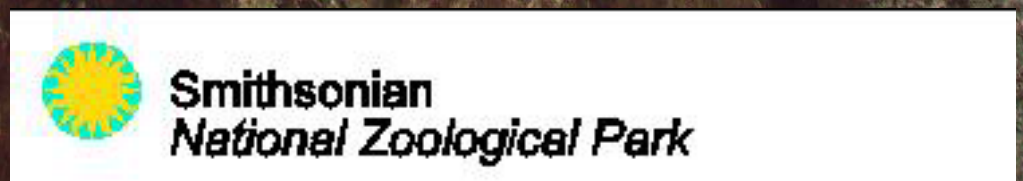
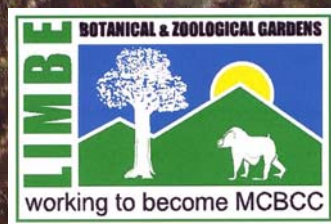


A PRELIMINARY VEGETATION ASSESSMENT OF THE MBÉ NATIONAL PARK, MONTS DE CRISTAL, GABON

June 2004



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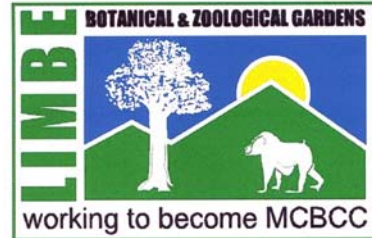
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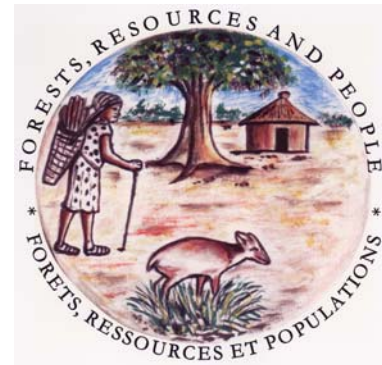
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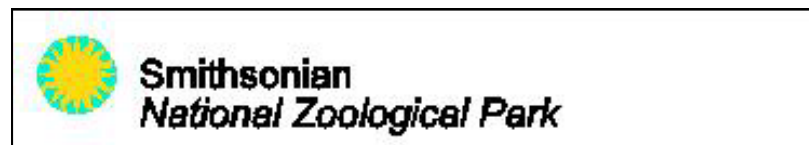
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EXECUTIVE SUMMARY

Gabon is one of tropical Africa's biologically richest countries, supporting several mountain chains where plant diversity is purported to be very high. Of all of the CARPE landscapes, the Monte-Alen-Monts de Cristal landscape of Equatorial Guinea and Gabon probably possess the greatest botanical wealth. Though severely underdocumented to the point of not knowing how many plant species are in the Monts or in Gabon proper, many have cited the Monts as a Pleistocene Refugium as evidenced by it being a center of regional plant diversity for several taxa and rich in endemic species. Rainfall is approximately 3,000mm per annum, and the substrate part of the ancient Precambrian basement rising to just over 900m. Logging, gold mining, and hunting are considered to be the main threats in the Monts de Cristal, but the recent creation of two national parks (Mt. Seni and Mbé National Parks) in the area potentially lessens these threats once a management structure is in place.

A multi-national botanical team of four institutions came together from Limbe Botanic Garden, l'Herbier National du Gabon, Smithsonian Institution, and the Missouri Botanical Garden and installed permanent Biodiversity Plots (BDP's) at two sites in the Mbé National Park. Placement of the plots was undertaken in consultation with Gabonese botanists familiar with the area and through the implementation of reconnaissance ("reccé") surveys. Prior to this assessment, few data were available to fully evaluate the Park's diversity. In order to fill in this gap, this project employed standard Smithsonian Institution methodology used elsewhere in Central Africa and the wider humid tropics, to place five BDP's within the Mbé National Park to assess the plant diversity contained therein and to provide baseline information for future forest monitoring.

Despite being the most high profile area for plant collecting in Gabon, due to its proximity to Libreville and its famed diversity, this monitoring project added almost 100 taxa to the existing checklist for the area list by virtue of the use of quantitative assessment methods in which every tree species in a given area is collected. The use of a full time expert tree climber, often under-used in botanical fieldwork throughout Central Africa, made this possible. The beta diversity of the Mbé National Park is extraordinarily high with the species composition in BDP's separated by less than one kilometre changing significantly.

Rece transects prior to the park establishment used *Begonia* and Caesalpiniod legumes as indicators of diversity. Comparisons of these results substantiate the beta diversity of the area since these two taxa do not have overlapping centres of diversity. The dominant families when considering relative frequency, dominance, and density, are the Burseraceae, Euphorbiaceae, Caesalpinaceae and Olacaceae, in rank order. The total basal area per hectare is relatively high reaching 45 m²/ha and included many important commercially valuable timber trees. The mean number of trees per hectare was 539. In terms of species diversity, when compared with Smithsonian Institution's BDP's elsewhere in Central Africa, the Monts de Cristal ranked the most diverse site assessed to date with a mean number of 97 species per hectare (trees >10cm dbh).

This was substantiated by the Missouri Botanical Garden African dataset where the Central Africa subset of plots ranked the Monts de Cristal only second to Banyang Mbo, Cameroon. Through the collaboration with Smithsonian's Center for Tropical Forestry Science, the presence of *Korupodendron* was documented for the first time outside of Korup National Park, Cameroon. This range extension is significant in that it was made possible by the rare opportunity for regional botanists to be in the field together and that this monotypic genus of conservation concern was not originally believed to have a distribution outside of Southwestern Cameroon. The simultaneous support of a Congo Basin wide monitoring program in conjunction with south-south collaboration makes for a sustainable future in the landscapes where the understanding, conservation, and management of the forest are essential for its survival.

Monitoring networks are still a relatively new idea in the long established national parks, even in the United States. By contrast, creating such a network at the inception of the newly-created Gabonese national parks constitutes a rare opportunity that will be highly valuable over time. It is hoped that future assessment and monitoring endeavours will take place in Republic of Congo, Equatorial Guinea, and southern Gabon to broaden the collaboration and monitoring network.

