them breeding on a rock face in the grassland below Namuli peak, the first record for Mozambique. Given the number of suitable granitic mountains in the area, the species ought to be widespread here.

African Rock Martin, *Hirundo fuligula*. The odd pair feeding along rock faces, 1400–1950 m.

Eurasian Swallow, *Hirundo rustica*. Palaearctic migrant. A few occasionally passing through at any levels (1200–1900 m), but not recorded daily.

Eurasian House Martin, *Delichon urbicum*. Palaearctic migrant. Wintering in large numbers (hundreds) in the area, usually associating with African Black Swifts, over Manho, Muretha, Namuli and Ukalini cliffs, etc.

Long-tailed Wagtail, *Motacilla clara*. Territorial pairs on rocky streams, penetrating inside forest (Ukalini, Manho), 1200–1700 m.

Richard's Pipit, *Anthus richardi* (syn. African, Grassveld or Grassland Pipit *A. cinnamomeus*). On ridges with relatively short grassland, from 1400–1900 m. Frequent aerial displays.

Tree Pipit, *Anthus trivialis*. Palaearctic migrant. One passing through, Muretha, 22 Nov 07.

Striped Pipit, *Anthus lineiventris*. Associated with rocks with some woodland (*Syzygium, Iboza*), at all levels (at least 1300–1840 m).

Black Cuckoo-shrike, *Campephaga flava*. Common in mid-altitude riparian forest, *Syzygium cordatum* forest, reaching upper altitudinal limit at 1580 m at lower edge of Ukalini. Several pairs chasing each other near the Nanchli bridge, probably as a result of very recent deforestation.

Eastern Mountain Greenbul, *Andropadus nigriceps*. Afromontane endemic, confined to the highest mountains (in S Malawi only on Zomba/Malosa and Mulanje). Common in small forest patches on Muretha, with single pairs occupying patches of 1–1.5 ha. Appears to be in competition with Striped-cheeked Greenbul, as these patches contain in fact one pair of each *Andropadus*. Males of both occupy different song posts, and seem to indulge in counter-singing and to "control" different sections of these small patches (although they can be found at times feeding in the same fruit tree). Absent from the interior of Manho Forest, being confined to edges at high altitude (1800–1900 m). Not recorded lower down, including Ukalini (despite listening for its distinctive song, and watching fruiting trees for hours). Overall, its population on Namuli must be quite low, with not much of a surplus even in optimal habitat. Katrina Cook's nets on Muretha caught only one *A. nigriceps* in 9 days against at least 9 *A. milanjensis*.

Vincent remarked that he found this bulbul more numerous on Mulanje than on Namuli, and that Stripe-cheeked was much commoner here, whereas Mountain Greenbul was partial to the small patches on the plateau. He collected only 5 *A. nigriceps* as against 21 *milanjensis*, apparently down to 1400 m. If correct, this probably means that some were altitudinal migrants. On the other hand, Ryan *et al*.'s listing of this bulbul at low altitudes in the summer months of Nov–Dec is likely due to confusion with Stripe-cheeked.

Stripe-cheeked Greenbul, *Andropadus milanjensis*. Afromontane endemic. The most numerous member of the genus on Namuli, present not only on Muretha but also throughout montane and mid-altitude forest, down to 1250 m. Often seen taking fruit (*Aphloia, Macaranga, Rutidea, Schefflera*). Competes with Mountain Greenbul on Muretha (see above), where individual pairs

occupy patches of 1–1.5 ha, but the number of wandering birds is higher than in its congener.

Little Greenbul, *Andropadus virens*. Understorey species common in mid-altitude forest, reaching the lower levels of Ukalini (several up to 1650 m).

Cabanis's Bulbul, *Phyllastrephus cabanisi* (race *placidus*, sometimes treated as a separate species, but voice identical, and *placidus* reacts very well to tape playback of *cabanisi* songs). Afromontane near-endemic. Widespread in ground stratum of forest, normally in dense undergrowth in deep shade. At all levels, from 1200–1870 m. Single pairs present in some patches on Muretha (1–1.5 ha), in thickets of *Mimulopsis* and small saplings.

Yellow-streaked Bulbul, *Phyllastrephus flavostriatus*. A mid-stratum species, widespread from at least 1250–1820 m. Absent from small patches on Muretha.

Black-eyed Bulbul, *Pycnonotus barbatus*. Common in riparian forest, woodland and bush in farmland at low levels, up to Ukalini (forest edges), but absent from the Manho area and the Muretha Plateau except as an occasional wanderer. Demey found a few on Muretha in May.

Olive Thrush, *Turdus olivaceus*. Afromontane near-endemic. Very localized on Namuli, being confined to fragmented forest on the Muretha Plateau where a few pairs were found to occupy some small patches. One territory of a male consisted of two patches totalling just under 3 ha. This male (which appeared unmated) sang at all hours of the day, song motifs including occasional imitations of the "prui-prui" of Namuli Apalis and "kuwa-kuwa" of Red-chested Flufftail. A neighbouring male also imitated the apalis. Vincent collected only one female.

Spotted Ground Thrush, *Zoothera guttata*. **Endangered**. Sub-Afromontane endemic (the few breeding localities known being in mid-altitude forest or temperate forest in the Eastern Cape). Only recently discovered in Mozambique, with a couple of records of "wintering" birds on the coast near Maputo in Nov 1999 and April 2002 (Parker 2005: 310). In SE Malawi occurs in very small numbers on four different mountains (three largely or totally deforested in recent years) and appears to be resident, with some altitudinal movements in winter. Discovered on Namuli on this survey, in part thanks to the local knowledge of hunters who know this bird and its distinctive short song. Two hunters met in Manho on 17 Nov 07 and at least one guide knew this bird well and described the song as a series of 3 detached whistles (which they produced without prompting). Song heard and tape-recorded in Manho Forest near the entrance at 1710 m on 18 Nov. Only a few songs were produced and was not heard again. The guides later confirmed that the tape was indeed of the "bird with spots". One seen in Ukalini Forest on 26 Nov at just over 1700 m, feeding on the ground near some rocks.

The difficulty in locating Spotted Ground Thrush comes mainly from the fact that it also has a longer, fluty song similar to that of its congener Orange Thrush, with which it is often sympatric (as here and in Malawi). A tape of the long song of Spotted Ground Thrush from Ngoye (Natal) played at Thyolo in the 1980s elicited responses only from Orange Thrush, and a tape of a similar fluty song produced by Spotted Ground Thrush on the edge of Thyolo in Dec 2005 (obtained by Eric Herrmann), played in Manho and Ukalini, also provoked an Orange Thrush into song. The Orange Thrush at Ukalini was teased with this half a dozen times, and each time reacted very strongly. A recording of the much simpler 3-note song might be more effective, but it was taken from far away and is not loud enough for playback. Orange Thrush appears to be very common and interspecific competition may also keep numbers of Spotted Ground Thrush low. The Thyolo Spotted Ground Thrush tape also gave a descending whistle, repeated at intervals, either in isolation or as an introduction to song phrases. This whistle sounds rather similar to one of the main calls of Cholo Alethe. Playback of this call in Manho and Ukalini provoked reactions only from Cholo Alethe.

