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

THE BIODIVERSITY AND CONSERVATION OF MOUNT CHIPERONE, MOZAMBIQUE

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1. INTRODUCTION

A scientific expedition to Mount Chiperone in northern Mozambique was carried out from 22 November to 5 December 2006. The expedition was funded under a Darwin Initiative grant to the Royal Botanic Gardens, Kew – "Monitoring and Managing Biodiversity Loss on South-East Africa's Montane Ecosystems". The expedition was a collaborative effort between Kew, the Instituto de Investigação Agraria de Moçambique (IIAM), the Mulanje Mountain Conservation Trust (MMCT), and the Forest Research Institute of Malawi (FRIM). A full list of participants is given in Appendix 1.

The objectives of the expedition and study were:

1. To undertake botanical and vegetation field survey of Mount Chiperone
2. To gather additional zoological information on the mountain
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 to document what is known on the biodiversity and physical attributes of Mount Chiperone, to present the results of the expedition, and to outline the threats to that biodiversity. It also outlines conservation management issues, with particular reference to moist forest above 1000 m altitude, and gives some conservation recommendations. Species and habitat recovery plans will be outlined in another report towards the end of the project.

2. STUDY AREA

Location
Mount Chiperone in northern Mozambique is a semi-isolated peak situated some 50 km south of the Mount Mulanje massif in southern Malawi. It lies in Milange District of Zambézia Province, 40 km SSW of the District Centre of Milange. The area of Mount Chiperone above 600 m covers about 100 km^2, with around 4915 ha (in planimetric view) above 800 m altitude, 2770 ha above 1000 m, and only 110 ha over 1800 m. The massif is centred on 16^{o}29'S, 35^{o}43'E, with the highest point at 2054 m (c. 16^{o}28'44"S, 35^{o}42'88"E).

The surrounding plains to the north form part of the central African plateau, here lying at around 400–450 m altitude, while the land to the south falls away rapidly to 200–350 m towards the coast some 200 km away from the Zambezi Delta. The Shire valley, part of the East African Rift Valley, lies 35 km to the west at an altitude at this point of 50–100 m.

Starting from a road-head in Sabelua village (16^{o}30'48"S, 35^{o}46'08"E, alt. 400 m) on the SE slopes, expedition members walked up the south-eastern flank through cleared and regenerating woodland vegetation, across two ridges, and established a base camp just inside the nearest patch of moist forest (16^{o}30'35.4"S, 35^{o}43'42.7"E) at an altitude of 1029 m. Most of the survey work was concentrated in the forest and miombo woodland within relatively easy access of the camp. In addition, reconnaissance trips were made up along the NW–SE trending summit ridge and on the eastern slopes above Marega village (16^{o}28'1.4"S, 35^{o}45'45.1"E, alt. 502 m). Collecting localities and areas visited are shown in Figure 1.

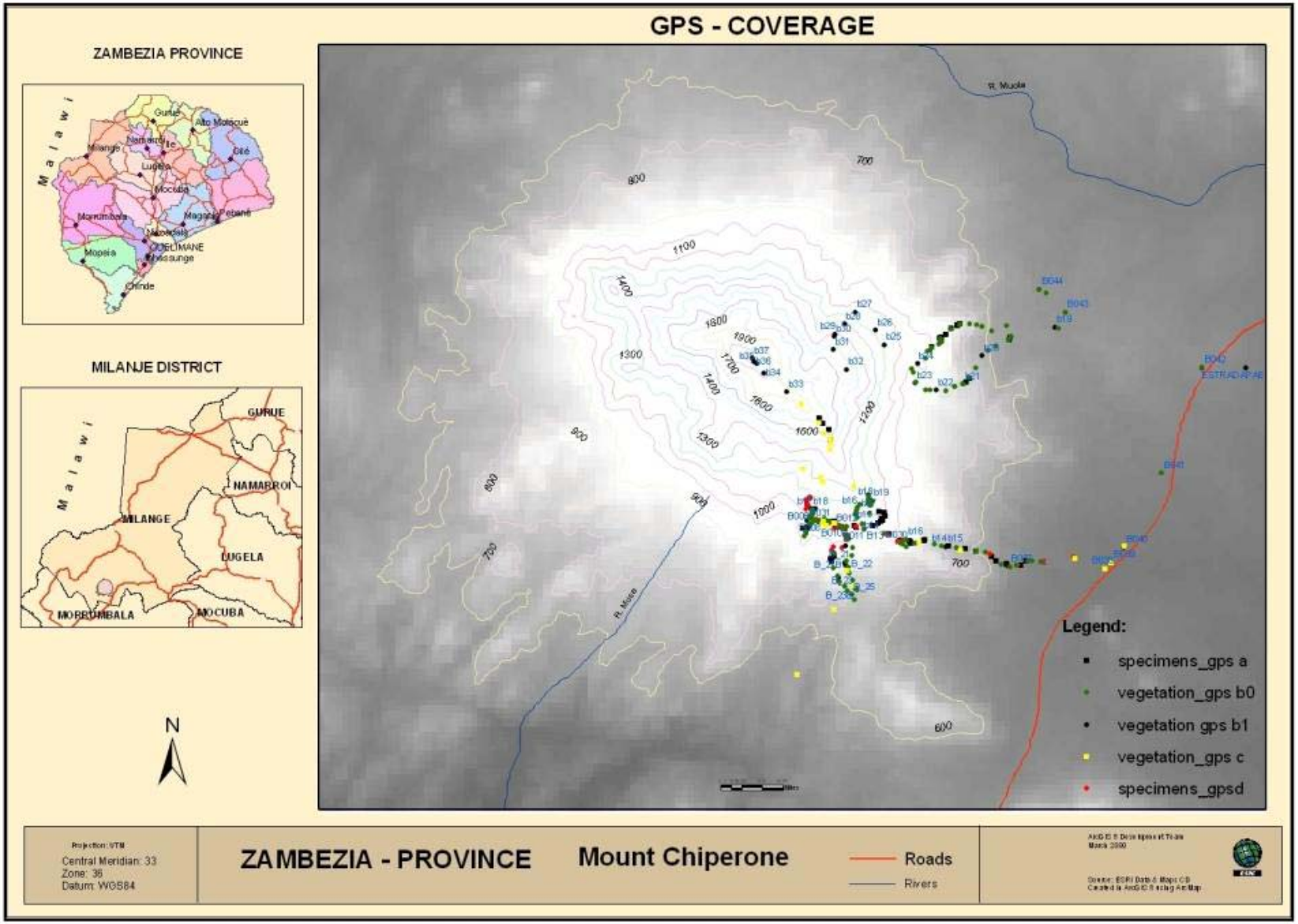


Figure 1. Map of Chiperone area and collecting localities.

Logistics and the full itinerary are given in a separate report (J. Bayliss, Trip Report – Mount Chiperone Expedition, 22 Nov–5 Dec 2006).

Geology and Geomorphology

Mount Chiperone, a semi-isolated peak, appears to rise rapidly out of the surrounding plateau, and has a distinctive small pointed peak when viewed from the north or east. There is a NW–SE trending ridge, with a main peak (2054 m, ONC charts) slightly towards the NW end. However published figures vary slightly, from 2017 m [Google Earth] to 2065 m [1:250,000 map]. Other minor high points are seen along the ridge, some of which are almost devoid of woody cover. Otherwise the slopes coming off the ridge are steep and mostly covered in closed moist forest.

The mountain is composed of fairly recent syenite (Jurassic/Cretaceous period, c.150 Mya), intruded the surrounding country rock, which comprises migmatites (metamorphic rock injected with igneous material) of the Namarroi series (850–1100 Mya). In this respect, Chiperone differs from most of the other massifs or hills in northern Mozambique, which are composed of migmatities or granites (e.g. Mt Namuli, the inselbergs around Ribaue and Nampula). The exceptions are Mt Tembe at Morrumbala and Mount Tumbine above Milange town, and much further to the south, a large part of Mount Gorongosa. Mt Mulanje, formed 130 Mya at approximately the same time as Chiperone, is composed of syenite, quartz-syenite and granite (Garson & Walshaw 1969, Eastwood 1988), nomenclature depending on the level of quartz (syenite if quartz is essentially absent).

The main drainage off the mountain is to the south west. These small rivers, the Rio Macololo (becoming the Rio Metambe) and the Rio Muse, are probably not perennial. They both drain into the Shire River in southern Malawi above the town of Nsanje.

Climate

Climatic data on the area are not available. From coarse-scale maps, mean annual rainfall is around 1400 mm/year. Meteorological data from Milange, 40 km away (Kassam et al. 1981), give a mean annual rainfall of 1733.9 mm (28 years), with a mean annual temperature of 23^{o}C, mean maximum of 28.9^{o}C and mean minimum of 17.1^{o}C. Vegetation on the lower slopes of the mountain, however, suggests that rainfall is somewhat lower, perhaps around 1000 mm/year.

Landuse

There are two villages and settlements at the base of Mt Chiperone on the south and south-eastern slopes, Sabelua and Marega. The peneplain here has been extensively cleared and is cultivated at subsistence level. The northern, north-eastern and western slopes seem little affected by human activity, although they were not visited on the ground. On the lower slopes on the south and south-east there has been patchy clearance for cultivation of maize, cassava and beans, and extensive burning, particularly in the Marega area. The landscape of Mt. Chiperone is a mosaic of cultivation, disturbed woodland and fallows/regenerating woodland of various ages. This continues through the miombo woodland belt until the edge of the moist forest. There is virtually no cultivation or cleared patches above 1000 m altitude on the southern and south-western slopes, but cleared patches are found up to 1400 m on the (presumably moister or more mesic) south-eastern slopes.

The moist forest itself appears very little disturbed, apart from fire along the boundaries, particularly marked in the gullies. This lack of anthropogenic disturbance is possibly due to the local belief of malevolent spirits residing in the forest.

Water was identified as a particular problem for villages at the base of the mountain. There are a few small streams running off, but during the dry season these dry up or become a trickle. There are apparently no wells or boreholes in the vicinity.

3. PREVIOUS STUDIES

It appears that very little published information is available on Mt Chiperone and the immediate surrounding area. This is rather surprising considering the wealth of information – geological, biological, historical – on Mt Mulanje in Malawi, just 50 km away. However, rarely did researchers and others based in Malawi extend their study or visit across the border, even though in the first part of the 20th century access to this part of Malawi was often by train through Mozambique and up the Shire Valley. Dixey, the Nyasaland Government Geologist, for example, does not mention Chiperone in his study on the "Mlanje Mountains of Nyasaland" (Dixey 1927), and Jim Chapman, a Forester who spent many years working and collecting on and around Mt Mulanje, has also not visited (pers. comm. 2007). Vincent, in his mammoth bird-collecting trip across southern Malawi and northern Mozambique, did not visit, but saw the "island" Mt Chiperone from afar and said it "..... should hold much interest to the naturalist". The main knowledge of Chiperone among many residents of Malawi would appear to be through the so-called "chiperone" weather, a 5-day misty weather system that is reputed to generate over Chiperone and which then moves towards Mulanje, bringing light rainfall. Such weather is of particular significance and benefit to the tea plantations there.

The first recorded biological collecting from Mount Chiperone was of birds, carried out from 25–31 July 1950 by Jali Makawa, a collector for the famous ornithologist C.W. Benson (reported in Benson 1950 and Spottiswoode et al. 2006). Over 6 days at an altitude of around 1500 m Makawa collected at least one specimen of 18 species, with 9 additional sight records, including a number of threatened or range-restricted species (see Parker 2001). Eight were new records for Mozambique at that time. He reported that there was extensive evergreen forest on the eastern slopes (3 square miles or 780 ha), more extensive then than anything in southern Malawi. There are reports of small mammals and birds being collected around 2002 by persons from the Chicago Field Museum and Department of Biology of Universidade Eduardo Mondlane in Maputo, but results are not yet available. In December 2005, Claire Spottiswoode, Hassam Patel, Eric Herrmann and Julian Bayliss recorded forest birds in the same part of the mountain visited by the present expedition, and also collected some of the main plants. A report on this study and an assessment of forest extent is given in Spottiswoode et al. (2007).

4. VEGETATION TYPES

At a regional scale the Chiperone massif is relatively small, but even so both Wild and Barbosa (1967) in the vegetation map of the Flora Zambesiaca area, and Frank White (1983) in his major work on African vegetation, depict it. White shows Chiperone as a forest patch of East African coastal mosaic (type 16b), similar to that on other montane massifs in northern Mozambique, and surrounded by Drier Zambezian Miombo Woodland (type 26). The more detailed map by Wild & Barbosa (1967), which formed the basis of White's map, shows it as Moist Evergreen Forest (medium and low altitude), surrounded by *Brachystegia spiciformis–Julbernardia* Woodland. Our observations support this, although little *B. spiciformis* was seen in the surrounding woodlands, and the moist forest was primarily medium altitude, not low altitude.