INTRODUCTION

Gabon is one of the most botanically diverse tropical African countries (Pomeroy, 1993). Covering an area of 267,660 km², it is home to an estimated 6,000-10,000 plant species (Breteler, 1989; Christy *et al.*, 2003). Relatively little is known about Gabon plant diversity and it is probably the least botanically known area in tropical Africa (Campbell and Hammond 1989). Closed canopy forest still covers an estimated 21,190,000 ha (over 80% of the country) (Mayaux *et al.*, 2004), although up to 70% of these remaining forests are currently allocated as logging concessions (Collomb *et al.*, 2000). Timber exploitation represents a major contribution to the country's economy, valued at some 190 milliards CFA per annum (Christy *et al.*, 2003). Reports as to how commercial logging is contributing to the loss in forest cover are somewhat unreliable, with the annual deforestation rate estimated at between 0.1% (Christy *et al.*, 2003) and 0.5% (FAO, 1999), the latter figure being one of the highest for the region.

Plant endemism is high in Gabon at an estimated 22% (Breteler, 1989) and new species are still being regularly discovered (see Breteler, 2001). Many species are limited to remote mountain ranges such as the Monts de Cristal, Monts Doudou and the Massif du Chaillu. A recent analysis of collecting density in Gabon shows that many such areas are poorly known botanically and have no known collections (Sosef, 2001). With only a few trained Gabonese botanists and limited resources, such areas will likely remain largely unexplored for the foreseeable future unless partnerships aimed at building the capacity of local institutions are further developed (Morat and Lowry 1997).

In late 2002, the Government of Gabon, working in close collaboration with the Wildlife Conservation Society, established 13 new National Parks, an unprecedented initiative in the region aimed at protecting a significant swathe of Central African forests and the biodiversity they contain (Quammen 2003). Despite one of the lowest population densities in the Congo Basin (4.3 people per km² (FAO, 1999), the challenge now is to manage these parks and this will require the provision of extensive biological, ecological and socio-economic baseline information as well as management capacity and financial commitment. Until recently, however, these latter two functions have often been considered lacking within the region (Wilkie *et al.*, 2001) and it is hoped the CARPE-funded Congo Basin Forest Partnership will address this shortfall.

The Monts de Cristal is purportedly one of the most botanically diverse areas of Gabon (Wilks, 1990) and with its proximity to Libreville is one of the most floristically well-known regions of Gabon, currently with 545 taxa listed for Mbé National Park (extracted from database from Herbarium National du Gabon). The Monts de Cristal is purported to be a significant Pleistocene Forest Refuge (Hamilton, 1982; Sosef 1994) and is considered one of the two¹ distinct "Centres of Plant Diversity" in the Atlantic Coastal Forest Ecoregion (CBFP Annex 2, 2002). The borders of the two National Parks in the Monts de Cristal are currently not delimited nor is there a management system yet in place.

¹ The other being the Mayombe region.

This report is the result of a multi-national and multi-institutional effort undertaken as part of the partially CARPE-funded Congo Basin Forest Partnership (CBFP) initiative. With members from the Herbar National, Libreville, Limbe Botanic Garden, Cameroon, Smithsonian Institution, and the Missouri Botanical Garden, a combination of field training and standardized vegetation assessment techniques were implemented in the Mbé National Park, the southern park of the pair in the Monts de Cristal. The information presented in this report can be used as a basis for comparison with other vegetation studies in Gabon (Minkébé, Monts Doudou, Forêt des Abeilles, etc) and the wider Congo Basin. In addition, the establishment of permanent biodiversity plots (BDP's) to provide critical baseline data for future monitoring within the Monts de Cristal is a powerful tool to understand the dynamic forest processes in the region and how such forest can be best managed. Finally, linking national institutions to form regional partnerships will only strengthen the ability of the CBFP partners to monitor, assess, and protect its resources across all landscapes.

SITE DESCRIPTION

The Mbé National Park is located in the Estuaire and Woleu Ntem Provinces of Gabon (0°36'-1°00' N; 10°13'-10° 58' E). The Park includes contains the watershed of the Mbé River and reaches almost to the Komo River. The Mbé River is the source of Libreville's hydroelectricity and two hydroelectric dams are located in the area, the northern Tchimbélé Dam at 900m and the Kinguélé Dam at 500m.

In common with southern Cameroon and Rio Muni, the geology of the Monts de Cristal is comprised of Precambrian African basement consisting of granite and gneiss (St. Aubin, 1963). Elevations reach over 900m with the highest point being Mont Mbilan, just north of Kinguélé, at 925m. Rainfall in the mountains is reported as having a marked dry season from June to September and a small dry season in January or February (Davis *et al.* 1994), but some consider the Monts de Cristal to be aseasonal (Wilks, pers. comm.). The highest rainfall in Gabon occurs in adjacent Mont Seni National Park, in the northern portion of the Monts de Cristal at 3,500mm per year (St. Aubin, 1963), decreasing on the eastern slopes to 2000mm per year (Rietsma, 1988). The mean annual temperature is 26°C (*ibid.*).

The vegetation of the Monts de Cristal has been described as a component of “la forêt des montagnes Gabonaises”, characterised by an abundance of *Aucoumea klaineana*, *Desbordesia glaucescens*, *Dacryodes buettneri* and *Erismadelphus exul*, but particularly by the genus *Bikinia* (syn. *Monopetalanthus*) (Christy *et al.*, 2003). The Monts de Cristal are thought to contain as many as 3,000 taxa, with ca.100 endemic species (de Wilde cited in Davis *et al.*, 1993). Inselbergs, or rock outcrops, are also a common feature of the Monts de Cristal, possessing unique vegetation communities and many narrow endemics (Ngok Banak, 2002). In terms of wider diversity, the Monts de Cristal are reported to support substantial populations of large mammals, notably the western lowland gorilla (*Gorilla gorilla gorilla*), mandrill (*Mandrillus sphinx*), chimpanzee (*Pan troglodytes troglodytes*), elephant (*Loxodonta africana cyclotis*), buffalo (*Syncerus caffer*) and

leopard (*Panthera pardus*). Very few studies have been made of any other biota in the region.

The human population is low, with only a few scattered villages in the area. Environmental threats to this area include local gold mining, its resultant mercury pollution, and hunting (Wilks, 1990), both of which were very much in evidence during our field work.

MATERIALS AND METHODS

Introduction

Five permanent 1ha biodiversity plots were established within the Mbé National Park. The location of the plots were not only dictated by logistical constraints but reflected the need to site them in “representative” forest. Three were located in the vicinity of the Tchimbélé Dam and two, close to the Kinguélé Dam. In order to ensure the plots captured the representative forest types, site selection of the plots was based on “reccé walks” (White and Edwards, 2000). These were undertaken to assess the dominant vegetation types within the area. A team of foresters and botanists (two of whom were familiar with the vegetation of the Monts de Cristal) prospected the area using existing trails and identified the dominant tree species every 200m or so. Within a relatively short distance from the commencement of the reccé walks, it was clear that the forest exhibited significant heterogeneity and vegetation composition changed dramatically between closely situated sites. Plots were then laid out in the major forest variations encountered. It was clear from these walks that the heterogeneity of the forest was tremendous and would need numerous plots in order to effectively describe its beta diversity.