Orange Thrush, *Zoothera gurneyi*. Afromontane endemic. Very common in montane forest in Manho and Ukalini, even in some of the patches on Muretha, 1580–1900 m.

Cholo Alethe, *Alethe choloensis*. **Endangered**. Afromontane endemic. An ant-following specialist, endemic to mid-altitude and lower montane forest in SE Malawi and adjacent Mozambique. This is perhaps a distinct race (*namuli*), but as the species has recently been found in an intermediate area at Mabu (Spottiswoode *et al*. 2008) and is likely to be on other mountains between Mabu and Namuli, it is difficult to see where the limits of any form might be; any variation is likely to be clinal. Very unevenly distributed on Namuli. It must have been common in the past in mid-altitude forest at 1200–1400 m, where it is still found today (1 calling on the Malema, 2 or more in strips on the Nanchili stream), but the habitat is almost gone. Reasonably common in Ukalini Forest (1600–1750 m), reaching densities close to the optimum of perhaps 2 pairs/10 ha. When there was much ant activity, 2–3 pairs of alethes gathered around ant swarms; there was also much counter-

singing between neighbouring birds.

The situation was very different in the cooler Manho Forest: only three pairs were located along c.1.5 km of trails; these birds were relocated on every walk and evidently breeding (much alarm-calling from both adults as soon as I entered the territory). Ants must have been far more local in Manho, as is to be expected in higher-altitude or cooler forest. On Muretha, two patches (one being 1.5 ha) were each occupied by one bird, calling briefly (but daily) in the early morning. These birds appeared unmated and did not give any alarm-calls. The overall number of Alethes in the study area is probably of the order of a few dozen pairs. However, there is no reason to think that the species is not also present on other forested mountains and hills around Namuli.

Ryan *et al*. wrote that Cholo Alethes near camp 2 (Nanchili bridge) occasionally fed in "dense *Brachystegia* woodland outside of forest". There is no such woodland in the area, and it is assumed they meant evergreen *Syzygium cordatum* formations, which have a closed canopy, immediately next to *Newtonia–Parinari* forest on the Nanchili. Cholo Alethe are not known to enter woodland of any kind.

Starred Robin, *Pogonocichla stellata*. Afromontane endemic. Very common in montane forest (Manho, Ukalini), including in small patches on Muretha. Territory size of 1 ha or a little less in small patches (1 pair in 1 ha, 2 pairs in 2 patches of 1.4 and 1.5 ha respectively).

Olive-flanked Robin, *Cossypha anomala*. Afromontane endemic. Belongs to the nominate race (*gurue* is a synonym), confined to Namuli and adjacent Mt Chiperone and Mulanje. Very common in montane forest (1600–1900 m) in dense understorey, including most (but not all) small patches of 1 ha or more on Muretha, still only one pair in patches of 1.4 and 1.5 ha. One of the noisiest forest species.

Cape Robin, *Cossypha caffra*. Afromontane near-endemic. Very common in bracken scrub and at edges of forest, from c.1400 to at least 1900 m (likely to reach the upper limits of scrub forest higher up). Although Ryan *et al*. ticked it for all altitudes, it is unlikely to be regular below this except in the winter months (Demey at 1250 m near the Malema bridge in June).

Red-capped Robin, *Cossypha natalensis*. Found in riparian forest on the Nanchili at 1200 m. Unlikely to occur any higher on the wet side of the mountain. This bird imitated Eurasian Bee-eater and Lizard Buzzard in its song.

Stonechat, *Saxicola torquatus*. Common in patches of bracken next to open grassland, and rank grass near streams with scattered bushes. On plateau and lower slopes, 1300–1900 m.

Broad-tailed Warbler, *Schoenicola platyurus*. A few singing or alarm-calling in rank grass in peaty meadows on Muretha (up to 1880 m), and lower down in dense bracken with some grass.

Evergreen Forest Warbler, *Bradypterus lopezi*. Afromontane near-endemic. Very common in dense forest understorey at medium and high altitudes (1200–1900 m), including small patches on Muretha. Also throughout well-developed bracken scrub with scattered trees or bushes. On Muretha some territories included small patches (down to 0.5 ha, but nearer 0.7 ha with adjacent bracken scrub); still only one pair in two patches of 1 and 1.4 ha, and one patch of 1.5 ha was not occupied (understorey not thick enough). In the absence of its congener *B. cinnamomeus* (see below), this species tends to expand its niche into secondary growth.

African Moustached Warbler, *Melocichla mentalis*. Widespread in low rank growth up to 1450 m.

African Yellow Warbler, *Chloropeta natalensis*. Common warbler in extensive patches of dense bracken, especially at 1250–1600 m (to lower edges of Ukalini). Above that, only in well-developed secondary growth, locally to 1900 m (in *Iboza* with dense bracken).

[**Red-faced Crombec**, *Sylvietta whytii*. A woodland species, recorded in mixed species flocks at forest edges or woodland at low altitudes (Ryan *et al*., Demey).]

Willow Warbler, *Phylloscopus trochilus*. Palaearctic migrant. The commonest Eurasian warbler, widespread at all levels, in forest, tall bracken scrub and woodland. Some in song.

Yellow-throated Warbler, *Phylloscopus ruficapilla*. Afromontane endemic. Uncommon in canopy and mid-stratum of montane forest (Manho and Ukalini). Singing very little and perhaps under-recorded (possibly breeding largely over, one family with dependent fledglings).

Garden Warbler, *Sylvia borin*. Palaearctic migrant. A few in forest at medium altitudes (on the Nanchili, 1250–1300 m) and one singing higher, in a *Maesa* thicket, c.1550 m (24 Nov 07). Melo *et al.* had some on Muretha in early Dec. This species is very fond of small fruit, and it is likely that some would move to Muretha when *Myrica* is fully ripe in Dec. *Myrica* is a favourite fruit on the Nyika (pers. obs.).

[**Blackcap**, *Sylvia atricapilla*. Palaearctic migrant near the southern limit of its wintering range. Only one record (first for Mozambique) from the Muretha Plateau by Melo *et al*. (2001), 5–6 Dec 01.

One bird (adult male) was mist-netted and a few others were present. Possibly not of annual occurrence this far south, this is another warbler that is largely frugivorous in its winter quarters, fond of *Myrica* and other small fruit.]