Earlier studies include Barbosa's (1952) study on the vegetation of Zambézia Province. He describes the vegetation of Mt Chiperone, along with that on other massifs such as Mt Mabu and

Morrumbala, as Unit 1, Moist Tropical Montane Forest (rain and clouds). He says that in general trees are 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 temperatures are sufficiently cool that a xerophytic thicket vegetation is encountered dominated by species from the Ericaceae and Proteaceae families. This is what the present survey found at around 1900–2000 m. According to Barbosa, typical moist forest species include: *Albizia gummifera*, *Anthocleista grandiflora*, *Coffea ligustroides*, *Cussonia arborea*, *Entada rheedei*, *Harungana madagascariensis*, *Heteropyxis natalensis*, *Macaranga* spp., *Maesa lanceolata*, *Newtonia buchananii*, *Oxyanthus speciosus*, *Parinari curatellifolia*, *Parinari excelsa*, *Smilax anceps*, *Trichila dregeana*, *Vitex* spp., and the herbs *Afromomum* spp., *Costus* sp, *Ensete* sp. and *Piper umbellatum*. A number of these species, although not all, were noted in the forests of Mt Chiperone.

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. 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).

Vegetation Mapping

Vegetation mapping, specifically determination of the extent of moist forest, was carried out using two separate techniques. These were manual interpretation of remotely-sensed data supported by study of available air photos, and the supervised classification of a combination of Landsat ETM+ and ASTER digital imagery. In addition, the historical air photos were used to determine approximate moist forest extent in 1969. These studies are elaborated upon below.

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

The only air photos available were from 1969 at a scale of 1:46,500. Unfortunately cloud cover over the peak and shadows from it reduced their usefulness. Orientation once up the mountain was difficult owing to the steeply-dissected terrain, lack of locatable landmarks, and uncertainty on extent of vegetation clearance and infrastructural changes since 1969.

Air photos of Mt Chiperone, 1:46,500 scale, 1969

path 76	39/ 168–171
path 77	39/ 193–195

a) *Manual Interpretation*

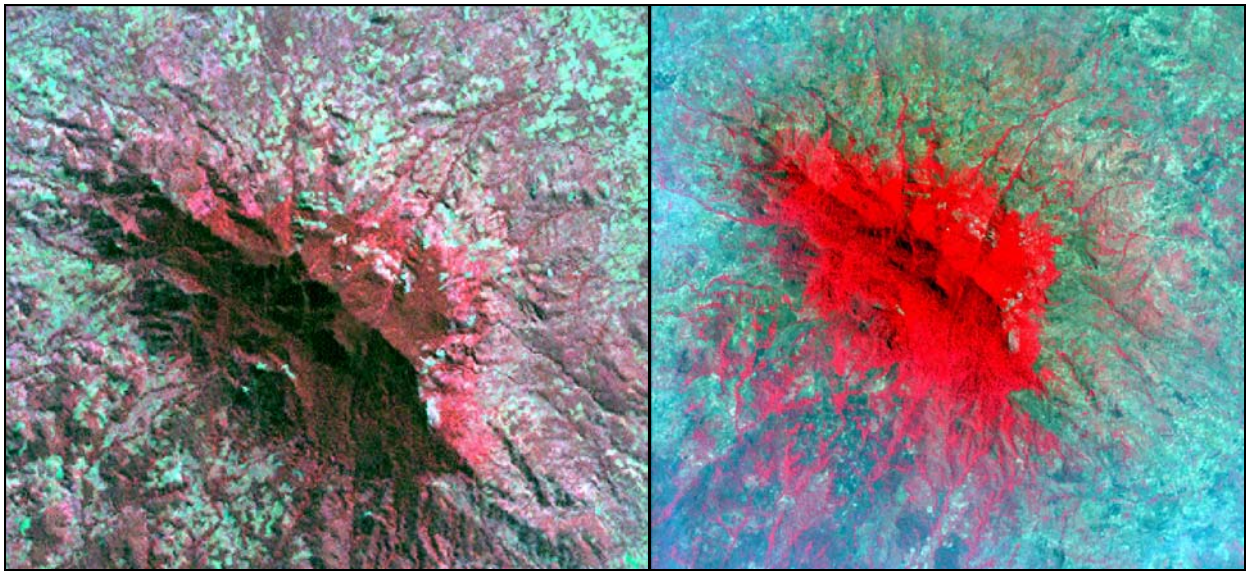
Manual interpretation of forest extent was carried out using a grey-scale Landsat ETM image from May 2002 as the base, and supported by use of 1969 air photos and field knowledge from the southern slopes. This polygon was digitised and put into a GIS (Figure 3). Based on this, forest extent was calculated to be 1717 ha (Table 1).

b) *Digital Classification*

Initially a draft vegetation map was made based on an unsupervised classification (maximum likelihood algorithm, applied to a 6-band stack image) of a Landsat ETM+ image acquired from May 2002 (path 167, row 071). Nine classes were recognised, including two different forest types

with an additional 'shadow' class. Based on this initial interpretation, it was calculated that 2063 ha of forest was present, with approximately 92% of this lying above 800 m altitude.

Following fieldwork and the recording of 170 ground control points (GPS readings in areas clearly either forest, woodland or cleared), a final vegetation map was developed using a Landsat ETM+ image acquired from May 2002 (30 m resolution, Figure 2a) and an ASTER image acquired in September 2001 (15 m resolution, Figure 2b). Both images (path/row 167/071) were registered to UTM Zone 36 S (WGS 84) with radiometric and geometric correction. Following an initial inspection of both images, Landsat proved to discriminate different vegetation types more accurately despite its coarser resolution. In order to gain information from the ASTER image, the NDVI was developed and stacked to the 6-band Landsat product. A supervised classification was then performed on the combination of original Landsat bands and NDVI. The following vegetation types were separated: forest, open forest, woodland, open savanna and cultivation. High-altitude forest was not spectrally different from medium-altitude forest, therefore a threshold of 1600 m was used to differentiate them. The resulting map is shown in Figure 4, with the extent of forest types given in Table 1.



Figures 2a and 2b. Mt Chiperone area – Landsat ETM+ image, May 2002 (left) and ASTER satellite image, September 2001 (right).

Relatively minor differences can be seen between the extent of forest as determined using the two techniques. As forest was hardly noted in the field below 1000 m, at least on the southern and eastern slopes, it is possible that the forest category also includes some miombo (*Brachystegia*-dominant) woodland areas.

Table 1. Forest extent (2002) on Mt Chiperone determined using different methods.

	Forest extent (ha)	
	Supervised	Manual
Open forest - medium altitude	241.6	–
Open forest - high altitude	165.4	–
Forest - medium altitude	1051.5	1307
Forest - high altitude	176.6	410
TOTAL	1635.1	1717

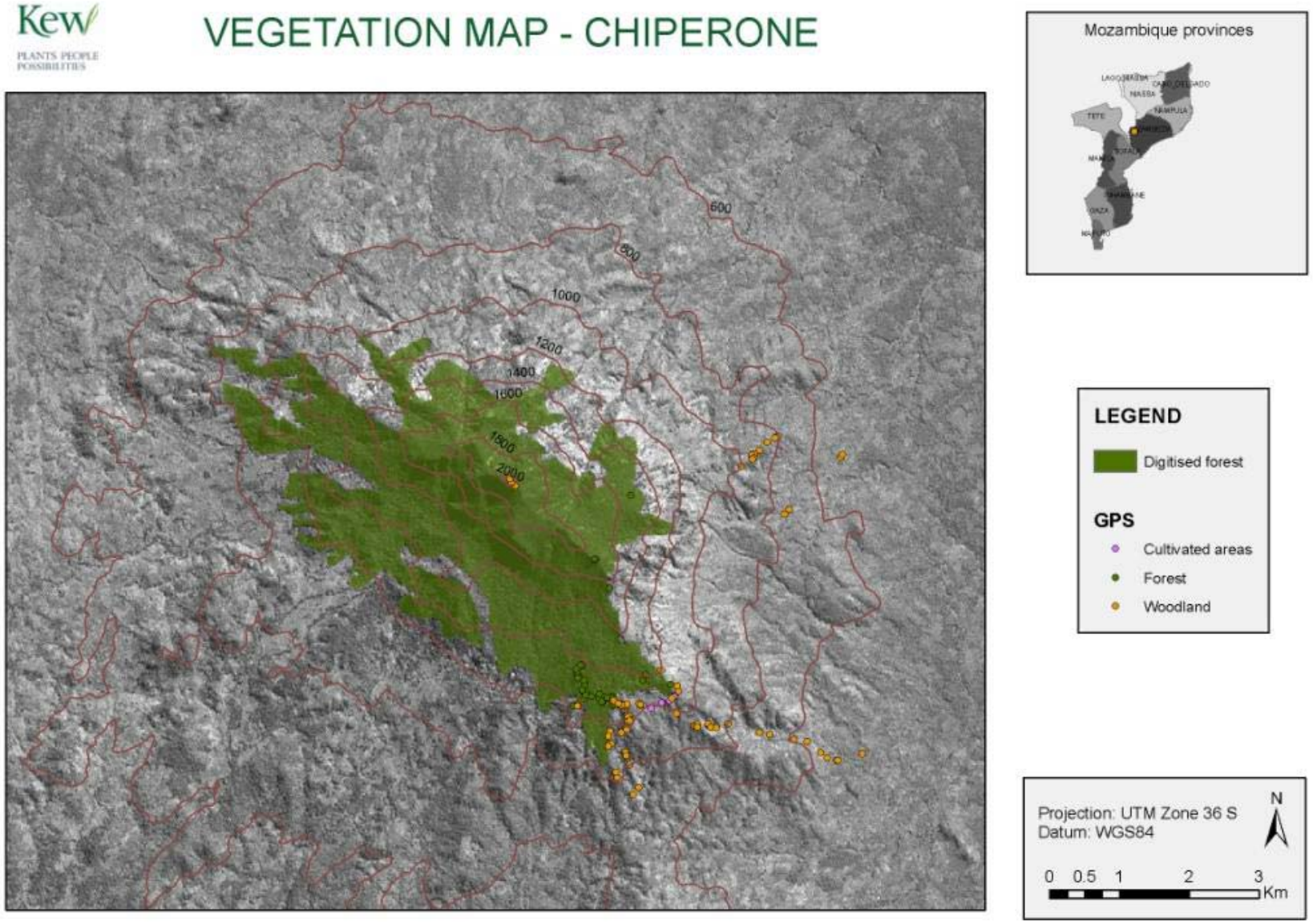


Figure 3. Extent of forest on Mt Chiperone (visual interpretation).