Figure 1. Census of a large *moabi* (*Baillonella toxisperma*) during a reccé walk on Mont Mbilan.

Table 1. Locations of BDP’s within the Mbé National Park.

Plot #	Location	Gazeteer	Altitude (m)
GAB 01	Tchimbélé	00°37’02”N: 010°24’49”E	400
GAB 02	Tchimbélé	00°37’08”N: 010°24’35”E	300
GAB 03	Tchimbélé	00°37’02”N: 010°23’57”E	300
GAB 04	Kinguélé	00°28’00”N: 010°16’41”E	200
GAB 05	Kinguélé	00°28’50”N: 010°17’56”E	250

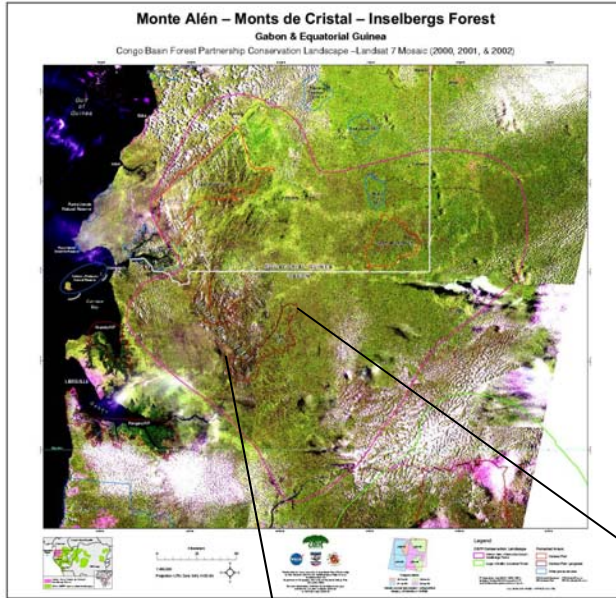
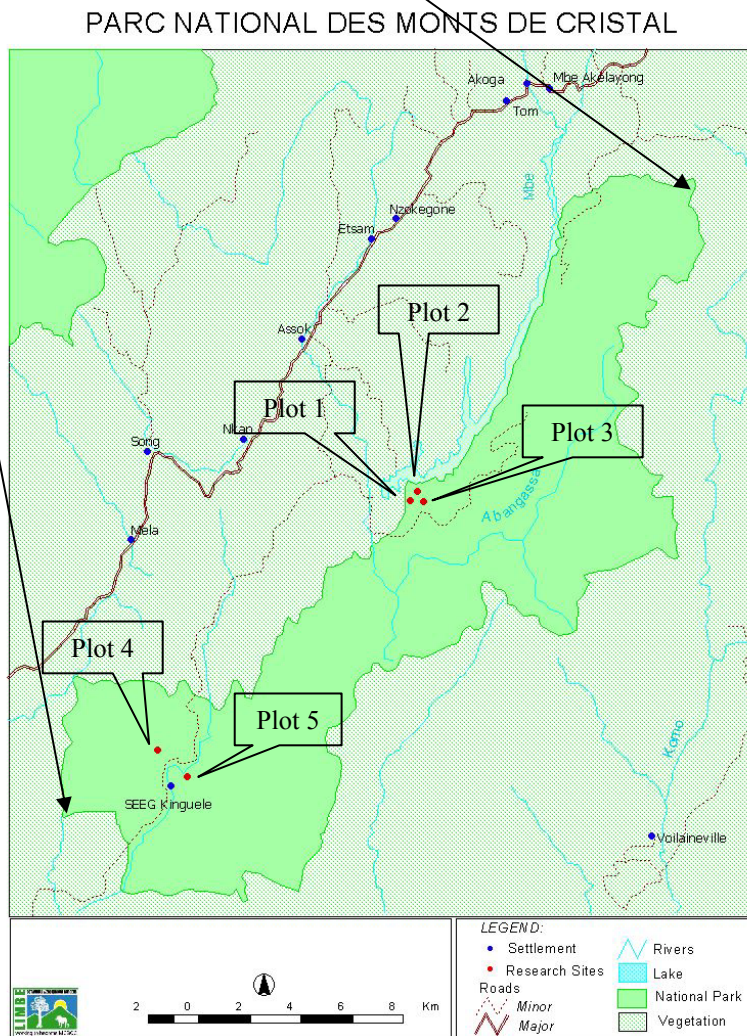


Figure 2: Location of the Mbé National Park within the Monts de Cristal-Monts Alèn Landscape. Note field study sites within the Park (below).



Plot establishment

In the one-hectare configuration used for SI/MAB 1ha BDP's, the area is first geo-referenced using a GPS and is then surveyed in a horizontal plane using a compass, tape and clinometer. The one-hectare plot is divided into 25 quadrats, each 20 x 20 meters in size (Fig. 1). It should be noted that, generally, 20 meters is the longest distance that can be accurately surveyed in dense forest.

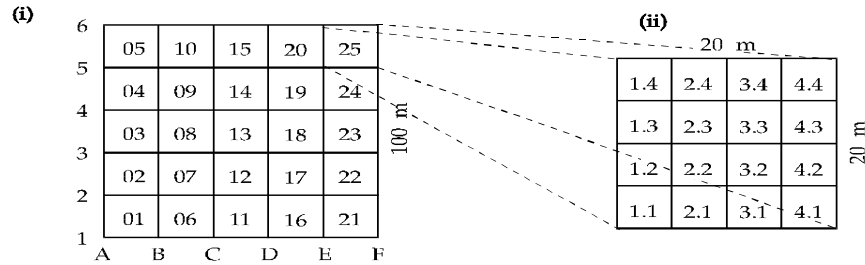


Figure 3: One hectare Biodiversity Plot (BDP) layout



Figure 4: Line sighting using a compass



Figure 5. Measuring horizontal distance

Surveying to establish quadrat corners proceeds from the bottom left-hand corner of the plot outward to eliminate errors. Corrections for slope are made, ensuring that each of the quadrats contains 400 square meters regardless of topography. The calculations used for slope correction are fully described in Dallmeier *et al.* (1992) and White and Edwards (2000). A row of quadrats is built north to south along the left line from the baseline; new

quadrats are then added westward until rows two to five are completed. All the quadrat corners are marked with stakes topped with flagging tape marked with the distance from the baseline.