Croaking Cisticola, *Cisticola natalensis*. One heard at c.1300 m, in open woodland with rank grass (normally found in dambos, and could be common in the big dambo to the south).

Wailing Cisticola, *Cisticola lais*. Afromontane endemic. Very common in montane grassland, from c.1400–1900 m (noted by Vincent up to 2000 m, and likely higher). Builds its nests in tufts of grass near the ground, but on Muretha often feeding in low trees on the edge of forest.

Red-faced Cisticola, *Cisticola erythrops*. In rank grass and bracken near streams, up to c.1250 m (Malema).

Singing Cisticola, *Cisticola cantans*. The common cisticola of dense bracken or bracken scrub, especially at 1200–1600 m. Becomes more local higher, up to the lip of Muretha Plateau (1860 m).

Tawny-flanked Prinia, *Prinia subflava*. Fairly common in grass and bracken scrub up to c.1500 m.

Red-winged Warbler, *Heliolais erythropterus*. Fairly common in grass and bracken scrub up to c.1400 m.

Yellow-breasted Apalis, *Apalis flavida*. In riparian forest in the foothills up to c.1300 m (Malema, Nanchili).

White-winged Apalis, *Apalis chariessa*. **Vulnerable**. Eastern endemic. Since the nominate race (Tana River, Kenya) became extinct (last seen in 1961), this rare species is confined to the forests of central Tanzania (Ulugurus, Udzungwas), SE Malawi and adjacent Mozambique (Mt Chiperone). The gap between Chiperone and Tanzania is marginally filled by its discovery on Namuli, but the population on Namuli must be considered as highly endangered. This is not a bird of montane forest, but mainly of mid-altitude forest dominated by Mimosaceae (*Albizia* or *Newtonia*). In Malawi, it is commonest on the edges of forest, or in riparian strips, avoiding primary forest of any great size. Very rare on Mulanje (perhaps too wet), with a couple of records on the southern slopes at 1000 and 1300 m (pers. obs.).

One male seen in riparian forest on the Nanchili at 1200 m in a small mixed party, 27 Nov 07. A pre-recorded tape of the species song (a highly synchronised duet of 4 notes, two by the male, two by the female) was tried in various places. The Black-headed Apalis always reacted to it (even in Manho), and there may well be competition between the two canopy apalises. Most surprisingly, at least two of the hunters interviewed knew this apalis, but when they claimed that it was widespread in Manho, this seemed to be based on confusion of the piping voice with that of Black-headed Apalis (similar in timbre, but with different motifs). One of the hunters also knew Yellow-breasted Apalis (in fact, he knew all 4 species present and pointed at the right place on the plates without hesitation). This apalis is evidently very rare on the wet side of Namuli, and should be searched for on the drier side, especially in any riparian strips with *Albizia adianthifolia* or *Newtonia*.

Namuli Apalis, *Apalis* (*thoracica*) *lynesi*. **Vulnerable**. Afromontane endemic, this form being confined to Namuli. Named by Vincent (1933) who collected 12 specimens. Its nearest relative is the yellow-bellied race of Bar-throated Apalis (*A. t. flavigularis*), found on Mulanje and Zomba-Malosa Mts in Malawi. Very common in forest and tall bracken scrub from 1270–1300 m to at least 1900 m (and likely reaching the upper limit of scrub forest). Inhabits even single lines of trees on streams, and the smaller patches on Muretha, but individual territories cover at least 0.5–0.6 ha (forest plus some bracken scrub), and in patches of 1–1.5 ha there is still only one pair. Territorial limits were confirmed in three patches of 1.0, 1.4 and 1.5 ha (all with one pair) using tape playback of a pre-recorded tape from the Nyika Plateau (race *A. t. youngi*). In the race *youngi*, the voice of the male sounds identical, whereas the female gives a slower series of high-pitched notes. The female of Namuli Apalis gives a fast "tititititiiti", similar to that in *A. t. flavigularis* of Mulanje. Pairs of Namuli Apalis reacted well to tape playback from the Nyika, coming to within 1–2 m of the recorder in the forest understorey, bill-snapping and wing-clapping.

Densities in continuous forest are likely to be around 5 pairs/10 ha, and the overall population in the study area (in 1200–1400 ha of forest) must be at least 6–700 pairs, probably more as narrow riparian strips and scrub forest are not really included in this calculation.

Black-headed Apalis, *Apalis melanocephala*. Eastern endemic. Very common in forest canopy at all altitudes, from 1200 m (and likely lower) to 1900 m. Pairs occupy small patches on Muretha, with territories of 1–1.5 ha. Also in patches of *Syzygium cordatum* forest at 1200 m. Readily reacts to tape playback of the song of White-winged Apalis (see above), perhaps competing with it.

Bleating Bush Warbler, *Camaroptera brachyura*. Common in forest understorey at low altitude, up to c.1400 m.

[**Southern Black Flycatcher**, *Melaenornis pammelaina*. One record only (Demey) of one in old cultivation with scattered trees below the Malema bridge.]

[**Spotted Flycatcher**, *Muscicapa striata*. Palaearctic migrant, recorded at low altitude by Ryan *et al*.]

Dusky Flycatcher, *Muscicapa adusta*. The odd pair in riparian forest, from 1250–1550 m, just below Ukalini.

[**Ashy Flycatcher**, *Muscicapa caerulescens*. A species of riparian forest recorded by Ryan *et al*. at c.1250 m.]

Lead-coloured Flycatcher, *Myioparus plumbeus*. One singing in open, secondary forest *(Syzygium cordatum, Trema* etc.) on a slope at 1400 m on the Ukalini path. No previous record.

Cape Batis, *Batis capensis*. Afromontane near-endemic. Common in forest, from 1270 m to the top. On Muretha one pair in a round patch of 1 ha, but 2 pairs present in two patches of 1.4 and 1.5 ha (comparable to densities on the Nyika Plateau). Vincent found them common from 1370 m.

Mozambique Batis, *Batis soror*. A few pairs at 1200–1300 m in *Syzygium cordatum* woodland and at forest edges.

Black-throated Wattle-eye, *Platysteira peltata*. A few pairs in riparian forest at 1200–1300 m.

White-tailed Crested Flycatcher, *Elminia albonotata*. Afromontane endemic. Common species of forest understorey, from 1250 m (Malema) to the top. On Muretha, single pairs occupy patches of 1–1.5 ha.

African Paradise Flycatcher, *Terpsiphone viridis*. Pairs in riparian forest at 1200–1300 m, possibly a little higher. Also in *Syzygium* woodland or forest.