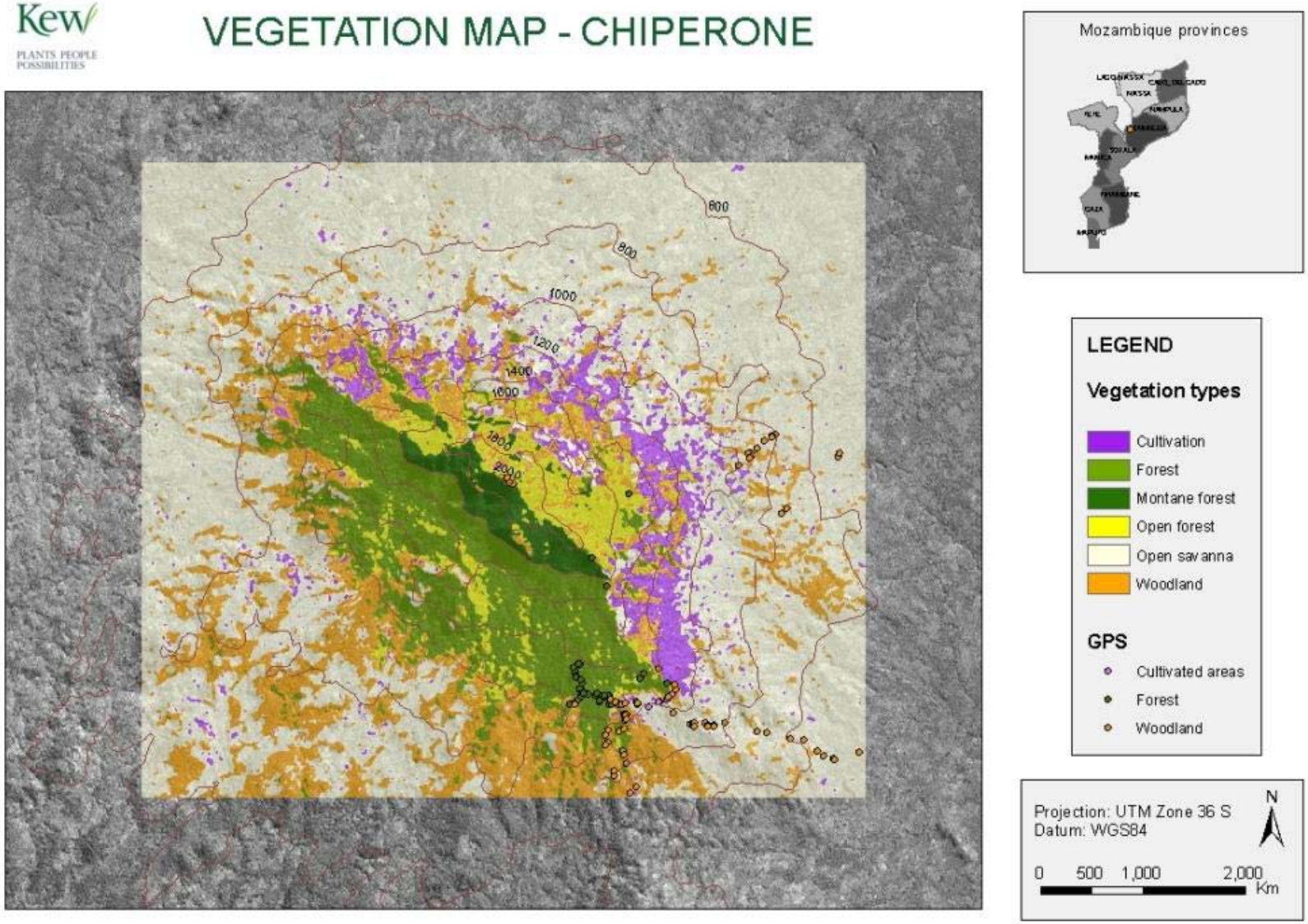


Figure 4. Vegetation types on Mt Chiperone, supervised classification.

In the digital classification map the separation between forest and open forest is not clear owing to lack of ground control points in this area and from casual ground observation. A better figure for forest extent is probably obtained by combining these two classes. As can be seen from Table 1, this is around 1635 ha. As mentioned previously, the separation of medium and high altitude forest was based solely on the 1600 m contour.

Ground control points were limited to the southern slopes, with a few on the eastern slopes (see Figure 1). The limited distribution of these points across the mountain was a severe impediment to a more accurate determination of vegetation patterns.

c) *Historical Forest Cover*

The 1969 extent of moist forest cover was determined from stereoscopic visual analysis of historical air photos. The mapped extent was calculated manually using a dot planimeter as no reliable control points were available to enter it into a GIS. Allowance was made for edge-distortion by calculating areas only from the central parts of the air photos. Total area was calculated to be around 2500 ha.

Historical Change

The limited comparisons possible on the extent of forest cover as seen on historical air photos, on recent satellite imagery and on the ground suggest that forest cover has diminished by 800–1000 ha over the intervening 37 years, or between 32 and 40%. This would appear to be primarily from the southern and south-eastern slopes between 800–1200 m, in some of the northern valleys at similar altitudes, and on lower south-western slopes at 600–1000 m.

Ground observation shows that fire is used extensively for clearing fallow land before replanting, and these fires eat into the remaining forest, particularly in gullies where fires are fiercer owing to a denser combustible layer of plant matter (= fuel). Evidence for this can be seen in severely fire-damaged forest trees now standing clear of the remaining forest, and in the frequency of secondary woody species growing into the forest. Even 50 m inside the present forest margin, evidence of fire on the trunks of forest trees can be seen. Apart from on the southern and south-eastern slopes, it is possible that much of the agricultural clearance in recent years is actually of pre-existing cleared land, or land that 50 years ago or more supported woodland, rather than true moist forest.

Vegetation Types

Broadly speaking, Mt Chiperone is covered with medium and higher altitude forest above about 1000 m, with miombo or similar woodland types below that and on the ridges above with shallow soils. The topography on the mid-slopes is very dissected and often steep, hence soils are shallow.

This may be an explanation for the comparatively low number of large diameter trees. Species composition and structure of the forest gradually changes at around 1600–1800 m, with shorter, more sclerophyllous tree species festooned with 'bearded' lichen (probably *Usnea* spp.), indicating cooler conditions and more frequent moist air (i.e. mists and cloud). At the very peak an odd sclerophyllous thicket vegetation is found, insufficiently investigated or collected, comprising *Erica* (previously *Phillipia*) shrubs and the shrubby *Aloe arborescens*. The general vegetation patterns and composition are similar to those recorded from Mt Mulanje by Chapman & White (1970).

From a conservation viewpoint, the most important habitat is moist forest. Such forests are particularly extensive and relatively undisturbed on Mt Chiperone compared to many areas in adjacent Malawi. Moist forest can be subdivided into medium altitude and high altitude, with the division occurring around 1600 m. In practice there is probably a broad transition zone ranging from 1600–1800 m depending on slope and aspect. Some tree species more typical of higher

altitude forest are found in medium altitude forest, and in more sheltered and favourable positions medium altitude forest species, e.g. *Khaya anthotheca* and *Strombosia scheffleri*, can be found as high as 1800 m. From limited observations it appears the forest canopy is around 20–30 m high at 1500 m altitude, reduced to 10–20 m high at 1700 m.

Unlike some other mountains in the region (e.g. Namuli, Gorongosa, Mulanje), Mt Chiperone has no grassland, a habitat that often supports endemic species. The main open areas are patches of bare or barely vegetated or scrubby rock outcrops.

Much of the woodland below 800 m altitude has been cleared for subsistence cultivation, at least where soils are more fertile. Large patches of miombo woodland are still present on the western and northern slopes (these areas were not visited), where human settlements are very few. Much of this cleared area supports regenerating or secondary woodland and fallows. The main vegetation types are described below.

Summit Thicket

This type is only reported from the exposed peak at around 1900–2000 m altitude to the summit, and probably has an extent of only 2–5 ha. It comprises an impenetrable thicket of *Erica* cf. *johnstoniana* shrubs 2–3 m high, previously classified under *Phillipia*, with a mass of decumbent stem aloes (*Aloe arborescens*). A small succulent, *Crassula swaziensis*, was found on rocks, along with the fern *Mohria lepigera*. The three persons from the expedition who reached this point found it too difficult to hack away through to the actual (unmarked) peak. Epiphytic "bearded" lichens (cf.*Usnea* spp.) are common.

Unfortunately, owing to time constraints, very little collecting was done here. It would appear this type is rarely, if ever, exposed to fire, and is rarely visited by humans. It is under no threat, and is of conservation interest.

High-altitude Forest

Above about 1600 m forest species composition starts to change. Shorter and more sclerophyllous trees predominate, many festooned with lichens. Total extent is probably around 400 ha. This forest type was only superficially explored on the southern ridges, hence the description below must be considered provisional.

The main woody species appear to be *Peddiea africana*, *Diospyros whyteana*, *Maytenus undata*, *M. acuminata*, *Myrsine africana*, *Ochna holstii*, *Vepris* (*Oricia*) *bachmannii* and *Olea capensis* subsp. *macrocarpa*. Other common species include *Garcinia kingaensis*, *Tricalysia* sp., *Lasianthus kilimandscharicus*, *Psychotria zombamontana*, *Rawsonia lucida*, *Xymalos monospora*, *Tabernaemontana stapfiana*, *Schefflera goetzenii*, *Rinorea angustifolia* subsp. *ardisiifolia* and *Rapanea melanophloeos*. Various species of fern and *Selaginella kraussiana* are more common here than lower down. Trees more typical of medium altitude forest also found at 1600 m include *Diospyros* cf. *abyssinica*, *Khaya anthotheca*, *Strombosia scheffleri*, *Syzygium guineense* subsp. *afromontanum*, *Rawsonia lucida*, *Myrianthus holstii*, *Garcinia volkensii* and *Drypetes gerrardii*.

At these altitudes there are also patches of woodland and forest margins or open areas associated with rocky outcrops. Common species include *Carissa bispinosa*, *Schefflera goetzenii*, *Dovyalis macrocalyx*, *Erythroxylum emarginatum*, *Tricalysia acocantheroides* and the lithophytic fern *Oleandra distenta*.

No evidence of fire was seen, and little evidence of human use or visitation. Accessibility is difficult, and the terrain is rugged. This type is of particular conservation interest, although the extent is limited and the species are commonly found on other montane areas in southern Africa.

Medium-altitude Forest

This vegetation type probably comprises the majority of the area on the mountain above 800 m altitude, although there is very little forest on the side visited below about 1000 m. Unfortunately, only the forests of the southern slopes from 1000–1200 m were adequately explored, hence medium altitude forests on other parts of Mt Chiperone may differ from the description below. The approximate extent is 1300 ha, most of it on steep slopes with very few gaps or breaks. Tree heights can reach 40–50 m in gullies and other favourable localities, but generally trees are 20–30 m high. Canopy height decreases with increasing altitude and on more shallow soils. The stocking rate of large diameter trees is lower than in some other regional medium altitude forests.

The main tree species are *Newtonia buchananii* (particularly prominent on ridges), *Strombosia scheffleri* (with purplish flaking bark), the thinner-stemmed *Rinorea convallarioides*, fluted trunks of *Chrysophyllum gorungosanum* and scattered large individuals of *Khaya anthotheca*, some of them quite magnificent. There are very few emergents. Large strangling *Ficus* trees are few and scattered throughout. Other common trees include *Rothmannia urcelliformis*, *Drypetes gerrardii* and *Myrianthuis holstii*, while somewhat smaller or sub-canopy trees include the large-leaved *Funtumia africana*, *Rawsonia inermis*, *Rinorea ferruginea*, *Garcinia kingaensis*, *G. volkensii*, *Trilepisium madagascariense* and *Pleiocarpa pycnantha*. The understorey vegetation is not thick and is characterised by *Dracaena fragrans* and *Pseuderanthemum subviscosum*, along with scattered forest grasses and the scrambling *Behnia reticulata*. There are a lot of young regenerating plants and seedlings of *Chrysophyllum* and *Rinorea convallarioides*. Lianas such as *Agelaea pentagyna* are not very common.

Where the forest adjoins woodland or land cleared for agriculture, typical forest edge species are *Albizia* cf. *gummifera*, *Macaranga capensis* and *Trema orientalis*, with large individuals of *Englerophytum magalismontanum* and *Parinari excelsa* on the ridges.

The three main features of conservation interest are (i) the extensive area of forest found, (ii) the uninterrupted altitudinal sequence it covers from 1000 to 2000 m, and (iii) the relatively intact and undisturbed nature of the forest. There has been some minor tree-felling close to the forest margins, but the biggest threat is uncontrolled fire from field clearance eating into the forest, especially in the gullies. There is evidence of such fires severely damaging or destroying even large forest trees up to 50 m from the margins, with an associated loss of humus from the forest floor and destruction of the low shrub and herbaceous layers. Once this happens, a number of forest gap or edge species such as *Trema* and *Albizia* establish themselves inside the forest along with a thick herbaceous undergrowth, which can inhibit regeneration of forest trees through excessive competition.

Miombo and Similar Woodland Types

Miombo woodland is seasonally-deciduous with canopy cover ranging from 20–80% comprising trees of *Brachystegia* and/or *Julbernardia*, and with a well-developed grass layer underneath. On Mt Chiperone such woodland is mainly characterised by various *Brachystegia* species, but there are also some areas without *Brachystegia* but with other miombo-associated species.

The woodlands studied were at an altitude of 600–1100 m on the southern and south-eastern flanks. At lower altitudes woodlands have often been cut and/or frequently burnt, but were in a better condition at altitudes above 900 m. At 600–800 m woodland covered the slopes of ridges as well as the ridge-tops, with the less steep land having been cleared for cultivation, while at higher altitudes

woodland was mostly confined to the shallow soil ridges, sometimes almost surrounded by moist forest. Various woodland types were noted. Most ridges were dominated by *Brachystegia spiciformis*, whilst others supported *B. utilis* or *B. tamarindoides* subsp. *microphylla* (= *B. glaucescens*), while one ridge at 1200 m had an open woodland of *Acacia abyssinica*. *Brachystegia boehmii* and some typical miombo species (e.g. *Schrebera trichoclada*, *Securidaca longepedunculata*, *Ozoroa reticulata*, *Elephantorrhiza goetzei*) were only found at an altitude of 650 m or below.