Tree enumeration

Tree tagging and identification begins as soon as the corner stakes of the quadrats are set. The process includes locating all trees with a diameter 10 centimetres in diameter at breast height (dbh), then measuring, marking and identifying the species; these specific activities are elaborated upon below. During the enumeration process, a team of three to five individuals walks the quadrat, starting at the left corner baseline and moving in concentric clockwise circles of decreasing size, ending in the centre of the quadrat in order to systematically encounter and record all trees of appropriate size.

Tree measurement and marking

All trees >10cm diameter at breast height (dbh) are measured. The dbh is measured with a diametric tape at approximately 1.3m, avoiding any protrusions or lianas growing on the trunk. Trees with stilt roots and buttresses are measured at the lowest point at which the diameter of the bole can be accurately measured without the influence of these additional protuberances. Measuring above buttress and stilt roots often requires the use of a skilled tree climber. The measurement of trees above the dbh point is known as the diameter at reference height (drh). The point of measurement is marked with an “X” with the sharp point of the dbh tape. At this exact point, a ring is then painted around the tree. This marking ensures that future measurements of the same tree are taken at exactly the same point.

Figures 6 & 7: Measuring tree diameter at breast height and at reference height.



Numbering and tagging

Each individual tree is tagged with a different number consisting of a sequence of three double digits. Using (01-24-09) as an example, the first two numbers (01) corresponds to the one-hectare plot within the zone, second pair (24) identifies the number of the quadrat and the last two numbers (09) represent an individual tree within the quadrat. No other tree receives this unique number. The tree numbers start at 1 in each quadrat and continue until the last tree is labelled.



Prior to all trees being permanently tagged with aluminium labels a temporary ribbon is tied to each tree with the number written in indelible ink. Once aluminium labels are produced with the correct numbers, they are nailed to the tree 10cm above the point of measurement, and as marked by the ring of paint on the trunk. The aluminium label faces outwards and is oriented toward the baseline of the plot. The nail is driven to angle down and just far enough in so that it will not fall out when pulled or when bark falls off, leaving enough room for the tree to grow before “eating” the tag.

Figure 8. Tagged and painted tree

Tree identification and voucher collection

As far as possible, individual trees within a BDP are identified in the field often using bark and slash characters. However, to verify the field determinations, voucher specimens are collected for each taxon encountered, whether the species has been identified with confidence or not. For problematic genera such as *Drypetes*, *Diospyros*, *Memecylon* and *Bielschmeidia*, all individuals encountered were vouchered. Unidentified species were sorted into “morphospecies” and at least one voucher was collected for each. The use of a tree climber greatly facilitated access to the forest canopy and ensured that very few, if any, individual species were not represented in the voucher collections. The specimens are preserved in the field using a portable aluminium field dryer with kerosene stoves providing the heat source.



Figure 9. Identifying species using slash characters

In addition to the voucher specimens collected during the enumeration of the plots, DNA silica collections were made for the following taxa: *Carapa*, *Garcinia*, *Memecylon*, and *Warneckia*. These groups have active researchers at MBG who will potentially be



performing molecular systematics and population genetics analyses on the material. Furthermore, as fertile specimens were found outside the plots, these were collected as well. At the time of setting the plots, the forest was not prolifically flowering and so botanical support focused primarily on the plots themselves. Several interesting taxa were collected in and around the plots, including one Triuridaceae which is awaiting determination by a specialist, and may potentially be a new species.

Figure 10. Field dryer using kerosene stoves as a heat source.

Voucher specimen management

During the plot enumeration, more than 300 vouchers, the majority of which were sterile, were collected. The first set of these vouchers have been deposited at the Herbar National du Gabon in Libreville and are still in the process of being determined, and will be subsequently curated and databased using BRAHMS. As with all CARPE-supported activities in the Congo Basin implemented by SI and MBG, duplicates of these vouchers will be kept in a sterile voucher collection at MBG and will be entered onto the TROPICOS database. This database provides taxonomic, ecological and geographical information on each accession and can be accessed via the internet (<http://mobot.mobot.org/W3T/Search/vast.html>). Undetermined plants will be sent to family specialists to complete the identification process and identify potential new species.



Figure 11. Pressing voucher specimens in the field

Tree mapping

In addition to measuring and identifying trees in the quadrats, SI/MAB researchers map each tree to the nearest centimetre. A mapping team of seven people uses automatic range finders to accomplish this task. The tree is located by one of two people person known as the “tree locators.” The distance of the tree from one of the lines of the quadrat (1,2,3 or 4) where the corners are visible, is then taken using the range finders.

These are recorded as “line A” and “line B”. These lines denote the diagonal distance from a left quadrat corner (line A) to the tree being measured and from a right corner (line B) to the same tree. The lines also allow measurements from any of the four sides of the quadrat. The coordinate corners are denoted by their intersecting boundary lines (quadrat boundary lines are numbered in clockwise sequence from one to four, starting at the baseline). BIOMON (see below) automatically calculates the x and y coordinates of the distances mapped and maps each individual tree on the quadrats.

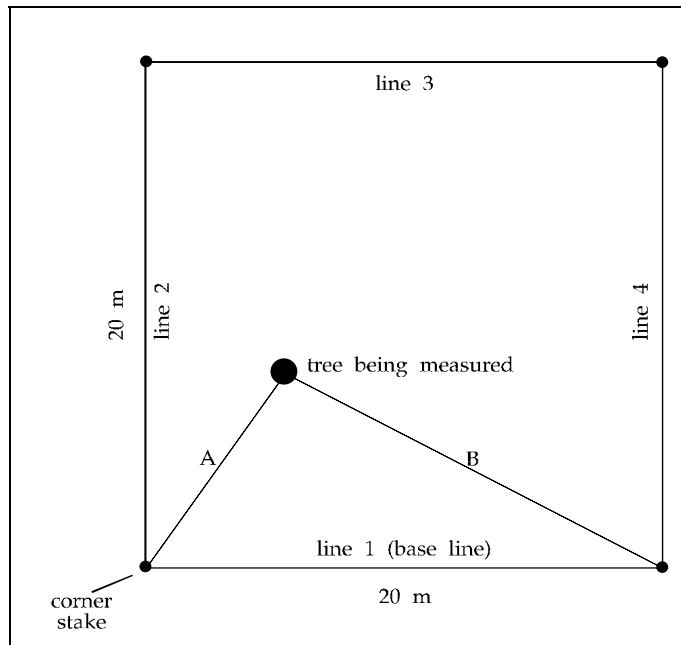


Figure 12. Tree mapping



Figures 13 & 14. Using electronic range finders to measure distance during the mapping process.