Dapple-throat, *Modulatrix orostruthus*. **Vulnerable**. Afromontane endemic, the nominate race being confined to Namuli. The underparts are much less clearly dappled than in the Tanzanian races (*amani*, *sanjei*) whose populations are respectively in the East Usambaras (rare) and Udzungwas (common; Keith *et al*. 1992). Confined to montane forest above 1500 or 1600 m, up to 1870 m. Common in Manho and Ukalini; rather marginal in fragmented forest on Muretha (one pair occupying two contiguous patches of closed forest totalling 2.5 ha). Feeds on ground, hopping and turning leaves like a thrush. Sings low down on small saplings, fallen logs or just a bump on the ground. The literature contains nothing on how this bird feeds or behaves (Keith *et al*. 1992), yet it is less difficult to watch than Spot-throat *M. stictigula*, as the latter prefers impenetrable thickets. The alarm-call is a striking modulated whistle, also given with songs by birds counter-singing with neighbours. Individuals have at least 2–3 song types; the Tanzanian populations produce slightly different motifs, as is to be expected of distant populations. The timbre and style of song are reminiscent of the melodious song of another montane babbler, the Grey-chested Illadopsis *Kakamega poliothorax*, but the voice of Spot-throat is more varied, although also loud and melodious.

Does not occupy the whole forest as it is partial to areas with high densities of saplings under fairly closed canopy; seems to avoid *Mimulopsis* thickets (unlike Spot-throat *M. stictigula* elsewhere) and is thus more readily observed than its congener. Densities in the large forest blocks (1000 ha) could be of the order of 300 to 500 pairs, based on an estimate of 3–5 pairs/10 ha.

Vincent collected a single male at an altitude of c.1464 m. There is no forest of any size today at that altitude that might be suitable for this species; he failed to find any more, but at this low level he might have come across an altitudinal wanderer. New to science when he collected it in 1932, it was originally placed in the bulbul genus *Phyllastrephus*. However, Vincent's assistant told him that he saw this bird produce a modulated whistle quite unlike that of bulbuls and reminding him rather of a robin.

Rufous-bellied Tit, *Parus pallidiventris*. Zambezian near-endemic. Occurs in *Syzygium cordatum* woodland near the Nanchili. Vincent did not collect any, but saw some in park-like clearings at 1400 m.

Violet-backed Sunbird, *Anthreptes longuemarei*. A few seen on flowers of *Syzygium cordatum* and *Eucalyptus* near the Nanchili bridge.

Collared Sunbird, *Anthreptes collaris*. Common in riparian forest at 1200–1300 m.

Olive Sunbird, *Nectarinia olivacea*. Common in riparian forest at medium altitude and in Ukalini, slightly less common in Manho, rare on Muretha (but at least one male singing in a patch of c.1 ha, and 1–2 wanderers elsewhere). Unlikely to occur above 1870 m. On pink flowers of Loranthaceae, but largely insectivorous.

Miombo Double-collared Sunbird, *Nectarinia manoensis*. Zambezian endemic. A few birds at

medium altitudes (up to 1400 m), on flowers of *Syzygium cordatum*, *Protea welwitschii*. The complete absence of sunbirds in bracken scrub at higher levels may seem surprising, but is probably due to the floristic poverty of this habitat with hardly any sunbird-favoured flowers. Vincent saw some higher up at c.1600 m. On Mulanje this species is common up to 2130 m.

Eastern Double-collared Sunbird, *Nectarinia mediocris*. Afromontane endemic. Normally a very common bird in montane forest, but uncommon in Manho (pairs in widely separated territories, 500 m or more apart) and on Muretha (1 or 2 wanderers, no song). Less uncommon in Ukalini. Seen on flowers of *Syzygium cordatum*, *Albizia gummifera* and on blue *Streptocarpus*. In July 1932 Vincent found them all in "full breeding activity". Definitely not recorded from lower levels in November, but Demey saw some on Rio Malema in June, the result of altitudinal movements in cold months.

Yellow-bellied Sunbird, *Nectarinia venusta*. On *Erythrina*, *Syzygium* etc. at medium altitudes (1200–1400 m). In late July Vincent saw it much higher, up to perhaps 1800 m, in bracken with wild flowers.

Yellow White-eye, *Zosterops senegalensis*. Common species in any forest, secondary formations and tall bracken scrub, up to at least 1900 m.

Southern Puffback, *Dryoscopus cubla*. Common in *Syzygium* woodland and mid-altitude forest. In montane forest only in Ukalini (up to at least 1750 m), but absent from cooler Manho and Muretha.

Marsh Tchagra, *Tchagra minutus*. Elusive species heard in dense bracken scrub (song, alarm-calls) in 3 places, from 1300–1850 m.

Brown-headed Tchagra, *Tchagra australis*. In dense bracken scrub and *Syzygium cordatum* woodland at 1200–1400 m.

Tropical Boubou, *Laniarius aethiopicus*. Fairly common in dense bracken scrub and at forest edges from low altitude to 1800 or (locally) 1870 m.

Many-coloured (Black-fronted) **Bush Shrike**, *Malaconotus multicolor*. Common in forest canopy and mid-stratum, from 1200–1820 m in Manho and Ukalini. Absent from fragmented forest on Muretha patches. Vincent collected 11 specimens, two of which were the melanistic morph.

[**Orange-breasted Bush Shrike**, *Malaconotus sulfureopectus*. Normally a species of dry riparian forest or woodland. One recorded by Demey from disturbed habitat with overgrown cultivation and scattered trees, below Malema bridge at c.1200 m. Also listed by Ryan *et al*. for low altitudes. Normally separated from *M. multicolor* and likely to be no more than very marginal in the area.]

[**Grey-headed Bush Shrike**, *Malaconotus blanchoti*. Vincent collected one female in forest at 1430 m and considered it "no doubt a straggler from the woodland below".]

Square-tailed Drongo, *Dicrurus ludwigii*. Common in riparian forest at medium altitudes, with strong disputes between displaced pairs following recent deforestation around the Nanchili bridge. Less common but widespread in Manho and Ukalini Forests, up to 1750 m, especially under closed canopy.

White-necked Raven, *Corvus albicollis*. Common on the mountain at all levels, around rocky hills. Up to 12 birds eating *Myrica* fruit on the edge of the Muretha Plateau on 21–22 Nov 07, some flying off with small broken branches (with fruit).

African Red-winged Starling, *Onychognathus morio*. Common around rocky formations, usually in pairs; nests in rocky cracks. Often feeds in canopy of nearby forest, on insects or fruit (e.g. *Aphloia*).

[**Amethyst Starling**, *Cinnyricinclus leucogaster*. Only records are from Ryan *et al*. who found some at lower levels, c.1250 m or lower. An intra-African migrant that may breed some years in montane or mid-altitude forest and adjacent woodland, depending on the amount of fruit, but usually avoids the wetter side of mountains.]