The small extent of 5–10 m high *Acacia abyssinica* woodland was unusual and seemed to be confined to just one ridge. Associated species included the fern *Pteridium aquilinum*, a scrambling *Rubus* sp. and with *Trema orientalis* at the forest/woodland boundary. Of particular note was the high number of epiphytic ferns, orchids and lichens on the *Acacia* branches, while the root parasite *Sarcophyte sanguinea* subsp. *piriei* was very common and visible on the ground underneath. It was flowering extensively in late November, appearing above ground in blackish-red masses.

Brachystegia spiciformis-dominated woodland with a 10–15 m high canopy also contained miombo species such as *Bridelia micrantha*, *Combretum molle*, *Pericopsis angolensis*, *Pterocarpus angolensis*, *Erythrina abyssinica*, *Cussionia arborea*, *Uapaca kirkiana*, *Uapaca nitida*, *Psorospermum febrifugum*, *Parinari excelsa*, *Faurea saligna*, and some typical forest edge species such as *Harungana madagascariensis* and *Albizia gummifera*. Epiphytic orchids and ferns were also very common on the branches. It does not appear as if these areas previously supported forest, at least over the last 50–100 years.

Although most wooded ridges were dominated by *B. spiciformis*, others were somewhat drier or dominated by trees of *Brachystegia utilis* 8–10 m high, owing to more shallow, less moisture-retentive soils. Associated species were *Julbernardia globiflora*, *Uapaca kirkiana*, *Protea welwitschii*, *Pterocarpus angolensis* and *Monotes africana*, with one patch of the fine-leaved *Brachystegia tamarindoides* subsp. *microphylla*.

The upper reaches of gullies below the ridges mostly support regenerating woodland and/or forest with secondary species such as *Trema orientalis*, *Macaranga capensis* and *Bridelia micrantha*. These gullies may well have supported some type of forest previously, now destroyed by fire.

Although interesting, such woodlands and the species comprising them are very widespread across this part of Africa. They have a useful role in forming part of the forest–woodland–shrubland vegetation mosaic on the mountain and acting as a buffer to the forest itself, and there are undoubtedly a number of plant, vertebrate and invertebrate species that on Chiperone are only found here.

Disturbed Woodland and Fallows

Most of this vegetation type was found below 900 m altitude and in the lower reaches of gullies between ridges. In most cases it is probable that it was previously (5–50 years ago) forest or forest-edge vegetation, but has been destroyed by frequent fires and perhaps partial clearance. This type was not investigated or collected in any detail owing to its low conservation value and potential.

In the gullies vegetation could be quite thick, making progress difficult. In more recent fallow it was more open, and a number of areas had been cleared within the last two years. Characteristic trees included *Trema orientalis*, *Dombeya burgessiae*, *Bridelia cathartica*, along with the plants of lower height such as *Smilax anceps*, *Anonna senegalensis*, *Afromomum* spp., *Mucuna pruriens*, clumps of bananas (*Musa*) and the bamboo *Oxytenanthera abyssinica*. The liana *Entada rheedei* with characteristic large woody pods was found in some places.

Lower down the slopes, at around 800 m and below, significant areas of bamboo (*Oxytenanthera abyssinica*) thicket were found. These appear to develop after clearance for cropping, particularly in gullies, and are tolerant of repeated fire.

Also at lower altitudes (c.600 m) a riparian forest fringe can be found along larger watercourses. Although extensively cleared in places, remnant large trees still remain, including *Treculia africana*, *Synsepalum* (=*Pachystela*) *brevipes*, and *Ficus* species.

Rocky Outcrops

There were a few areas of bare, or almost bare, rock on the mountain, but only two or three were visited owing to access problems. From airphotos there appears to be a greater extent of such outcrops on the north and north-eastern part of the mountain.

Surprisingly, even the rugged and narrow ridges have woody vegetation on them. Where rock is exposed over an area, vegetation consists of low shrubs, *Aloe*, and grasses/sedges, typical of such environments elsewhere. Through binoculars it appeared that some rock outcrops had been burnt. Further information is not available.

5. BOTANY

Plants were collected fairly extensively in the area around the main Forest Camp on the southern flanks of Mt Chiperone (Figure 1 shows collecting points) and along the track to the village below. More limited collecting was done above Marega village on the eastern side. In addition, plant specimens were collected from the summit ridge at altitudes of 1500 and above, which proved to be most interesting as vegetation composition appears to change above 1600–1800 m.

Most specimens were collected with notes on locality and habit. Unfortunately, time did not allow for good notes to be recorded from collections on the summit ridge. Labelled specimens are deposited at the LMA Herbarium at IIAM in Maputo and at the Kew Herbarium in London. A partial third set is deposited in Zomba (MAL). A total of over 400 numbered and unnumbered specimens were recorded.

A species list compiled from both specimens and confirmed field sightings is given as Annex 2. The great majority of records are from above 800 m altitude, although some woodland species from below this altitude are included. Of the 229 taxa listed, 145 are woody plants (trees, shrubs, lianas).

A number of species (around 15) are not listed in the Sabonet Mozambique plant checklist (Da Silva, Izidine & Amude 2004). However, this checklist is incomplete and only represents collections in the National Herbarium in Maputo. When citations from families published in the Flora Zambesiaca are incorporated, virtually all taxa are recorded from Mozambique, the great majority being recorded from the Z, MS or N divisions. However, there may be some new taxa for Mozambique in as yet unpublished family treatments. It should also be noted that northern Mozambique is known to be poorly and patchily collected, part of the justification for the present study.

Species or points of particular notes include:

Widdringtonia whytei — although common on Mt Mulanje, this tree was not seen on Chiperone.

Aloe arborescens (Aloaceae) – thicket-forming stem *Aloe* on rock outcrops at higher altitudes and on the peak. Very local here, but common on Mt Mulanje.

Cyperus amauropus (Cyperaceae) — first record for Mozambique.

Dracaena fragrans (Dracaenaceae) — first record for Mozambique Z.

Pollia condensata (Commelinaceae) – common forest undergrowth herb. First record of the genus from the FZ area.

Abrus melanospermus (Fabaceae: Papilionoideae) — first record for Mozambique.

Coffea mufindensis (Rubiaceae) — regarded as Vulnerable in the Mozambique Red Data List.

Crassula swaziensis (Crassulaceae) — this species has a number of varieties, one of which is apparently confined to the Namuli massif in N Mozambique. Material was insufficient for further determination, but this collection may well extend the known range of what was considered a Namuli endemic.

Plectranthus kapatensis (Lamiaceae) — first record for Mozambique Z.

Strychnos sp. (Loganiaceae) – a forest liana not possible to match at Kew; a potentially interesting taxon.

Three species of *Rinorea* were found in the forest (*R. convallarioides*, *R. ferruginea*, *R. angustifolia* subsp. *ardisiiflora*) compared to only one (Strugnell 2006) or two (White, Dowsett-Lemaire & Chapman 2001) recorded from the more extensive forests on Mt Mulanje. It is not known why this should be. *R. convallarioides* is common at around 1000–1200 m, while *R. angustifolia* appears to be more common at altitudes above 1600 m. *Rinorea* is primarily a genus of smaller trees from coastal or lowland forests, which may suggest Chiperone has more lowland or coastal influence than Mt Mulanje. This lowland and 'East African coastal' influence can also be seen in the presence of *Funtumia africana* and *Englerophyum natalense* and *Aporrhiza paniculata*, and, on the lower slopes, *Treculia africana* and *Synsepalum brevipes*. In Zimbabwe, all *Rinorea* species are considered Critically Endangered as they are only found in small remnant patches of low-altitude forest.

The only recorded species from Chiperone in a formal threat category (Vulnerable, Endangered or Critically Endangered) for Mozambique in the Sabonet Red Data List (Izidine & Bandiera 2002) is *Coffea mufindensis*. However, some species found are considered threatened in Zimbabwe as they are low altitude forest species there confined to small remnant forest parches along the Haroni and Rusitu rivers, but are more widespread in adjacent parts of Mozambique.

6. ZOOLOGY

Despite the close proximity and accessibility of Mt Chiperone to Mt Mulanje in Malawi considerably less biological work has been undertaken into the biodiversity of this area compared to the large volume of work undertaken on Mt Mulanje. There have been two previous visits to assess aspects of the biology of the area. The first was by Mr Jali Makawa, a bird collector for C.W. Benson, who made a 6-day collecting expedition in 1950 to Mt Chiperone as part of a wider birding survey of montane areas in Zambézia province (Benson 1950). Since then the only documented

visit was made in November 2005 by Claire Spottiswoode, Hassam Patel, Eric Herrmann and Julian Bayliss in preparation for this current Darwin expedition. During this latter trip the threatened avifauna was assessed and some plants collected. There are unconfirmed reports of an earlier visit (around 2002) by the American Field Museum of Natural History to collect birds and small mammals, but no results are available.

Findings from the present expedition show that generally the moist forest area was relatively undisturbed with no evidence of logging. However, there was much evidence of man-made fires on ridges, possibly as a result of preparation for small scale cultivation. The forest area above 1000 m is hunted with the main method being gin trapping. The main animals hunted are Bushbuck *Tragelaphus scriptus*, Bushpig *Potamochoerus larvatus*, and a duiker *Cephalophus* spp. Gin traps are apparently commonly available in local markets. The Leopard *Panthera pardus* is reputed to be common throughout the forest. Of particular note was the mention on several occasions of the presence of Buffalo *Syncerus caffer* on the northwestern side of Mt Chiperone. The forest is also utilised for honey collecting.

A relatively high incidence of calling bushbabies was recorded from around the main forest camp at c.1000 m. The calls sounded similar to those of the Lesser Bushbaby that occurs on Mt Mulanje, which has been identified as *Galago grantii*. This would merit further investigation.

This study found two endemic species previously only known to occur on Mt Mulanje in Malawi, 60 km to the north, one lizard and one butterfly. This is not wholly surprising as the distance is relatively small, but such records represent important new discoveries for Mozambique.

Local Hunter Records

One of the forest guides employed on the expedition also utilised the area for hunting. Employing local hunters as forest guides is a good practice as they are often the most knowledgeable people on the area and know where various ground traps have been set, traps that can severely injure humans.

Table 2. Mammals recorded as being found on Mt Chiperone.

Common Name	**Scientific name**	**Local name** (in Khokhola)	**Notes**
Bushpig	*Potamochoerus larvatus*	Nguluwe	
Blue Monkey	*Cercopithecus mitis*	Nchimwe	
Vervet Monkey	*Cercopithecus aethiops*	Nakahmwa	Black face. Woodland
Baboon	*Papio cynocephalus*	Nyani	Woodland
Duiker	*Cephalophus* spp	Nazoro	Black body, reddish head
Rock Hyrax	*Procavia capensis*	Mbila	
Bush baby	*Galago granti*?	Nchanga	
Bushbuck	*Tragelaphus scriptus*	Nanse	
Porcupine	*Hystrix africaeaustralis*	Nansununga	Forest and woodland
"Big Rat"	?	Ncheza	White and black spots, small tail twice length of back leg
Black Rat	*Rattus rattus*?	Nyenga	Same size as Ncheza but with 30 cm tail
Mole Rat		Nafoko	Brown/grey back, white belly. No tail. Woodland. Lives underground
Zorilla	*Ictonyx striatus*		Rat-like teeth, round small ears

The most common form of trapping in Mt Chiperone is 'gin-trapping' (also know as Bear Traps in the western world), not snares or the setting of fires to flush animals into traps as is the case on Mt Mulanje. A local hunter and guide, Besta, was interviewed on the animals present in the forest and which were commonly hunted by the local population. His responses are given in Table 2.

Small Mammals

Small mammal species were also opportunistically collected. Such studies largely centred around the mist netting of bats. Although time was very limited, several species were caught (Table 3). The capture of *Miniopterus inflatus* represents an important new record for the region. As can be seen from the distribution map (Figure 5) it has a very restricted range and is only known from a few localities. It was previously unknown from Mozambique and was only recently caught at Mt Gorongosa (Ara Monadjem, pers. comm.), about 300 km south of Chiperone. The Chiperone record is only the second for the country.