On-site training and capacity building

One of the main objectives of this field work was to bring together a wide range of local technicians (tree climbers, herbarium technicians, botanists, foresters) from a number of recognised regional institutions to share professional experience and technical expertise and jointly evaluate the forest using their combined knowledge. By working on a standardized plot protocol, implementing it in the field, and undertaking preliminary data analysis, the local capacity for both monitoring the existing plots and perhaps extending the plot network to other new national parks in Gabon to allow further comparison between sites, has been considerably supported. In this regard the staff of the National Herbarium in Libreville are currently working on a proposal to develop a national strategy for the establishment of such a permanent sample plot network. Some basic field equipment to support this initiative was donated to LBV by the SI/MBG team.

Data analysis

The Smithsonian Institution's Monitoring and Assessment of Biodiversity Programme (SI/MAB) has developed a Windows driven computer programme that manages and analyses data collected on the 1ha BDP's. BIOMON² undertakes basic assessments based calculations of species numbers, frequencies, basal areas and mean dbh as well as on species "importance value index" (IVI) i.e. species with the highest IVI are referred to as the most "important" at that site. The IVI is calculated as follows:

$$\text{Relative density} = \frac{\text{Number of individuals of a species} \times 100}{\text{Total number of individuals of all species}}$$

$$\text{Relative dominance} = \frac{\text{Total basal area of the species} \times 100}{\text{Total basal area of all species}}$$

$$\text{Relative frequency} = \frac{\text{Frequency of species} \times 100}{\text{Sum of all frequencies}}$$

Frequency = Number of quadrats in which a species is found.

Cover value index (CVI) = Relative density + Relative dominance.

Important value index (IVI) = CVI + Relative frequency.

² BIOMON can be downloaded at www.si.edu/simab

Summary of results

A total of 2,697 individual trees representing 39 families, 114 genera and 152 species³ were enumerated on the Monts de Cristal BDP's. The detailed breakdown of species composition, density, dominance and frequency within each BDP are presented in the field guide accompanying this report. A brief summary of results is presented below.

Table 2. A summary of the preliminary data gathered from each BDP.

Site	Plot No.	No. of species	No. of trees	No. of stems	Mean dbh (cm)	Total BA (m ² /ha)
Tchimbélé	GAB 01	91	533	542	25.97	28.7
Tchimbélé	GAB 02	92	554	560	30.78	41.68
Tchimbélé	GAB 03	102	533	533	29.83	37.42
Kinguélé	GAB 04	90	523	526	29.22	35.27
Kinguélé	GAB 05	110	554	557	31.59	43.65

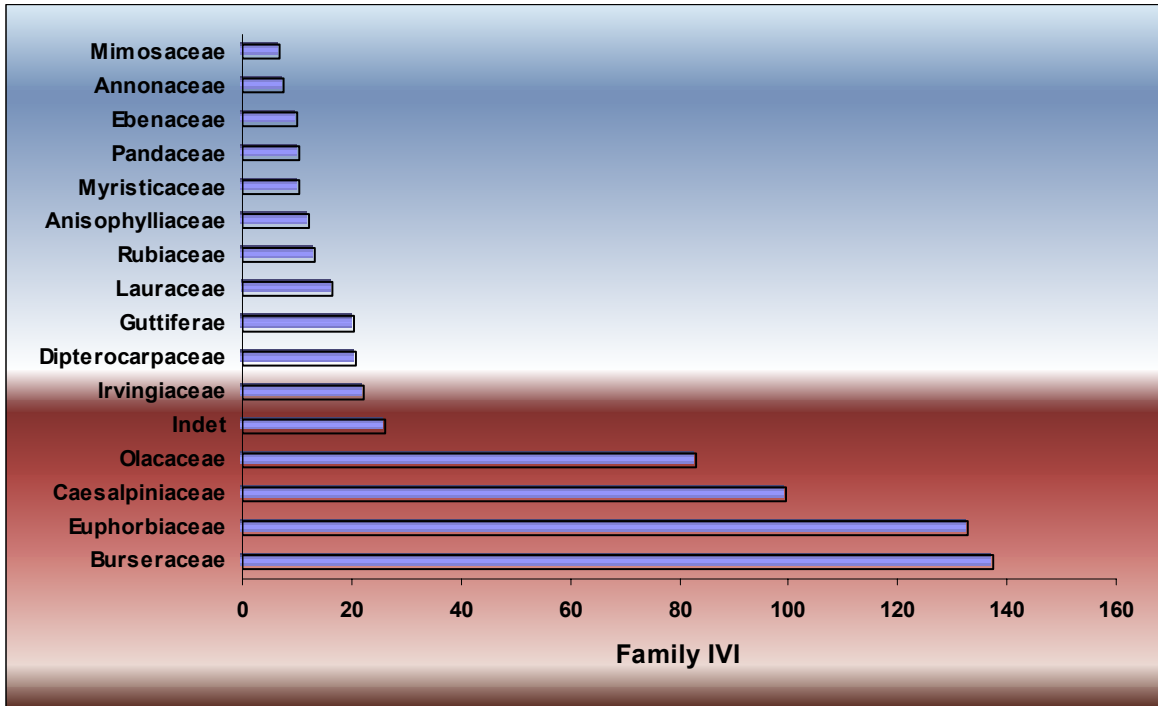
In terms of family importance, the Caesalpiniaceae has the most number of species, followed by the Euphorbiaceae and the Rubiaceae (see Table 3). However when the family importance is calculated in terms of cumulative IVI, the Burseraceae, Euphorbiaceae, Caesalpiniaceae and Olacaceae are by far the dominant families within the Monts de Cristal (see Figure 3).

Table 3. Summary of number of species per family

Family	Number of species
Caesalpiniaceae	25
Euphorbiaceae	14
Rubiaceae	10
Olacaceae	7
Annonaceae	7
Burseraceae	6
Mimosaceae	6
Anacardiaceae	4
Apocynaceae	4
Meliaceae	4
Irvingiaceae	4
Myristicaceae	4
Sapindaceae	4
Sapotaceae	4

³ Although this figure will undoubtedly rise as the voucher specimens are determined.

Figure 15. Dominant families (IVI) of Mbé National Park (all trees >10cm dbh)



The most important species by plot are presented in the following graphs.