Bertram's Weaver, *Ploceus bertrandi*. Afromontane endemic. Uncommon: one pair in riparian forest near the Nanchili bridge; one pair in secondary growth among scattered trees below the lip of Ukalini Forest at 1580 m. A nest from the previous year was clearly visible at a height of 2.5 m hanging on afrond of a tree fern *Cyathea dregei*. Noted by Demey and Melo *et al.* but not by Ryan *et al*.

Spectacled Weaver, *Ploceus ocularis*. At forest edges and in bracken scrub at medium altitude, 1200–1400 m.

Dark-backed (Forest) **Weaver**, *Ploceus bicolor*. Common in riparian forest and higher in the larger blocks of montane forest (Manho and Ukalini) up to 1800 m.

Black-winged Bishop, *Euplectes hordeaceus*. Several small flocks (non-breeding dress) in the

Malema area, 14–15 Nov 07.

Red-collared Whydah, *Euplectes ardens*. A male turning into breeding dress in a wet peaty meadow, 1880 m, 22 Nov 07. Likely to breed in this habitat, but no previous records.

Red-faced Crimsonwing, *Cryptospiza reichenovii*. Afromontane endemic. Very discreet species of forest understorey, locally encountered in pairs: Muretha Plateau, Manho, riparian forest lower down; overall 1250–1870 m.

[**Lesser Seedcracker**, *Pyrenestes minor*. Eastern endemic. One record of this very discreet bird by Demey of a pair in secondary growth below the Malema bridge, 4 Jun 07.]

Blue-billed Firefinch, *Lagonosticta rubricata*. A few pairs in dense bracken scrub and at forest edges, 1200–1600 m, possibly higher.

Swee Waxbill, *Estrilda melanotis*. Afromontane near-endemic. A few pairs at medium altitudes, in bracken scrub, near rocks at forest edges, up to 1400–1500 m.

Common Waxbill, *Estrilda astrild*. Common in peaty meadows on Muretha, in pairs or small groups, feeding on grass seeds; also lower down in grassland.

Red-backed Mannikin, *Spermestes bicolor*. Small flocks in bracken scrub at 1200–1350 m.

Pin-tailed Widow, *Vidua macroura*. A male displaying in short grassland on ridge at 1350 m, 26–27 Nov 07 (also seen lower down), nearly in full dress; birds seen in June (Demey) were still in full dress.

[**Indigobird**, *Vidua* sp. Demey saw one in breeding dress near the Malema bridge on 3 Jun 07. The only likely species is Variable Indigobird *V. funerea*, as the only firefinch present (which it parasitizes) is *L. rubricata*.]

African Citril, *Serinus citrinelloides*. Afromontane near-endemic. A few at forest edges and in secondary growth with scattered trees, medium elevations up to 1580 m (lower edge of Ukalini).

[**Bully Canary**, *Serinus sulphuratus*. One record of 1–2 pairs by Demey near the Malema bridge, in secondary growth.]

Cabanis's Bunting, *Emberiza cabanisi*. A few singing at forest edges, in *Syzygium cordatum* woodland and wooded grassland at medium altitude (1200–1400 m).

A few more species recorded below 1200 m are likely to wander occasionally a bit higher, such as Bronze Mannikin *Spermestes cucullata*. Red-throated Twinspot *Hypargos niveoguttatus*, recorded by Melo *et al.* on the Malema, was probably below 1200 m.

<u>Species to be deleted from previous lists or in need of confirmation</u>

Hottentot Teal, *Anas hottentota*. Vincent flushed 3 ducks from a forest stream at 1550 m in the Ukusini forest. He thought they were small enough to be this species, but other than size his short description agrees equally well with African Black Duck. As the habitat is abnormal for Hottentot Teal and that Black Ducks certainly occur, this record is best considered as unproven. It was listed without comment in a summary table by Ryan *et al*.

African Hawk-Eagle, *Hieraaetus spilogaster*. Listed by Vincent in a summary table (Ibis 1934: 159) for both Namuli and Cholo (Thyolo). But the text does not mention this species at all, and I suspect it was dropped through the lack of specimens. This bird is unlikely at both localities, being a bird of woodland rather than forest, absent from the wet slopes of forested mountains. If a hawk-eagle were to occur on Namuli, it would be far more likely the forest species Ayres's Hawk Eagle *H. ayresii*. It is indeed the latter which is or was recorded from Thyolo Forest (Dowsett-Lemaire & Dowsett 2006). Listed without comment by Ryan *et al*. (1999a) based on Vincent.

Red-tailed Flufftail, *Sarothrura affinis*. Afromontane near-endemic. Apparently recorded by Ryan *et al.* (1999a, b) based on a bird seen by P. Ryan alone on Muretha Plateau (C. Cohen, pers. com.) during a day visit to the area. Most flufftails seen would be in flight, when it is difficult to see plumage details, and there is no tape-recording in support. The author was perhaps unaware that Red-chested Flufftail may occur at high altitudes as well, and may have assumed it was *S. affinis* because of the altitude. As this is a biome species, it appears also in the IBA account for Namuli (Parker 2001). The habitat of *S. affinis* in the tropics is dry montane grassland, which is hardly present on Namuli. Were the Red-tailed Flufftail to occur, it should be singing spontaneously at this time of year, but I did not hear any. Repeated searches for the species (with the help of tape playback) met with complete failure, whereas Red-chested Flufftail was found to be common throughout the peaty meadows of Muretha Plateau. Although one cannot altogether dismiss the 1998 record, as it is conceivable that the species occurs very locally (it is present on Mt Mulanje,

but there is much suitable habitat), it would be wise to consider it as unproven, and the species should be deleted from the Afromontane biome list for Namuli. *S. affinis* is known from the montane grassland of the Chimanimani Mountains (Masterson & Child 1959). Melo *et al.* mention a *Sarothrura affinis* with a question mark: this is based on a flufftail flushed on Muretha Plateau, which they could not identify (K. Dijkstra, pers. comm.). The species "*S. affinis*" appears on their list perhaps because it was the only flufftail mentioned earlier, by Ryan *et al*.

Purple-crested Turaco, *Tauraco porphyreolophus*. Shown as occurring on the Nanchili (camp 2, 1250 m) in Ryan et al. (1999a: 327), but this is in error. The bird was seen at lower levels near Gurue town and not on Namuli (J. Graham & P. Ryan, pers. comm.). Indeed this species is normally absent from mid-altitude forest occupied by Livingstone's Turacos.

Bearded Woodpecker, *Thripias namaquus*. Vincent did not collect any, but thought he heard its call from the forest canopy at 1430 m. This is so unusual for this woodland species that the record is best dropped (moreover, the call described does not correspond to the typical calls of this woodpecker). No-one else who visited the area has found the species, and indeed the large woodland trees favoured by it are lacking. Listed without comment by Ryan *et al*. (1999a), based on Vincent.