Table 3. Small mammals collected from Mt Chiperone (identified by Peter Taylor, Durban Natural History Museum).

Species	Sex	Comments
Miniopterus inflatus	F	*Greatest skull length (CIL=16.0)
Myotis tricolor	F	*CIL. 6 molars top and bottom
Myotis tricolor	F	*CIL. 6 molars top and bottom
Praomys delectorum		

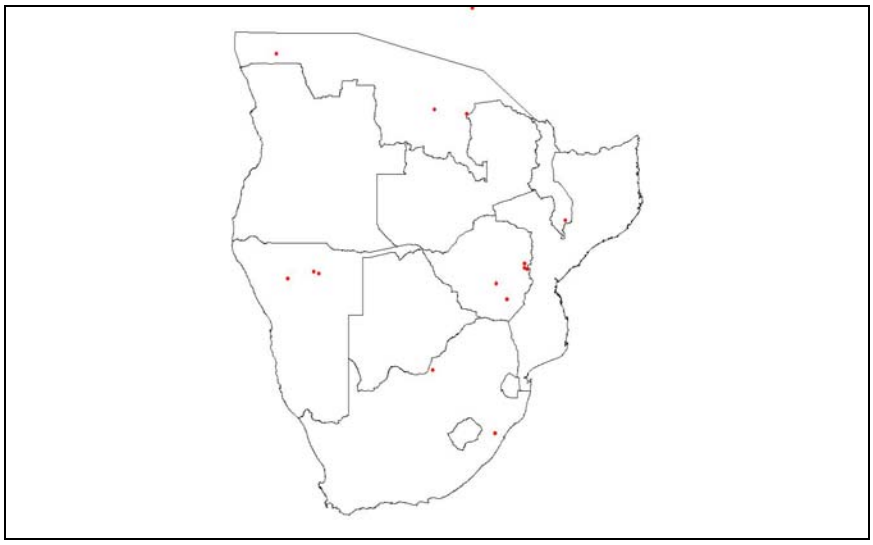


Figure 5. Known records for *Miniopterus inflatus* in Southern Africa (Peter Taylor, 2007).

Birds

The avifauna of northern Mozambique is very poorly known, and many montane areas are still largely unexplored for birds except from single collecting expeditions between 1932 and 1950 (e.g. Vincent 1933a, 1933b, 1934). Consequently there have been repeated calls for further descriptive information on the extent, conservation status and avifauna of the evergreen forests of this region (Collar & Stuart 1988, Stattersfield et al. 1998, Parker 2001), with particular focus on the status of the rapidly declining Thyolo Alethe *Alethe choloensis* (BirdLife International 2006).

Mt Chiperone was visited 15–18 December 2005 by Claire Spottiswoode, Hassam Patel, Eric Herrmann and Julian Bayliss in preparation for this expedition in November 2006 (Spottiswoode et al. 2007, in press). Bird species were detected by sightings, with cassette and minidisc recordings sometimes subsequently used for playback, and by mist-netting. Mist-nets were opened for a total of 56 net-hours. To investigate the forest areas a camp was made at 1050 m; the highest altitude reached was 1260 m. Incidental observations were also made while hiking through mixed

woodlands and cultivation at lower altitudes (500–1000 m). The resulting checklist is given in Annex 3.

According to Spottiswoode (pers. comm.) the two globally threatened species collected by Makawa in 1950 were both found in 2005. A territorial pair of Thyolo Alethe *Alethe choloensis* (Endangered) were seen and tape-recorded in ridge forest at altitude 1200 m (16°30'12"S, 35°43'50"E), and a pair of White-winged Apalis *Apalis chariessae* (Vulnerable) were seen in a forest clearing at altitude 1120 m (16°30'20"S, 35°43'50"E).

Further to these findings a considerable range extension was represented by the numerous individuals of Eastern Bronze-naped Pigeon *Columba delegorguei*, heard constantly at 1100–1200 m and seen pursuing territorial chases. This is the only record between Zimbabwe's Eastern Highlands and central Tanzania, other than the handful of records from Thyolo Mountain in Malawi (Dowsett-Lemaire & Dowsett 2006), where it is now likely to be extinct in view of virtual complete deforestation of this area. The fact that Makawa did not find this species in 1950 is not surprising. He visited the area in the non-breeding season (July) when this species, if not calling, would have been very inconspicuous (Benson & Irwin 1966).

In addition to these montane species, other species typical of forest margins, miombo and mixed woodland and *Pennisetum* grassland habitats were recorded, such as the Olive-headed Weaver *Ploceus oliveiceps* and Cabanis' Bunting *Emberiza cabanisi* (miombo), and Marsh Tchagra *Tchagra minuta* and Singing Cisticola *Cisticola cantans* (grassland).

Occurrence of globally threatened, biome-restricted, and/or range-restricted species were noted. Table 4 shows globally threatened species in bold type, along with their 2005 threat status. Biome and Endemic Bird Area (EBA) membership for biome-restricted and range-restricted species (Fishpool & Evans 2001) is indicated by the following: A07 Afrotropical Highlands Biome; A09 East African Coast Biome; A10 Zambesian Biome; 105: Tanzania-Malawi Mountains EBA. Records for Mt Chiperone from 1950 are from Benson (1950).

Table 4. Globally threatened, biome-restricted, and/or range-restricted bird species from Mt Chiperone (from Spottiswoode et al., in press).

Species	**Biome**	**EBA**	**Chiperone 1950**	**Chiperone 2005**
Bar-tailed Trogon *Apoloderma vittatum*	A07		x	
Grey Cuckooshrike *Coracina caesia*	A07		x	
Striped-cheeked Greenbul *Andropadus milanjensis*	A07		x	
Orange Ground-thrush *Zoothera gurneyi*	A07		x	
Thyolo Alethe *Alethe choloensis* EN	A07	105	x	x
White-starred Robin *Pogonocichla stellata*	A07		x	
East Coast Akalat *Sheppardia gunningi* VU	A09			
Olive-flanked Robin-chat *Cossypha anomala*	A07		x	
White-winged Apalis *Apalis chariessa* VU	A09	105	x	x
Yellow-throated Warbler *Phylloscopus ruficapilla*	A07		x	x
White-tailed Crested Flycatcher *Elminia albonotatus*	A07		x	
Green-headed Oriole *Oriolus chlorocephalus*	A09		x	x
Eastern Double-collared Sunbird *Nectarinia mediocris*	A07		x	
East African Citril *Serinus hypostictus*	A07			x
Red-faced Crimson-wing *Cryptospiza reichenovii*	A07		x	
Swee Waxbill *Estrilda melanotis*	A07			x
Bertram's Weaver *Ploceus bertrandi*	A07			x
Olive-headed Weaver *Ploceus olivaceiceps*	A10			x

Reptiles and Amphibians

Reptiles and amphibians were collected opportunistically but non-intensively during the expedition. Only a few records have been collated for Mt Chiperone, but which contain some notable and interesting results (Table 5).

Of particular note was the observation record of the Gaboon Viper (*Bitis gabonica*), seen on the forest margin on 25 November 2006. It is the first record of this species from Mt Chiperone and the first record from this region of Mozambique since 1950. The earliest record from northern Mozambique, and apparently the only voucher specimen from this half of the country (Don Broadley, pers. comm. 2007), is from Wilhelm Peters in 1846 (published in *Reise nach Mossambique*: 146, as *Bitis rhinoceros*) from Prazo Boror (c.100–200 m altitude), just south of Morrumbala Mountain and about 140 km SE of Mt Chiperone. The Gaboon Viper has not been recorded from nearby Mt Mulanje, despite the presence of apparently suitable habitat. In Malawi it has only been ever recorded from the Mzuzu–Nkhata Bay area at 500–600 m altitude, almost 600 km away (Don Broadley, pers. comm.).

Table 5. Reptiles recorded from Mt Chiperone.

Lizards (Order Lacertilia)	
Gekkonidae	
King Dwarf Day Gecko	*Lygodactylus rex*
Chamaeleonidae	
Pygmy Chameleon	*Rhampholeon champmanorum*
Snakes (Order Serpentes)	
Typhlopidae	
Blunt Blind Snake	*Letheobia obtusus*
Colubridae	
Mulanje Water Snake	*Lycodonomorphus mlanjensis*
Mozambique Twig Snake	*Thelotornis mossambicanus*
Viperidae	
Gaboon Viper	*Bitis gabonica*
Frogs (Order Anura)	
Arthroleptidae	
Dwarf Squeaker	*Arthroleptis xenodactyloides*

Another notable record was the capture of the gecko *Lygodactylus rex*. This species has only recently been discovered on Mt Mulanje in Malawi, to which it was previously thought to be endemic. Its discovery on Mt Chiperone is the first record for Mozambique (Bill Branch, pers. comm.).

Lepidoptera

The Lepidoptera of Mt Chiperone were opportunistically collected over the course of the expedition by Julian Bayliss. The majority of specimens were collected with a 4-fold hand net or (for the Charaxinae and certain Satyridae) through baited aerial traps using fermenting bananas.

A total of 56 butterfly species were collected and were sent to the African Butterfly Research Institute (ABRI) in Nairobi, Kenya for formal identification. ABRI is the recognized institute where the main African butterfly reference collection is stored. There appear to be no previous records of Lepidoptera from Mt Chiperone, and therefore the list in Table 6 presents the first records from this site.

The range of butterflies typically represents a wet forest, forest edge and miombo woodland collection. Of particular note was the capture of *Cymothoe melanjae* (an endemic previously only known from Mt Mulanje), *Eurema senegalensis*, *Eurema floricola*, *Bicyclus vansoni*, *Anthene lunube* and *Platylesches vasta*. These are the first records of these species from Mozambique (Steve Collins, pers. comm.).

Table 6. List of butterflies collected from Mt Chiperone (Nov/Dec 2006), identified by J. Bayliss and S. Collins (ABRI).

Family/subfamily	**Species/authority**
Hesperiidae	
Hesperiinae	*Acada bieriatus* Mabille 1893
Hesperiinae	*Platylesches rasta* Holland 1896
Pyrginae	*Eagris sabadius* Lathy 1901
Pyrginae	*Tagiades flesus* Fabricius 1781
Lycaenidae	
Lipteninae	*Alaena amazoula* Hawker Smith 1933
Lipteninae	*Teriomima puella* Kirby 1887
Polyommatinae	*Anthene barnesi* Stevenson 1940
Polyommatinae	*Anthene lunulata* Doubleday 1847?
Polyommatinae	*Euchrysops malathana* Boisduval 1833
Polyommatinae	*Leptotes pirithous* Linnaeus 1767
Theclinae	*Axiocerces* sp.
Nymphalidae	
Acraeinae	*Acraea acrita* Hewitson 1865
Acraeinae	*Acraea calderena* Hewitson 1877
Acraeinae	*Acraea egina areca* Cramer 1775
Acraeinae	*Acraea johnstoni* Godman 1855
Acraeinae	*Acraea natalica* Boisduval 1847
Acraeinae	*Acraea oncaea* Hopffer 1855
Acraeinae	*Acraea zetes* Linnaeus 1758
Argynninae	*Lachnoptera ayresii* Trimen 1879
Biblidinae	*Eurytela hiarbas* Rothschild & Jordan 1903
Charaxinae	*Charaxes brutus natalensis* Staudinger & Schatz 1886
Charaxinae	*Charaxes candiope* Godart 1824
Charaxinae	*Charaxes cithaeron nyassae* van Someren 1964
Charaxinae	*Charaxes protoclea azota* Hewitson 1877
Charaxinae	*Charaxes pollus geminus* Rothschild & Jordan 1900
Charaxinae	*Charaxes violetta melloni* Fox 1963
Charaxinae	*Euxanthe wakefieldi* Ward 1873
Danainae	*Amauris niavius dominicanus* Trimen 1879
Limenitinae	*Cymothoe melanjae* Bethune-Baker 1926
Limenitinae	*Neptis alta* Overlaet 1955
Limenitinae	*Neptis saclava* Hopffer 1855
Limenitinae	*Neptis swynnertoni neavi* Trimen 1912
Nymphalinae	*Junonia artaxia* Hewitson 1864
Nymphalinae	*Junonia natalensis* Felder & Felder 1860
Nymphalinae	*Antanartia schaenia dutia* Howarth 1966
Nymphalinae	*Precis antilope* Feisthamel 1850
Nymphalinae	*Precis tugela* Trimen 1879
Nymphalinae	*Salamis parhassus* Drury 1782
Papilionidae	
Papilioninae	*Graphium angolanus* Goeze 1779

Papilioninae	*Graphium policenes* Cramer 1775
Papilioninae	*Papilio dardanus tibullus* Kirby 1880
Papilioninae	*Papilio echeriodes shirensis* Hancock 1987
Papilioninae	*Papilio nireus* Doubleday 1845
Pieridae	
Coliadinae	*Catopsilia florella* Fabricius 1775
Coliadinae	*Eurema floricola* Boisduval 1883
Coliadinae	*Eurema regularis* Butler 1876
Coliadinae	*Eurema senegalensis* Boisduval 1836
Pierinae	*Appias sabina phoebe* Butler 1901
Pierinae	*Mylothris sagalla* Butler 1896
Pierinae	*Nepheronia thalassine* de Boisduval 1836
Satyridae	
Satyrinae	*Bicyclus safitza* Westwood 1850
Satyrinae	*Bicyclus vansoni* Condamin 1965
Satyrinae	*Gnophodes betsimena diversa* Butler 1880
Satyrinae	*Henotesia* (*Heteropsis*) *perspicua* Trimen 1873
Satyrinae	*Melanitis leda* Westwood 1851
Satyrinae	*Melanitis libia* Distant 1882

Several day-flying moths were also captured and most await identification. The capture of the geometrid moth *Cartaletis nigricosta* is an indicator of much wetter forest. It was originally described from Mt Mulanje which was the only known locality until specimens were collected from Mt Rungwe (Tanzania) and now Mt Chiperone (Herman Staude, pers. comm.). Larvae of a moth attacking *Khaya* seedlings, probably *Hypsipyla robusta*, were later found hatching from seeds collected on the lower slopes of Mt Chiperone (T. Alves, pers. comm.).