Figure 16. Dominant species by IVI in Plot 1 (all trees >10cm dbh)

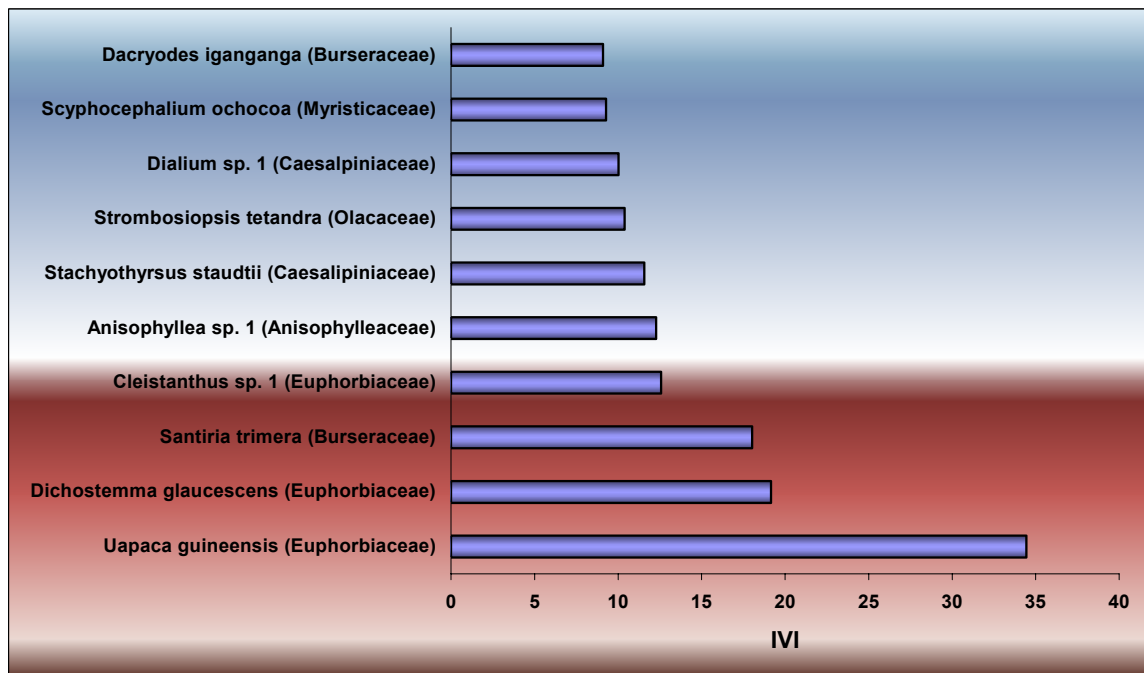


Figure 17. Dominant species by IVI in Plot 2 (all trees >10cm dbh)

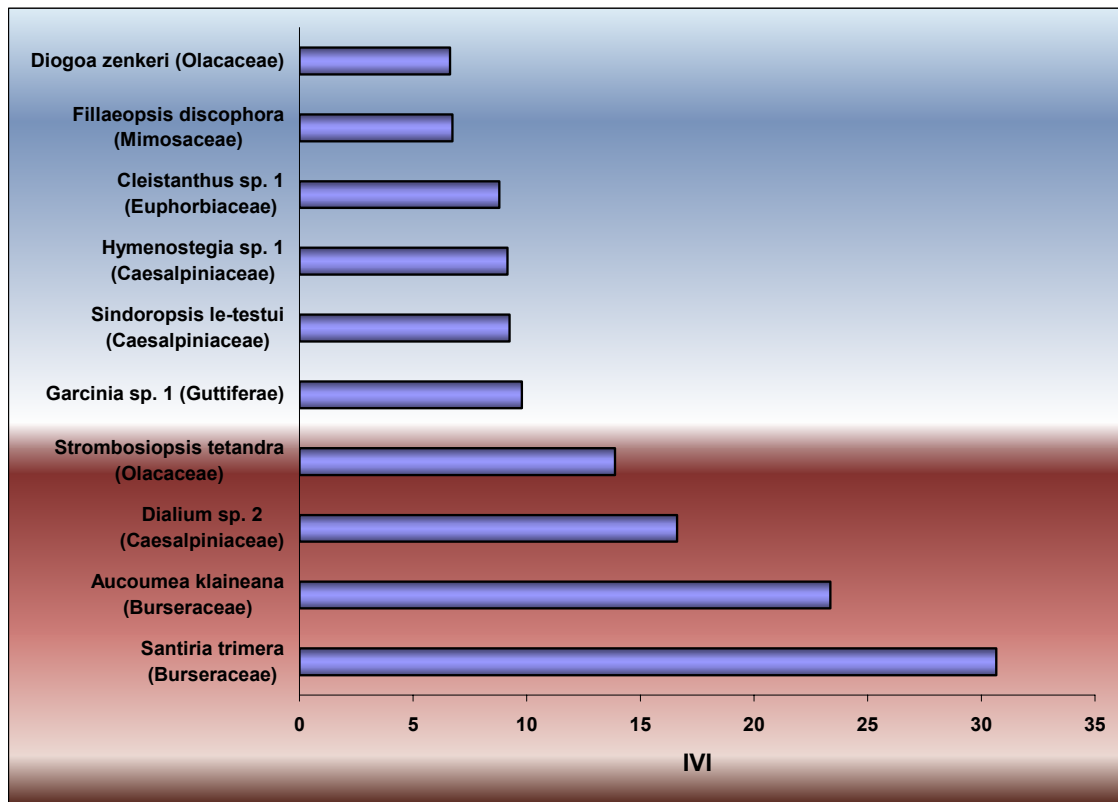


Figure 18. Dominant species by IVI in Plot 3 (all trees >10cm dbh)