Cinnamon Bracken Warbler, *Bradypterus cinnamomeus*. Afromontane endemic (from Ethiopia to Malawi). A warbler of bracken scrub and forest edges of the highest mountains in eastern Africa, where it can be very common. It remains unknown from Mozambique (its inclusion in Dowsett 1993 is in error), and the southern limits of range are reached in Malawi. South of the Nyika and North Viphya Plateaux there is an isolated, relict population on Mt Mulanje, which it ascends to 2840 m near the summit (Dowsett-Lemaire & Dowsett 2006). Demey thought he might have heard it on Namuli. Aware of the possibility, I paid more than usual attention to the songs and calls of *Bradypterus* warblers on Namuli (it is difficult to see these birds and also to distinguish the two species on sight, especially in dark understorey); after listening to hundreds of songs, I identified only *B. lopezi*. The latter has three main song types on Namuli (all tape-recorded on this visit), and the fastest could conceivably be confused with the fast trill of *B. cinnamomeus.* However, at all times, the songs of *B. cinnamomeus* can be identified by the presence of one to a few thin whistles preceding the trill (absent in *B. lopezi*), and by the fact that the main song is given without a crescendo (present in *B. lopezi*). The contact or alarm calls also differ, those of *B. lopezi* being one or a few hard "thac", those of *B. cinnamomeus* a soft rolled purr or "trrr". Again, all the *Bradypterus* I came across, including in bracken scrub, were alarm-calling like *B. lopezi*. The fact that *B. lopezi* extends its niche into secondary growth outside forest is also strongly suggestive of the absence of its congener. Wherever the two species coexist *B. cinnamomeus* occupies secondary growth, or even some types of small, secondary forest patches, and prevents *B. lopezi* from leaving the forest undergrowth (some cases of counter-singing have been observed on the Nyika, Dowsett-Lemaire 1983). My conclusion is that it is very unlikely that *B. cinnamomeus* occurs on Namuli, and in the absence of tape recordings, this tentative record should be dropped. All specimens collected by Vincent and K. Cook are of *B. lopezi*, including in bracken scrub.

ANNEX 5. Birds caught in nets, Namuli November 2007 (Katrina Cook).

Species	Coll. no.	Ring no.	Date	Locality	GPS S	GPS E	Altitude	Time	Age	Sex	Wing [mm]	Tarsus [mm]	Tail [mm]	Weight [g]	Specimen location
Cuculus solitarius	9		17-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	14:00	Ad.	F	174	19	124	79	BMNH
Psalidoprocne pristoptera	36		23-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	12:00	Ad.	M	111	9	95	10.5	BMNH
Motacilla clara	2		15-Nov-07	Rio Malema base camp	15° 24'	37° 04'	1188m	05:00	Juv.	M	79	21	95	18.5	BMNH
Pycnonotus barbatus	7		17-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	M	96	23	80	41	BMNH
Andropadus virens	1		15-Nov-07	Rio Malema base camp	15° 24'	37° 04'	1188m	05:00	Ad.	M	91	22	86	25.5	BMNH
Andropadus virens	3		15-Nov-07	Rio Malema base camp	15° 24'	37° 04'	1188m	07:00	Juv.	M	82	21	77	21.5	MAPUTO
Andropadus virens		FA93701	15-Nov-07	Rio Malema base camp	15° 24'	37° 04'	1188m	07:00	Juv.		84	22	75	26	
Andropadus virens		FA93702	15-Nov-07	Rio Malema base camp	15° 24'	37° 04'	1188m	07:00	Juv.		86	21	82	24.7	
Andropadus virens	45		25-Nov-07	Ukalini Forest	15° 22'	37° 03'	1615m		Juv.		80	20	72	22.8	BMNH
Andropadus virens	46		25-Nov-07	Ukalini Forest	15° 22'	37° 03'	1615m		1st yr.		83	19	70	23.1	BMNH
Andropadus nigriceps	34		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	13:00	Ad.	M	93	26	86	36.9	BMNH
Andropadus milanjensis	5		17-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	F	91	22	83	36	BMNH
Andropadus milanjensis	6		17-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00		F	87	24	80	36	BMNH
Andropadus milanjensis	11		18-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	07:00	Juv.	M	86	22	84	33.2	MAPUTO
Andropadus milanjensis	17		19-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00		F	87	24	82	31.2	BMNH
Andropadus milanjensis	29		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	M	98	25	89	37.4	BMNH
Andropadus milanjensis	37		23-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	12:00	Ad.	M	95	24	88	35.4	MAPUTO
Pogonocichla stellata		GA94399	20-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	17:00	Ad.	F	75	23	56	19.3	
Pogonocichla stellata	22		20-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m		Ad.	M	81	25	58	16.4	BMNH
Pogonocichla stellata	40		23-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	17:00	Ad.	M	80	25	60	18.2	MAPUTO
Pogonocichla stellata	42		23-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m		Ad.	M	82	26	59	15.6	MAPUTO
Pogonocichla stellata	44		25-Nov-07	Ukalini Forest	15° 22'	37° 03'	1615m	17:00	Ad.	M	83	24	64	17.4	BMNH
Alethe choloensis			26-Nov-07	Ukalini Forest	15° 22'	37° 03'	1615m	08:30	Ad.	F	103	31	72	47	
Alethe choloensis			26-Nov-07	Ukalini Forest	15° 22'	37° 03'	1615m	09:00	Ad.	F	99	31	68	44	
Cossypha caffra	4		16-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	17:00	Ad.	M	86	30	74	29	MAPUTO
Cossypha caffra	10		18-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	07:00	Ad.	M	88	28	85	27.4	MAPUTO
Cossypha caffra	12		18-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	M	83	28	82	26.8	BMNH
Cossypha a. anomala	20		19-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	10:00	Ad.	F	75	31	53	24.8	BMNH
Cossypha a. anomala	23		20-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m		Ad.	M	80	39	61	22.6	BMNH
Turdus olivaceus	8		17-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	10:00	Ad.	F	120	32	89	76	BMNH
Turdus olivaceus	39		23-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	17:00	Ad.	M	120	32	89	71	BMNH