Coleoptera and Hemiptera

The following are some preliminary identifications by Cornell Dudley of Coleoptera (beetles), Hemiptera (bugs) and Diptera (flies) collected during the expedition to Mt Chiperone.

Coleoptera: Cetoniidae
- *Amaurodes passerinii* Westwood — common
- *Rhabdotis aulica* Fabricius — very common
- *Diplognatha silicea* MacLeay — very common
- *Plaesiorrhina mohondana* Oberthür — uncommon
- *Stethopseudinca maculatus* Valak Lucassen — rare, previously only known from Mt Mulanje

Coleoptera: Scarabaeidae-Coprinae
- *Diostellopalpus neavei* d'Orbigny — common, but previously only known from Mulanje

Coleoptera: Rutelidae
- *Anomala* sp. — large difficult genus

Coleoptera: Cerambycidae-Lamiinae
- *Tragocephala pretiosa* Hintz — rare

Coleoptera: Chrysomelidae-Cassidinae
- *Aspidomorpha* sp. — common, but unable to identify

Hemiptera-Homoptera: Cicadidae
- *Ioba leopardina* (Distant) — very common
- ?*Taipinga* sp. — uncommon in collections, genus unsure

Diptera: Tabanidae
- *Tabanus* sp. — Common large genus; species unlikely to be new.

7. THREATS AND CONSERVATION ISSUES

Mt Chiperone is under no form of formal conservation and has no specific status. However, the forest and its wildlife should be protected under the Forest and Wildlife Act (Lei No. 10/99 of 1999). The Environmental Act (Lei No. 20/97 of 1997) prohibits cultivation of annual crops on slopes greater than 7^{o} and perennial crops on slopes greater than 14^{o}, which many of Chiperone's slopes exceed.

Both Mount Namuli and Chiperone are recognised as Important Bird Areas (MZ 009 and MZ 010 respectively) by Parker (2001). A brief description of the area is given there along with a list of the forest bird species of interest – *Alethe choloensis*, *Apalis chariessa* (only known site in Mozambique), and the woodland species *Nectarinia shelleyi*. The conservation status of these bird species is fundamentally determined by the extent and condition of the forest habitat.

At the base of the southern and eastern flanks, there are a few villages with a population around 1000–2000 people. However, there is no clean water supply other than the small streams coming off the mountain. The nearest wells or boreholes are some kilometres away. From an interview with Chief Sapande Marega at Marega locality on the eastern slopes of Mt Chiperone it appears that the forests on the upper slopes have little perceived value to the local population. The only persons going there are bushmeat hunters, a small select group. Even traditional medicinal practitioners tend to collect medicinal plants from the disturbed and woodland areas lower down.

During the course of this interview, the Chief mentioned that there was said to be "tea" plants growing on the lower northern slopes of the mountain, but it is likely this does not refer to the tea of commerce. There has been minimal extraction of timber from the forests, only from the woodlands around where *Pterocarpus angolensis*, *Lonchocarpus capassa* and *Pericopsis angolensis* have been harvested on a small-scale.

Interestingly, he also pointed out that people clear shambas (small fields) and grow maize and beans on the steep slopes with shallow rocky soils because in bad rainfall years these fields ensure at least a small harvest. In good rainfall years, fields below the mountain have a much higher production, but in times of drought fields on the mountain slopes provide some food. This is probably related to incoming moist air and reduced evapotranspiration on the middle slopes compared to the hot dry plains.

In Malawi, folk history links Mt Chiperone with Mt Mulanje through the advent of the 'chiperone' weather front that appears to start on Chiperone and move across into Malawi. This misty weather is important for the tea plantations as it brings moisture during the dry season. A good case can be made for linking conservation of the two mountains in a form of transfrontier initiative. In both cases the key issue is moisture and water, which relies on forest cover for its generation and continued supply.

The suggestion for transfrontier cooperation has already been discussed between the Mulanje Mountain Conservation Trust in Malawi and the District Administrator of Milange District in Mozambique. The District Administrator has expressed great interest in getting technical cooperation and assistance for forest conservation and control of natural resource degradation in his area. It is intended to discuss the issue further with the Provincial Governor and provincial authorities in Quelimane during 2007.

8. RECOMMENDATIONS

From a conservation perspective, although Mt Chiperone has threats to its habitats and biodiversity, these are generalised, and not specific at any particular species or habitat. The threats to the forest above 1000 m appear to be primarily from: (a) encroachment by clearance for cultivation (localised, but are a particular concern on the southern and eastern slopes, and (b) from wild fires eating into the forest margin, particularly in gullies. The following specific conservation recommendations are therefore given:

- Conserve the remaining areas of moist forest, especially those above the 1000 m contour. Stop wherever possible any clearance of vegetation above this line, or perhaps even as low as 900 m.

- Control wildfires along the margins of moist forest. Fires resulting from bush clearance on steep slopes, especially gullies, burn up into the forest and destroy younger trees and the regenerating layer. Subsequently, soils do not appear to retain as much moisture, and the areas are invaded by secondary or forest margin species.

- Transfrontier cooperation and conservation initiatives with MMCT and others in Malawi should be actively encouraged. Issues of forest conservation should be linked in to water supply and rainfall. This could be initiated through a meeting with the Governor of Zambézia Province.

- A meeting should be arranged between the Provincial Director of Agriculture, the Milange District Administrator, MMCT and provincial representatives of IIAM, to determine how conservation of Mt Chiperone and the improvement of agricultural practices could best be tackled.

- Experience of catastrophic landslips on Mt Tumbine above Milange town owing to deforestation, should be used as an illustration of what unregulated forest destruction can do.

Research Issues

- Investigate why woodlands and forests of western and northern slopes, which appear more intact although perhaps drier, are more intact than those on southern and eastern slopes.

- Determine what the altitudinal transition point of medium and higher altitude forest types is, and whether this transition is similar on all sides of the mountain.

- Further botanical and ornithological survey work is required on moist forest areas on the north-western and eastern slopes of the mountain. Further collecting is also needed in the areas of shrubland and rocky outcrops, both of which are likely to support some interesting species and outlying populations.

9. CONCLUSIONS

Mt Chiperone is a steep-sided montane massif that is relatively undisturbed above c. 1000 m altitude up to the summit at just over 2000 m. Owing to its conical shape, the area above 1800 m is quite small. The wooded slopes, many of which have been cleared for agriculture on the southern and eastern sides, give way to moist forest at around 1000 m altitude on the steeper slopes up to the summit. The forest is well-developed, is around 1700 ha in extent (estimates from 1635 to 1720),

and has an uninterrupted altitudinal sequence from medium altitude to high altitude. This feature is increasingly rare to find on montane massifs in the region owing to encroachment on lower slopes. The exposed summit ridge supports a fynbos-type scrub vegetation of very limited extent, and small patches of miombo-type woodlands are found on the ridges from 800–1200 m.

Owing to difficulties with access, the study was primarily confined to the southern and eastern slopes up to 1200 m. It is possible that findings may differ significantly on the northern slopes, and conservation conclusions should be interpreted accordingly.

The plant species found are mostly fairly widespread across other Eastern African mountains from South Africa through Zimbabwe and Mozambique to Malawi and Tanzania. Although a few new records for N Mozambique were recorded, no threatened species or species of particular interest or concern were noted.

Mt Chiperone supports perhaps the largest known population of the Thyolo Alethe, a threatened bird species, which is under increasing threat in Malawi owing to forest destruction. A number of interesting new records for birds, small mammals, reptiles and butterflies were also noted, making the mountain of particular conservation interest and concern for Mozambique.

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ANNEX 2. Plant checklist from Mt Chiperone above 800 m.

T - tree; S - shrub; t - small tree; cl - liana; h - herb; gr - grass; ps - parasite; ge - geophyte; su - succulent; ep – epiphytic

MF-h - moist forest, high altitude; MF-m - moist forest, medium altitude; W - miombo woodland; D/F - heavily disturbed/fallow; Shrub - shrubland; R - riverine

Family	Species	Alt.	L/F	Habitat	Conf.	Notes
PTERIDOPHYTA						
Fern	Asplenium anisophyllum *Kunze*	1000-1800	h	MF-h	√	
Fern	Asplenium dregeanum *Kunze*	1000	h	MF-m	√	
Fern	Asplenium sandersonii *Hook.*	1800	h	MF-m/h	√	
Fern	Marattia fraxinea *Sm.*	1000	h	MF-m	√	
Fern	Mohria lepigera *(Baker) Baker*	2000	h	Shrub	√	
Fern	Oleandra distenta *Kunze*	1800	ep	W	√	
Fern	Pellaea doniana *Hook.*	1000	h	W	√	
Fern	Polypodium polypodiodes *(L.) Hitchcock* subsp. ecklonii *(Kunze) Schelpe*	1000	ep	W	√	
Pteridaceae	Pteridium aquilinum *(L.) Kuhn*	1000	h	W	√	
Fern	Selaginella kraussiana *(Kunze) A.Braun*	1800	h	MF-h	√	
MONOCOTYLEDONS						
Aloaceae	Aloe arborescens *Mill.*	2000	su	Shrub	√	summit
Aloaceae	Aloe sp.	1000	su	W		miombo
Amaryllidaceae	Scadoxus multiflorus *(Martyn) Raf.* subsp. multiflorus	1000	ge	D/F	√	
Araceae	Culcasia falcifolia *Engl.*	1000	cl	MF-m	√	
Araceae	Gonatopus clavatus *Mayo*	at 500m	h	D/F	√	
Asparagaceae	Asparagus africanus *Lam.* var. africanus	1000	h	W	√	
Asparagaceae	Asparagus virgatus *Baker*	800	h	D/F	√	
Behniaceae	Behnia reticulata *(Thunb.) Didr.*	1000	cl	MF-m	√	
Commelinaceae	Commelina zambesica *C.B.Clarke*	1000	h	MF-m	√	
Commelinaceae	Murdannia simplex *(Vahl) Brenan*	1000	h	W	√	
Commelinaceae	Pollia condensata *C.B.Clarke*	1000	h	MF-m	√	new to FZ area
Cyperaceae	Cyperus cf. amauropus *Steud.*	1000	h	W	√	new to Moz
Cyperaceae	Cyperus hemisphaericus *Boeck.*	1000	h	W	√	
Cyperaceae	Cyperus pseudoleptocladus *Kule*	1800	h	W	√	
Cyperaceae	Cyperus sp.	1000	h	W		
Cyperaceae	Coleochloa cf. setigera *(Ridl.) Gilly*	2000	h	Shrub	√	
Dracaenaceae	Dracaena fragrans *(L.) Ker Gawl.*	1000	S	MF-m	√	new to Moz Z:
Dracaenaceae	Dracaena laxissima *Engl.*	1800	S	MF-h	√	
Dracaenaceae	Dracaena mannii *Baker*	1000	S	MF-m	√	
Iridaceae	Gladiolus sp.		ge	W		
Hyacinthaceae	Drimia altissima *(L.f.) Ker Gawl.*	800	ge	W	√	
Hyacinthaceae	Ledebouria revoluta *(L.f.) Jessop*	1000	ge	D/F	√	
Hypoxidaceae	Hypoxis angustifolia *Lam.*	1000	h	W	√	
Musaceae	Ensete ventricosum *(Welw.) Cheesman*	1000	S	MF-m,W	√	
Orchidaceae	Aerangis sp.	1000	ep	W		
Poaceae	Andropogon schirensis *Hochst.*	1000	gr	W	√	
Poaceae	Hyparrhenia sp.	1000	gr	D/F		
Poaceae	Leptaspis cochleata *Thwaites*	1000	gr	MF-m	√	
Poaceae	Oxytenanthera abyssinica *(A.Rich.) Munro*	1000	S	D/F	√	
Poaceae	Pennisetum purpureum *Schumach.*	1000	gr	D/F	√	
Smilacaceae	Smilax anceps *Willd.*	1000	cl	D/F	√	
Zingiberaceae	Afromomum albiflorum *Lock*	1000	ge	W	√	
Zingiberaceae	Siphonochilus aethiopicus *(Schweinf.) B.L.Burtt*	1000	ge	W	√	
Zingiberaceae	Siphonochilus kirkii *(Hook.f.) B.L.Burtt*	1000	ge	W	√	
DICOTYLEDONS						
Acanthaceae	Crossandra pyrophila *Vollesen*	1000	h	D/F	√	
Acanthaceae	Pseuderanthemum subviscosum *(C.B.Clarke) Stapf*	1000	S	MF-m	√	
Acanthaceae	Ruellia prostrata *Poir.*	850	h	W	√	
Acanthaceae	Thunbergia lancifolia *T.Anders.*	850	h	W	√	
Amaranthaceae	Achyranthes aspera *L.* var. pubescens *(Moq.) Townsend*	1000	h	W	√	
Amaranthaceae	Achyranthes aspera *L.* var. sicula *L.*	1000	h	D/F	√	
Anacardiaceae	Lannea discolor *(Sond.) Engl.*	1000	T	W	√	