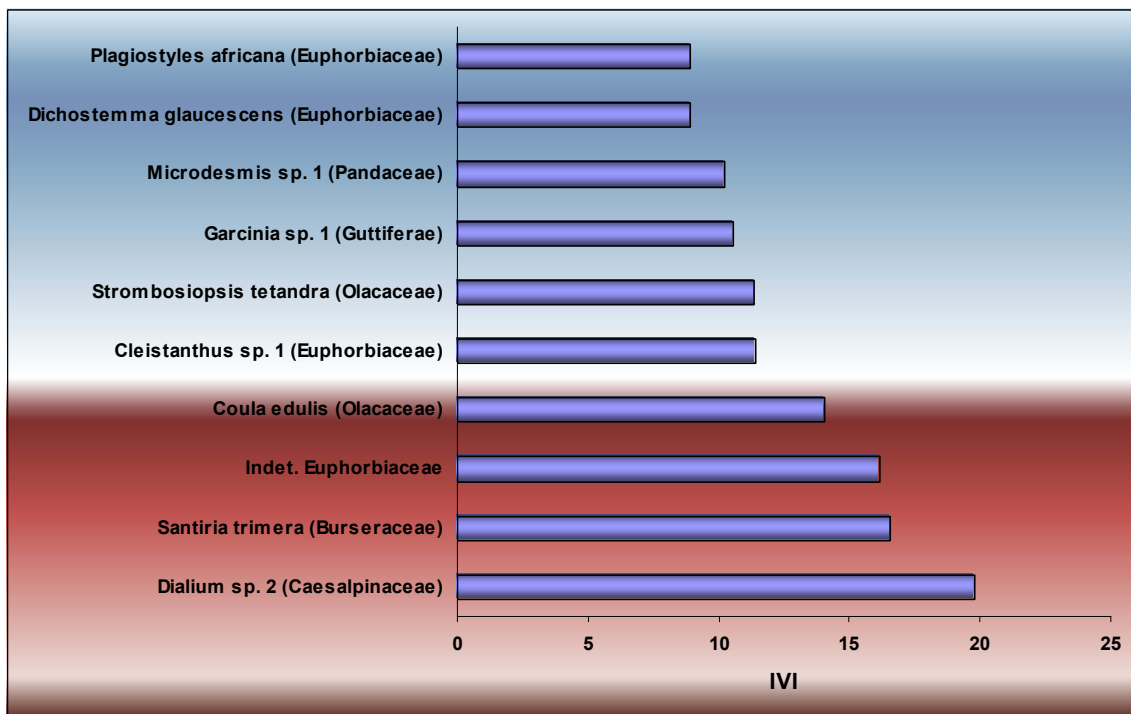


Figure 19. Dominant species by IVI in Plot 4 (all trees >10cm dbh)

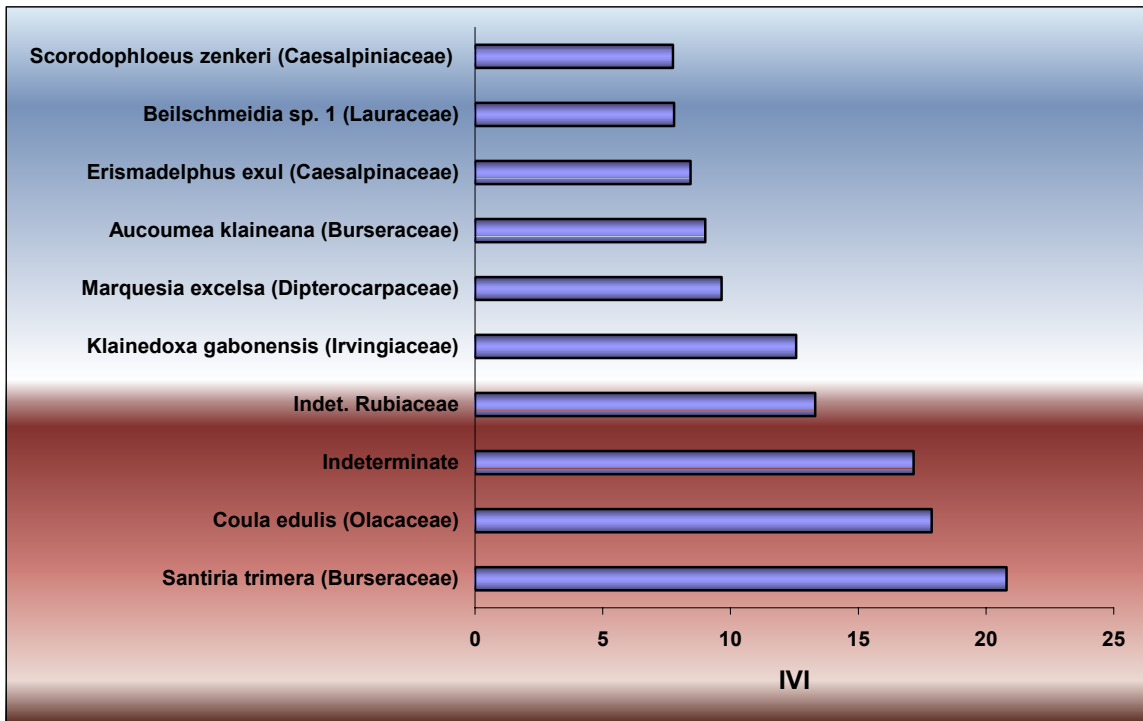
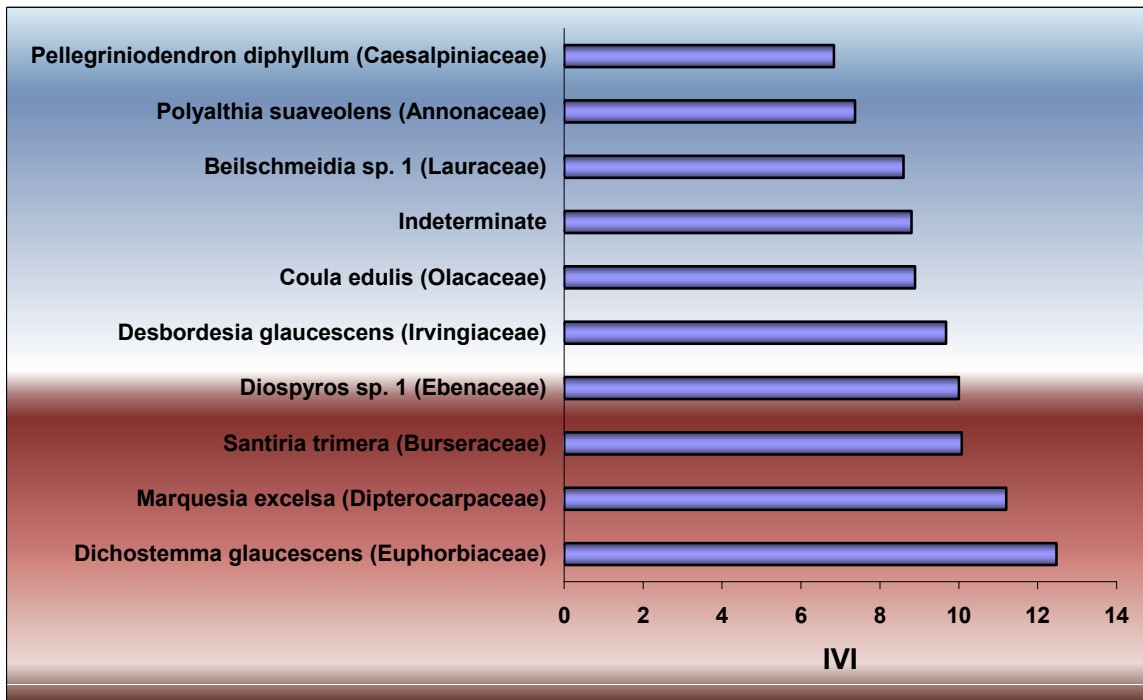


Figure 20. Dominant species by IVI in Plot 5 (all trees >10cm dbh)



Species richness

Monts de Cristal exhibits a remarkably high level of alpha diversity (in terms of number of species per hectare, of individuals >10cm dbh) when compared with other SI/MAB vegetation assessment sites in Africa.