Species	Coll. no.	Ring no.	Date	Locality	GPS S	GPS E	Altitude	Time	Age	Sex	Wing [mm]	Tarsus [mm]	Tail [mm]	Weight [g]	Specimen location
Zoothera gurneyi	26		20-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m		Ad.	M	110	34	63	54	BMNH
Zoothera gurneyi	41		23-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m		Ad.	M	109	34	67	53	MAPUTO
Modulatrix orostruthus	43		23-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m		Ad.	M	87	28	74	29.9	BMNH
Bradypterus lopezi	19		19-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	10:00		M	68	24	70	20.8	BMNH
Bradypterus lopezi	27		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	F	61	23	63	17.7	BMNH
Cisticola lais	14		19-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	07:00	Juv.	M	56	21	46	13.4	BMNH
Cisticola lais	28		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	F	51	20	50	10.4	BMNH
Apalis lynesi	24		20-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m		Ad.	M	52	22	52	10.8	MAPUTO
Apalis lynesi	32		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	10:00	Imm.	F	50	23	44	11.5	BMNH
Batis capensis dimorpha	25		20-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m		1st yr.	F	62	21	46	12.2	BMNH
Batis capensis dimorpha	30		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	10:00	Ad.	F	60	19	40	10.6	MAPUTO
Batis capensis dimorpha	31		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	10:00	1st yr.	M	59	20	40	11.5	MAPUTO
Batis capensis dimorpha	35		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	14:00	Ad.	M	63	19	44	11.8	BMNH
Elminia albonotata	13		18-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	F	60	19	65	7.6	BMNH
Elminia albonotata	18		19-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	10:00	Juv.		59	17	67	8.2	BMNH
Elminia albonotata	21		20-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	17:00	Ad.	M	64	18	70	9	BMNH
Elminia albonotata	33		22-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	12:00		M	61	17	66	8.3	MAPUTO
Elminia albonotata	38		23-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	14:00	Ad.	F	60	17	65	8.5	MAPUTO
Zosterops senegalensis		retrap *	19-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	M	61	16	43	11.4	
Zosterops senegalensis	15		19-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	F	56	16	38	10.6	BMNH
Zosterops senegalensis	16		19-Nov-07	Muretha plateau	15° 23'	37° 02'	1860m	08:00	Ad.	M	60	16	39	9.5	BMNH
Nectarinia olivacea	47		26-Nov-07	Ukalini Forest	15° 22'	37° 03'	1615m	05:00	Juv.		59	15.5	43	9	BMNH
Nectarinia olivacea	48		26-Nov-07	Ukalini Forest	15° 22'	37° 03'	1615m	08:00	Ad.	M	65	16.5	53	10.5	BMNH
Specimens without a collecting number were ringed and released.															

ANNEX 6. List of small mammal species collected or recorded from the Namuli massif (S = sight record). Bat records from netting at two altitudes in 2008 by Kopp & Curran are also shown here (some identifications still to be confirmed). Nomenclature follows Kingdon (1997), and Taylor (2001) for bats.

Family / Species	Monadejm, Gurué 2006	Bayliss, June 2007	Bayliss, Nov 2007	Kopp & Curran, Nov 2008	
				1220m	1650m
Primates: Galagonidae					
Galagoides granti		S	S		
Primates: Cercopithecidae					
Cercopithecus nictitans mitis		S	S		
Chiroptera: Pteropodidae					
Eidolon helvum			S		
Epomophorus cf. *crypturus*				X	
Epomophorus wahlbergi	X			X	
Lissonycteris goliath	X			X	X
Rousettus aegyptiacus leachi	X				
Chiroptera: Rhinolophidae					
Rhinolophus cf. *blasii*	X				X
Rhinolophus clivosus zuluensis	X				X
Rhinolophus sp.				X	X
Chiroptera: Vespertilionidae					
Eptesicus hottentotus			X		
Hipposideros ruber centralis	X				
Miniopterus fraterculus	X		X		X
Miniopterus inflatus			X		X
Myotis bocagii				X	
Myotis tricolor	X	X	X	X	X
Neoromicia africanus	X				
Neoromicia nanus					X
Pipistrellus hesperidus	X			X	X
Pipistrellus rusticus			X		
Scotophilus dinganii	X				
Insectivora: Soricidae					
Crocidura luna		X	X		
Crocidura mariquensis		X			
Crocidura silacea		X	X		
Macroscelidea: Macroscelidinae					
Petrodomus tetradactylus			S		
Rhynchocyon cirnei			S		
Lagomorpha: Leporidae					
Pronolagus rupestris			S		
Rodentia: Sciuridae					
Heliosciurus mutabilis			S		
Paraxerus vincenti			S		
Rodentia: Dendromurinae					
Dendromus melanotis			X		
Dendromus mystacalis		X			
Rodentia: Otomyinae					
Otomys angoniensis		X	X		
Rodentia: Muridae					
Aethomys namaquensis		X			
Dasymys incomtus			X		
Mus minutoides		X			

Mus triton		X			
Praomys delectorum		X	X		
Carnivora: Herpestidae					
Herpestes sanguinea			X		
Mungos mungo bororensis		X			
Carnivora: Viverridae					
Genetta tigrina		X			
Hyracoidea: Procavidae					
Heterohyrax brucei			S		
Artiodactyla: Cephalophini					
Cephalophus monticola		X	S		

ANNEX 7. Butterfly species collected on Mt Namuli by Julian Bayliss (2005–2008), Colin Congdon, Ivan Bampton & Martin Hassan (Nov 2008). Identifications confirmed by Steve Collins (African Butterfly Research Institute, Nairobi, Kenya).

Species arrangement and nomenclature follows Carcasson's African Butterflies (Ackery *et al.* 1995), taking account of some recent changes. 'New to Mozambique' means not listed as occurring in Mozambique according to Ackery *et al.* (1995), Cabral (2000), d'Abrera (1980), Alan Gardiner (unpublished records), Kielland (1990), Libert (1999, 2004), Pringle *et al.* (1994) and Williams (2007).