Family	Species	Alt.	L/F	Habitat	Conf.	Notes
Anacardiaceae	Ozoroa insignis *Delile* subsp. reticulata *(Baker f.) Gillett*	at 500m	t	D/F	√	
Annonaceae	Annona senegalensis *Pers.*	1000	t	D/F	√	
Apiaceae	Heteromorpha arborescens *(Spreng.) Cham.& Schltd.* var. montana *P.J.D.Winter*	1000	t	W	√	
Apiaceae	Steganotaenia araliacea *Hochst.*	1000	t	W, D/F	√	
Apocynaceae	Carissa bispinosa *(L.) Brenan* subsp. zambesiensis *Kupicha*	1500	S	W	√	
Apocynaceae	Carvalhoa campanulata *K.Schum.*	1000	S	MF-m	√	
Apocynaceae	Diplorhynchus condylocarpon *(Müll.Arg.) Pichon*	1000	T	W	√	
Apocynaceae	Funtumia africana *(Benth.) Stapf*	1000	T	MF-m	√	
Apocynaceae	Landolphia sp.		cl	MF-m		
Apocynaceae	Pleiocarpa pycnantha *(K.Schum.) Stapf*	1000	T/S	MF-m	√	
Apocynaceae	Rauvolfia caffra *Sond.*		T	MF-m	√	
Apocynaceae	Tabernaemontana stapfiana *Britten*	1800	T	MF-h	√	
Araliaceae	Cussonia arborea *A.Rich.*	1000	T	W, D/F	√	
Araliaceae	Cussonia spicata *Thunb.*	1000	T	W/F	√	
Araliaceae	Polyscias fulva *(Hiern) Harms*	1000	T	MF-m	√	
Araliaceae	Schefflera goetzenii *Harms*	1800	T	MF-h,W	√	
Asclepiadaceae	Glossostelma carsonii *(N.E.Br.) Bullock*	1000	h	W	√	
Asclepiadaceae	Margaretta rosea *Oliv.* subsp. whytei *(K.Schum.) Mwanyambo*	700	h	D/F	√	
Asteraceae	Berkhaya zeyheri *Oliv.& Hiern*	1000	h	W	√	
Asteraceae	Conyza bonariensis *(L.) Cronquist*	1000	h	D/F	√	
Asteraceae	Gerbera viridifolia *(DC.) Sch.*	1000	h	W	√	
Asteraceae	Nidorella auriculata *DC.*	1000	h	D/F	√	
Balanophoraceae	Sarcophyte sanguinea *Sparrm.* subsp. sanguinea	1000	ps	W	√	
Balsamaceae	Impatiens walleriana *Hook.f.*	1000-1500	h	MF-m	√	
Bignoniaceae	Markhamia obtusifolia *(Baker) Sprague*	1000	t	W	√	
Campanulaceae	Wahlenbergia abyssinica *(A.Rich.) Thulin* subsp. abyssinica	1000	h	D/F	√	
Cecropiaceae	Myrianthus holstii *Engl.*	1000-1500	T	MF-m	√	
Celastraceae	Catha edulis *(Vahl) Endl.*	1000	T	MF-m,W	√	
Celastraceae	Maytenus acuminata *(L.f.) Loes.* var. acuminata	1800	t	MF-h	√	
Celastraceae	Maytenus undata *(Thunb.) Blakelock*	1800	t	MF-h	√	
Chrysobalanaceae	Parinari excelsa *Sabine*	1000	T	W	√	
Clusiaceae	Garcinia kingaensis *Engl.*	1000-1500	T	MF-m/h	√	
Clusiaceae	Garcinia volkensii *Engl.*	1000	T	MF-m	√	
Clusiaceae	Harungana madagascariensis *Poir.*	1000-1600	t	MF-m	√	
Clusiaceae	Psorospermum febrifugum *Spach*	1000	t	W	√	
Combretaceae	Combretum molle *G.Don.*	1000	t	W, D/F	√	
Connaraceae	Agelaea pentagyna (Lam.) Baill.	1500	cl	MF-m	√	
Convolvulaceae	Astripomoea malvacea *(Klotzsch) Meeuse* var. malvacea	1000	h	W	√	
Crassulaceae	Crassula swaziensis *Schonl.*	2000	su	Shrub	√	
Cucurbitaceae	Coccinea adoensis *Cogn.*	800	h	W	√	
Cucurbitaceae	Momordica foetida *Schumach.*	1000	h	D/F	√	
Dipterocarpaceae	Monotes africanus *A.DC.*	1000	T	W	√	
Ebenaceae	Diospyros abyssinica *(Hiern) F.White* subsp. attenuata *F.White*	1000-1800	T	MF-m	√	
Ebenaceae	Diospyros whyteana *(Hiern) F.White*	2000	t	MF-h	√	
Ericaceae	Erica cf. johnstoniana *Britten*	2000	S	Shrub	√	
Erythroxylaceae	Erythroxylum emarginatum *Thonn.*	1000-2000	t	W	√	
Euphorbiaceae	Acalypha villicaulis *Hochst.*	1000	h	W	√	
Euphorbiaceae	Acalypha welwitschiana *Müll.*	1800	S	W	√	
Euphorbiaceae	Antidesma membranaceum *Müll.*	1000	t	W	√	
Euphorbiaceae	Bridelia micrantha *(Hochst.) Baill.*	1000	T	W,D/F	√	
Euphorbiaceae	Croton sylvaticus *Hochst.*	1800	t	MF-h	√	
Euphorbiaceae	Drypetes gerrardii *Hutch.* var. grandifolia *Radcl.-Sm.*	1000-1800	T	MF-mh	√	
Euphorbiaceae	Drypetes sp.	1000	T	MF-m		unmatched
Euphorbiaceae	Erythrococca polyandra *(Pax & K.Hoffm.) Prain*	1000	t	W, MF-m	√	
Euphorbiaceae	Macaranga capensis *(Baill.) Sim*	1000	T	MF-m	√	
Euphorbiaceae	Margaritarea discoidea *(Baill.) G.L.Webster* var. nitida *(Pax) Radcl.-Sm.*	600	t	D/F	√	
Euphorbiaceae	Neoboutonia macrocalyx *Pax*	1000	t	MF-m	√	
Euphorbiaceae	Uapaca kirkiana *Müll.Arg.*	1000	T	W	√	
Euphorbiaceae	Uapaca nitida *Müll.Arg.* var. nitida	1000	t	W	√	
Fab: Caesalpinioideae	Brachystegia boehmii *Taub.*	at 500m	T	W	√	
Fab: Caesalpinioideae	Brachystegia spiciformis *Benth.*	1000	T	W	√	
Fab: Caesalpinioideae	Brachystegia tamarindoides *Benth.* subsp. microphylla (*Harms) Chikuni*	1000	T	W	√	

Family	Species	Alt.	L/F	Habitat	Conf.	Notes
Fab: Caesalpinioideae	Brachystegia utilis *Hutch.& Burtt Davy*	1000	T	W	√	
Fab: Caesalpinioideae	Julbernardia globiflora *(Benth.) Troupin*	1000	T	W	√	
Fab: Mimosoideae	Acacia abyssinica *Benth.*	1200	T	W	√	
Fab: Mimosoideae	Acacia nilotica *(L.) Delile* subsp. kraussiana *(Vatke) Brenan*	at 500m	T	D/F	√	
Fab: Mimosoideae	Albizia adianthifolia *(Schumach.) W.Wight*	1000	T	MF-m	√	
Fab: Mimosoideae	Dichrostachys cinerea *(L.) Wight & Arn.* subsp. africana *Brenan & Brummitt*	500m	S	W	√	
Fab: Mimosoideae	Elephantorrhiza goetzei *(Harms) Harms* subsp. goetzei	at 500m	S	D/F	√	
Fab: Mimosoideae	Entada rheedei *Spreng.*	800	cl	W	√	
Fab: Mimosoideae	Newtonia buchananii *(Baker) G.C.C.Gilbert & Boutique*	1000	T	MF-m	√	
Fab: Papilionioideae	Abrus melanospermus *Hassk.* subsp. suffruticosus *(Boutique) D.K.Harder*	1000	h	W	√	new to Moz
Fab: Papilionioideae	Aeschynomene nyassana *Taub.*	1000	h	W	√	
Fab: Papilionioideae	Dalbergia nitidula *Baker*	at 500m	t	W,D/F	√	
Fab: Papilionioideae	Desmodium gangeticum *(L.) DC.*	800	h	W	√	
Fab: Papilionioideae	Dolichos kilimandscharicus *Taub.* subsp. kilimandscharicus	800	h	D/F	√	
Fab: Papilionioideae	Erythrina abyssinica *DC.*	1000	T	W	√	
Fab: Papilionioideae	Millettia stuhlmannii *Taub.*	at 500m	T	W	√	
Fab: Papilionioideae	Mucuna pruriens *(L.) DC.* var. pruriens	1000	cl	D/F	√	
Fab: Papilionioideae	Pericopsis angolensis *(Baker) Meeuwen*	1000	T	W	√	
Fab: Papilionioideae	Pterocarpus angolensis *DC.*	1000	T	W	√	
Flacourtiaceae	Dovyalis macrocalyx *(Oliv.) Warb.*	1000-1800	S	MF-h,W	√	
Flacourtiaceae	Flacourtia indica *(Burm.f.) Merr.*	600	t	W/D	√	
Flacourtiaceae	Rawsonia lucida *Harv.& Sond.*	1000-1500	t	MF-mh	√	
Gesneriaceae	Streptocarpus cf. goetzei *Engl.*	1500	ep	MF-h	√	
Lamiaceae	Achryospermum laterale *Baker*	1500	h	W	√	
Lamiaceae	Leucas milanjiana *Gürke*	1000	h	W,D/F	√	
Lamiaceae	Ocimum obovatum *Benth.* subsp. obovatum	1000	h	W	√	
Lamiaceae	Plectranthus cf. hadiensis *(Forssk.) E.A.Bruce*	1000	h	W	√	
Lamiaceae	Plectranthus kapatensis *(R.E.Fr.) J.K.Morton*	1000	h	W	√	new to Moz Z:
Lamiaceae	Scutellaria schweinfurthii *Briq.* subsp. paucifolia *(Baker) Paton*	1000	h	MF-m	√	
Lamiaceae	Vitex cf. doniana *Sweet*	1000	t	W	√	
Loganiaceae	Anthocleista grandiflora *Gilg*	1000	T	MF-m	√	
Loganiaceae	Buddleja salviifolia *(L.) Lam.*	1800	t	Shrub	√	
Loganiaceae	Mostuea brunonis *Didr.* var. brunonis	1800	S	MF-h	√	new to Moz Z:
Loganiaceae	Nuxia floribunda Benth.	1500	t	MF-m	√	
Loganiaceae	Strychnos spinosa *Lam.*	1000	t	W	√	
Loganiaceae	Strychnos sp. - forest climber	1000	cl	MF-m		unmatched
Loranthaceae	Agelanthus subulatus *(Engl.) Polhill & Wiens*	1000	ep	W	√	
Malvaceae	Hibiscus fuscus *Garcke*	1000	h	D/F	√	
Melastomataceae	Dissotis sp.	1000	S	D/F		
Melastomataceae	Dissotis sp.	2000	S	Shrub	√	
Meliaceae	Ekebergia capensis *Sparm.*	1800	T	MF-h	√	
Meliaceae	Khaya anthotheca *(Welw.) C.DC.*	1000-1500	T	MF-m	√	
Meliaceae	Trichilia dregeana *Sond.*	1000	T	MF-m	√	
Monimiaceae	Xymalos monospora *(Harv.) Warb.*	1800	T	MF-h	√	
Moraceae	Ficus exasperata *Vahl.*	1000	T	W	√	
Moraceae	Ficus scassellatii *Pamp.*	1000	T	MF-m	√	
Moraceae	Ficus sp. - strangling	1000	T	MF-m		
Moraceae	Ficus sur *Forssk.*	1000	T	W	√	
Moraceae	Treculia africana *Decne* subsp. africana var. africana	at 500 m	T	W	√	
Moraceae	Trilepisium madagascariense *DC.*	1000	T	MF-m	√	
Myricaceae	Morella pilulifera *(Rendle) Killick*	1000	t	W	√	
Myrsinaceae	Maesa lanceolata *Forssk.*	1000	t	W	√	
Myrsinaceae	Myrsine africana *L.*	2000	S	MF-h	√	
Myrsinaceae	Rapanea melanophloeos *(L.) Mez*	1000	T	W	√	
Myrtaceae	Psidium guajava *L.*	1000	t	D/F	√	
Myrtaceae	Syzygium cordatum *C.Krauss*	1000	T	W	√	
Myrtaceae	Syzygium guineense *(Willd.) DC.* subsp. afromontanum *F.White*	1000-1800	T	MF-mh	√	
Ochnaceae	Ochna holstii *Engl.*	1800	t	MF-h	√	
Ochnaceae	Ochna cf. mossambicensis *Klotzsch*	at 500m	S	D/F	√	
Olacaeae	Strombosia scheffleri *Engl.*	1000-1600	T	MF-m	√	
Olacaeae	Ximenia caffra *Sond.* var. natalensis *Sond.*	at 500m	S	W	√	
Oleaceae	Olea capensis *L.* subsp. macrocarpa *(C.H.Wright) I.Verd.*	1600	T	MF-h	√	
Oleaceae	Schrebera trichoclada *Welw.*	at 500 m	t	D/F	√	

Family	Species	Alt.	L/F	Habitat	Conf.	Notes
Passifloraceae	Adenia digitata *(Harv.) Engl.*	1000	h	W	√	
Passifloraceae	Adenia rumicifolia *Engl.& Harms* var. rumicifolia	1000	h	MF-m	√	
Piperaceae	Piper capensis *L.f.*	1000	S	MF-m	√	
Polygalaceae	Securidaca longepedunculata *Fresen.*	at 500m	T	W	√	
Proteaceae	Faurea saligna *Harv.*	1000	T	W	√	
Proteaceae	Protea welwitschii *Engl.*	1000	t	W	√	
Rubiaceae	Chassalia parvifolia *K.Schum.*	1000	S	MF-m	√	
Rubiaceae	Coffea mufindiensis *Bridson* subsp. australis *Bridson*	1000-1500	S	MF-m	√	VU
Rubiaceae	Coffea salvatrix *Swynn.& Phillipson*	1000	t	MF-m	√	
Rubiaceae	Cremospora triflora *(Thonn.) K.Schum.*	1000	S	MF-m	√	
Rubiaceae	Lasianthus kilimandscharicus *K.Schum.*	2000	S	MF-h	√	
Rubiaceae	Mussaenda arcuata *Poir.*	1000	S	W	√	
Rubiaceae	Oleandra distenta Kunze	1800	S	W	√	
Rubiaceae	Oxyanthus speciosus *DC.* subsp. stenocarpus *(K.Schum.) Bridson*	1000	S	MF-m	√	
Rubiaceae	Pauridiantha symplocoides *(S.Moore) Bremek.*	1800	S	W	√	
Rubiaceae	Pavetta chapmannii *Bridson*	1800	S	W	√	
Rubiaceae	Pavetta sp. A	1600	S	W	√	
Rubiaceae	Psychotria zombamontana *(Kuntze) Petit*	1600	t	MF-h,W	√	
Rubiaceae	Pyrostria sp.	1800	S	MF-h	√	
Rubiaceae	Rothmannia urcelliformis *(Hiern) Robyns*	1000	T	MF-m	√	
Rubiaceae	Rytigynia uhligii *(K.Schum.& K.Krause) Verdc.*	1000	t	MF-m	√	
Rubiaceae	Tricalysia acocantheroides *K.Schum.*	1800	t	W	√	
Rubiaceae	Rytigynia uhligii *(K.Schum.& K.Krause) Verc.*	1000	S	MF-m	√	
Rubiaceae	Vangueria infausta *Burchell* subsp. rotundata *(Robyns) Verdc.*	1000	t	W	√	
Rutaceae	Clausena anisata *(Willd.) Benth.*		S	W		
Rutaceae	Toddalia asiatica *(L.) Lam.*	1000	cl	MF-m	√	
Rutaceae	Vepris cf. bachmannii *(Engl.) W.Mziray*	1500-2000	t	MF-h	√	
Rutaceae	Vepris nobilis *(Delile) W.Mziray*	1600	t	MF-h	√	
Rutaceae	Zanthoxylum gilletti *(De Wild.) P.G.Waterman*	1000	T	MF-m		
Sapindaceae	Allophylus cf. chaunostachys *Gilg*	1500-2000	S	MF-h	√	
Sapindaceae	Blighia unijugata *Baker*	1000	t	MF-m	√	
Sapindaceae	Dodonea viscosa *Jacq.*	2000	S	Shrub	√	uncertain
Sapindaceae	Macphersonia gracilis *O.Hoffm.* var. hildebrandtii *(O.Hoffm.) Capuron*	1500	S	MF-h	√	
Sapotaceae	Chrysophyllum gorungosanum *Engl.*	1000	T	MF-m	√	
Sapotaceae	Englerophytum magalismontanum *(Sond.) T.D.Penn.*	1000	T	W	√	
Sapotaceae	Englerophytum natalense *(Sond.) T.D.Penn.*	1000	T	MF-m	√	
Sapotaceae	Synsepalum brevipes *(Baker f.) T.D.Penn.*	at 500m	T	R	√	
Sapotaceae	Synsepalum muelleri *(Kupicha) T.D.Penn.*	1000-1800	t	MF-mh	√	
Scrophulariaceae	Cycnium adonense *Benth.*	1000	h	W	√	
Simaroubaceae	Harrisonia abyssinica *A.Juss.*	1000	t	W		
Solanaceae	Solanum cf. giganteum *Jacq.*	1200-1500	S	MF-mh	√	
Sterculiaceae	Cola greenwayii *Brenan*	1000	T	MF-m	√	
Sterculiaceae	Dombeya burgessiae *Harv.*	1000	S	D/F	√	
Thymeleaceae	Peddiea africana *Harv.*	1500-2000	t	MF-h	√	
Tiliaceae	Triumfetta cf. pilosa *Roth* var. effusa *(Harv.) Wild*	1000	h	D/F	√	
Turneraceae	Tricliceras longepedunculatum *(Mast.) R.Fern.*	800	h	D/F	√	
Ulmaceae	Celtis gomphophylla *Baker*	1000	T	MF-m	√	
Ulmaceae	Trema orientalis *(L.) Blume*	1000	T	D/F	√	
Violaceae	Rinorea angustifolia *(Thouars) Baill.* subsp. ardisiiflora *(Oliv.) Grey-Wilson*	1000-1800	t	MF-m/h	√	
Violaceae	Rinorea convallarioides *(Baker f.) Eyles*	1000	T	MF-m	√	
Violaceae	Rinorea ferruginea Engl.	1000	T	MF-m	√	
Vitaceae	Cyphostemma cf. congestum *(Baker) Descoings*	1000	h	D/F	√	
Vitaceae	Rhoicissus tridentata *(L.f.) Wild.& R.B.Drumm.*	1000	cl	W	√	

NB. Altitude given as 1000 m implies can be found from 800–1200 m in suitable habitat.

ANNEX 3. List of birds seen on Mt Chiperone, 15–18 December 2005 (from Claire Spottiswoode & Eric Herrmann).

Scientific name	**Common name**
Pernis apivorus	European Honey Buzzard
Buteo augur	Augur Buzzard
Hieraaetus pennatus	Booted Eagle
Francolinus hildebrandti	Hildebrandt's Francolin
Francolinus afer	Red-necked Spurfowl
Treron calvus	African Green Pigeon
Turtur tympanistria	Tambourine Dove
Turtur afer	Blue-spotted Wood Dove
Columba delegorguei	Eastern Bronze-naped Pigeon
Columba larvata	Lemon Dove
Tauraco livingstonii	Livingstone's Turaco
Chrysococcyx klaas	Klaas's Cuckoo
Bubo africanus	Spotted Eagle Owl
Strix woodfordii	African Wood Owl
Macrodipteryx vexillarius	Pennant-winged Nightjar
Apaloderma narina	Narina's Trogon
Bycanistes bucinator	Trumpeter Hornbill
Bycanistes brevis	Silvery-cheeked Hornbill
Stactolaema leucotis	White-eared Barbet
Pogoniulus bilineatus	Yellow-rumped Tinkerbird
Campethera cailliautii	Green-backed Woodpecker
Dendropicos fuscescens	Cardinal Woodpecker
Psalidoprocne orientalist	Eastern Saw-wing
Hirundo abyssinica	Lesser Striped Swallow
Campephaga flava	Black Cuckoo-Shrike
Coracina caesia	Grey Cuckoo-Shrike
Andropadus virens	Little Greenbul
Andropadus importunus	Sombre Greenbul
Phyllastrephus flavostriatus	Yellow-streaked Bulbul
Pycnonotus barbatus	Common Bulbul
Nicator gularis	Eastern Nicator
Cossypha heuglini	White-browed Robin-Chat
Cercomela familiaris	Familiar Chat
Alethe choloensis	Thyolo Alethe
Phylloscopus trochilus	Willow Warbler
Phylloscopus ruficapilla	Yellow-throated Woodland Warbler
Cisticola cantans	Singing Cisticola
Prinia subflava	Tawny-flanked Prinia
Heliolais erythroptera	Red-winged Warbler
Apalis chariessa	White-winged Apalis
Apalis melanocephala	Black-headed Apalis
Camaroptera brachyura	Grey-backed Camaroptera
Bradornis pallidus	Pale Flycatcher
Platysteira peltata	Black-throated Wattle-eye
Turdoides jardineii	Arrow-marked Babbler
Cyanomitra olivacea	Eastern Olive Sunbird
Hedydipna collaris	Collared Sunbird
Cinnyris venusta	Variable Sunbird
Zosterops senegalensis	Yellow White-eye

Telophorus nigrifrons	Black-fronted Bush-Shrike
Tchagra anchietae	Anchieta's Tchagra
Dryoscopus cubla	Black-backed Puffback
Laniarius aethiopicus	Tropical Boubou
Oriolus chlorocephalus	Green-headed Oriole
Dicrurus ludwigii	Square-tailed Drongo
Cinnyricinclus leucogaster	Violet-backed Starling
Ploceus bertrandi	Bertram's Weaver
Ploceus ocularis	Spectacled Weaver
Ploceus bicolor	Dark-backed Weaver
Ploceus olivaceiceps	Olive-headed Weaver
Lagonosticta rhodopareia	Jameson's Firefinch
Estrilda quartinia	Yellow-bellied Waxbill
Estrilda astrild	Common Waxbill
Vidua macroura	Pin-tailed Whydah
Serinus citrinelloides	African Citril
Emberiza cabanisi	Cabanis's Bunting