FAMILY Subfamily	Species	Notes
HESPERIIDAE		
Pyrginae	*Tagiades flesus* (Fabricius, 1781)	
	Eagris sabadius (Gray, 1832)	
	Sarangesa maculata (Mabille, 1891)	
Hesperiinae	*Metisella abdeli* (Krüger, 1928)	
	Metisella medea Evans, 1937	New to Mozambique
	Kedestes mohozutza (Wallengren, 1857)	
	Teniorhinus harona (Westwood, 1881)	
	Acada biseriata (Mabille, 1893)	
	Acleros mackenii (Trimen, 1868)	
	Semalea pulvina (Plötz, 1879)	
	Chondrolepis niveicornis (Plotz, 1883)	
	Artitropa erinnys (Trimen, 1862)	
	Monza punctata (Aurivillius, 1910)	New to Mozambique
	Platylesches tina Evans, 1937	
	Zenonia zeno (Trimen,1864)	
	Borbo perobscura (Druce, 1912)	
	Parnara naso (Fabricius, 1798)	
	Gegenes niso (Linnaeus, 1764)	
PAPILIONIDAE		
Papilioninae	*Papilio dardanus tibullus* Kirby, 1880	
	Papilio demodocus Esper, 1798	
	Papilio desmondi usambarensis (Koçak, 1980)	New to Mozambique
	Papilio echerioides shirensis (Hancock, 1987)	New to Mozambique
	Papilio pelodurus Butler, 1896 subsp. ?nov.	New subspecies
	Papilio phorcas nyikanus Rothschild & Jordan, 1903	
	Graphium angolanus (Goeze, 1779)	
	Graphium policenes (Cramer, 1775)	
PIERIDAE		
Coliadinae	*Catopsilia florella* Fabricius, 1775)	
	Colias electo (Linnaeus, 1773)	
	Eurema(Eurema) brigitta (Stoll, 1780)	
	Eurema(Eurema) desjardinsii (de Boisduval, 1833)	
	Eurema (Eurema) mandarinula (Holland, 1892)	
	Eurema (Terias) hapale (Mabille, 1882)	
	Eurema(Terias) hecabe (Linnaeus, 1758)	
Pierinae	*Colotis euippe omphale* (Godart, 1819)	
	Belenois creona (Cramer, 1776)	
	Appias epaphia (Cramer, 1779)	
	Appias sabina (Felder & Felder, 1865)	
	Mylothris agathina (Cramer, 1779)	
	Mylothris rueppellii rhodesiana (Koch, 1865)	
	Mylothris sagala dentatus Butler, 1896	New to Mozambique
NYMPHALIDAE		
Acraeinae	*Acraea (Acraea) acrita* Hewitson, 1865	
	Acraea(Acraea) calderena Hewitson, 1877	
	Acraea(Acraea) egina areca Mabille, 1889	
	Acraea (Acraea) natalica De Boisduval, 1847	
	Acraea (Acraea) oncaea Hopffer, 1855	

	Acraea (Actinote) cabira (Hopffer, 1855)	
	Acraea (Actinote) conradti Oberthur, 1893	
	Acraea (Actinote) eponina (Cramer, 1780)	
	Acraea (Actinote) goetzei (Thurau, 1903)	New to Mozambique
	Acraea (Actinote) johnstoni (Godman, 1885)	
	Acraea (Actinote) ?*parei* Henning & Henning, 1996	New to Mozambique if confirmed
Danainae	*Danaus chrysippus aegyptius* (von Schreber, 1759)	
	Amauris albimaculata latifascia Talbot, 1940	New to Mozambique
Satyrinae	*Aphysoneura pigmentaria* Karsch, 1894	Possibly ssp. *latilimba* Le Cerf, 1919.
	Bicyclus campina (Aurivillius, 1901)	
	Bicyclus safitza (Westwood, 1850)	
	Henotesia ubenica Thurau, 1903	New to Mozambique
	Ypthima impura Elwes & Edwards, 1893	
	Neocoenyra bioculata Carcasson, 1964 subsp. nov.	New subspecies; species new to Mozambique
Argynninae	*Lachnoptera ayresii* Trimen, 1879	
	Phalanta phalantha (Drury, 1773)	
	Issoria smaragdifera (Butler, 1895)	New to Mozambique
Nymphalinae	*Precis archesia* (Cramer, 1779)	
	Precis octavia (Cramer, 1777)	
	Precis tugela Trimen, 1879	
	Junonia oenone (Linnaeus, 1758)	
	Junonia orithya madagascariensis Guenée, 1865	
	Junonia sophia infracta Butler, 1888	New to Mozambique
	Cynthia cardui (Linnaeus, 1758)	
	Antanartia dimorphica Howarth, 1966	New to Mozambique
	Antanartia schaeneia (Trimen, 1879)	New to Mozambique
Limenitinae	*Neptis alta* Overlaet, 1955	
	Neptis gratiosa Overlaet, 1955	
	Neptis laeta Overlaet, 1955	
	Neptis swynnertoni Trimen, 1912	
	Cymothoe sp. nov.	New species
	Pseudacraea boisduvali (Doubleday, 1845)	
	Pseudacraea eurytus (Linnaeus, 1758)	
	Pseudathyma sp. nov.	New species
	Euryphura achlys (Hopffer, 1855)	
	Hamanumida daedalus (Fabricius, 1775)	
	Pseudargynnis hegemone (Godart, 1819)	
Charaxinae	*Charaxes achaemenes* Felder & Felder, 1867	
	Charaxes acuminatus Thurau, 1903	
	Charaxes brutus (Cramer, 1779)	
	Charaxes cithaeron Felder & Felder, 1859	
	Charaxes dilutus Rothschild, 1898	New to Mozambique
	Charaxes druceanus proximans Joicey & Talbot, 1922	
	Charaxes ethalion (de Boisduval, 1847)	
	Charaxes macclounii Butler, 1895	
	Charaxes xiphares woodi van Someren, 1964	New to Mozambique
	Charaxes sp. aff. *margaretae* Rydon, 1980	New to Mozambique
LYCAENIDAE		
Lipteninae	*Pentila pauli* Staudinger, 1888	New to Mozambique
Theclinae	*Cigaritis trimeni* Neave, 1910	
	Iolaus (Epamera) sidus Trimen, 1864	
	Iolaus (Epamera) sp. nov.	New species
	Iolaus (Philiolaus) ?sp. nov.	New species
	Hemiolaus caeculus (Hopffer, 1855)	
	Leptomyrina hirundo (Wallengren, 1857)	
	Leptomyrina handmani Gifford, 1965	New to Mozambique
	Capys disjunctus Trimen, 1895	New to Mozambique
Polyommatinae	*Anthene amarah* (Guérin-Méneville, 1849)	
	Anthene definita (Butler, 1899)	
	Anthene kersteni (Gerstaecker, 1871)	

	Anthene lasti (Grose-Smith & Kirby, 1894)	
	Anthene lunulata (Trimen, 1894)	
	Anthene princeps (Butler, 1876)	
	Pseudonacaduba sichela (Wallengren, 1857)	
	Lampides boeticus (Linnaeus, 1767)	
	Uranothauma antinorii (Oberthur, 1883)	
	Uranothauma falkensteini (Dewitz, 1879)	New to Mozambique
	Uranothauma poggei (Dewitz, 1879)	
	Uranothauma sp. nov.	New species
	Cacyreus tespis (=*palemon*) (Herbst, 1804)	
	Cacyreus virilis Stempffer, 1936	
	Leptotes pirithous (Linnaeus, 1767)	
	Zizina antanossa (Mabille, 1877)	
	Actizera lucida (Trimen, 1883)	
	Zizula hylax (Fabricius, 1775)	
	Eicochrysops hippocrates (Fabricius, 1793)	
	Euchrysops malathana (de Boisduval, 1833)	
	Euchrysops osiris (Hopffer, 1855)	
	Euchrysops subpallida Bethune-Baker, 1923	New to Mozambique
	Cupidopsis cissus (Godart, 1824)	
	Azanus moriqua (Wallengren, 1857)	
	Azanus jesous (Guérin-Méneville, 1849)	
	Chilades trochylus (Freyer, 1843)	