Table 4. Summary of SI/MAB BDP's in Central Africa.

	Campo, Cameroon	Ejagham, Cameroon	Takamanda Cameroon	Monts de Cristal Gabon
No. of plots	3	2	10	5
Mean no. of trees (min. dbh)	397 (>10cm)	525 (>10cm)	463 (>10cm)	539 (10cm)
Mean total BA (m²/ha)	31.9	33.6	30.8	37.23
Mean no. of species/ha (standard deviation)	76 (4.04)	75 (6.36)	93 (16.54)	97 (8.71)

Species distribution

It can be seen from the graphs above, Appendix 1, and the data presented in the accompanying field guide to this report, there are significant differences in species composition both within and between the two main sites suggesting that the Mbé National Park exhibits a remarkably high level of beta diversity. For example, of particular note is the dominance of *Uapaca guineensis* on Plot 1 and its virtual absence, aside from a few scattered individuals on Plots 2 and 3, from the other plots. Similarly the high frequency of two (unidentified) species of *Anisophyllea* on Plot 1, and their relative absence elsewhere is also of noticeable interest. Likewise, a species that is seemingly ubiquitous to the Mont de Cristal, *Dichostemma glaucescens*, is present in high densities in Plots 1, 2, 3 and 5 but is completely absent from Plot 4, where the sub-canopy is dominated by *Klainianthus gabonae* and an indeterminate Rubiaceae, both of which are rare or absent from the other BDP's. *Oubangia* sp. is particularly well represented on Plot 5 but rare or absent elsewhere. These examples indicate that the species composition of the forests of the Monts de Cristal changes considerably within a relatively small spatial area and the forest is highly heterogeneous.

Summary of species restricted to a particular site:

Tchimbélé: *Afrostryax lepidophyllus*, *Anisophyllea* sp. 2, *Anthonotha* sp., *Bikinia letestui*, *Dacryodes edulis*, *Dialium* sp. 1, *Gilbertiodendron ogoouense*, *Hymenostegia afzelii*, *H. klainii*, *Parinari excelsa*, *Pentaclethra macrophylla*, *Protomegabaria stapfiana*, *Psychotria gabonica*, *Pterocarpus soyauxii*, *Stachyorthyrus staudtii*, *Swartzia fistuloides*, *Uapaca guineensis*, *Vitex doniana*, *Xylopia macrophyllum* and *X. quintasii*.

Kinguélé: *Angylocalyx* sp., *Baillonella toxisperma*, *Bikinia durandii*, *Carapa* sp., *Chrysophyllum pruniforme*, *Craterispermum* sp., *Desbordesia glaucescens*, *Dialium tessmannii*, *Drypetes gossweileri*, *Hunteria* sp., *Irvingia robur*, *Lecomtedoxa heitziana*, *Lophira alata*, *Pellegriniodendron diphyllum*, *Paraberlinia bifoliolata*, *Scottelia zenkeri*, *Symphonia globulifera*, *Synsepalum* sp. and *Zenkerella* sp.

Some taxa are well represented in both sites and in all plots; these include *Aucoumea klaineana*, *Beilschmeidia* sp., *Coula edulis*, *Dacryodes igaganga*, *D. klaineana*, *Microdesmis* sp., *Polyalthia suaveolens*, *Santiria trimera*, *Strombosia grandifolia*, *S. scheffleri*, *Tetraberlinia bifoliolata* and *Trichoscypha acuminata*.

A full analysis of the species richness using diversity indices such as the Shannon-Weaver index and a comparison between assessment sites using ordinations will be undertaken once the final voucher determinations are completed.

Forest structure

In terms of forest structure, the Monts de Cristal BDP's exhibit high tree densities, with a mean number of 539 individuals / ha. Correspondingly, the area also possesses a very high basal area m²/ha with many large merchantable tree species being represented. Canopy emergents up to 50m tall were recorded, however, most canopy trees are between 25-35m in height.

Endemism

Gabon is denoted as having a high rate of endemism, and the Monts de Cristal are considered to contain a significant proportion of endemic species. As a direct result of this study, a new population of *Korupodendron songweanum* was noted for the first time outside of Korup National Park, Cameroon (Litt and Cheek, 2003). Previously thought to be of conservation concern due to its limited distribution, botanists from the CTFS Korup Forest Dynamics Plot who were collaborating on this project recorded *Korupodendron* from plot 3. This exciting new discovery was made possible by the rare field collaboration between Cameroonian and Gabonese botanists. Similar collaboration in the future will undoubtedly result in other additions to the knowledge of Central African plants and a better understanding of their IUCN conservation status and hence their overall conservation needs.

Discussion

Without question, particularly when compared with other humid tropical forests in Africa the Monts de Cristal exhibit high levels of species richness. In terms of numbers of species per hectare (trees >10cm dbh) it is the richest site in Africa assessed to date. The high levels of both alpha and beta diversity are remarkable. In terms of species richness, Africa has been referred to as the “odd man out” (Richards, 1973) when compared with high diversity forests of Latin America and SE Asia. However, when comparing the SI/MAB Central African sites with other SI/MAB assessment sites elsewhere in the tropics it is evident that they exhibit comparatively high levels of species richness. Similarly, with the MBG Gentry global dataset of 0.10 ha plots measuring stems greater than 2.5cm in diameter, within tropical continental Africa (Phillips and Miller 2002), the Monts de Cristal are the second most diverse site, even though only trees >10cm dbh were measured. It must be noted that when smaller stems are measured, a greater diversity of liana and subcanopy species are captured (Tchouto, 2004), thus if the Monts de Cristal plots had been enumerated below 10cm dbh, this site would surely exceed the Banyang Mbo 0.10 ha study site.

Figure 21. A comparison of SI/MAB assessment sites in the humid tropics in terms of species richness (calculated as the mean number of species per hectare).

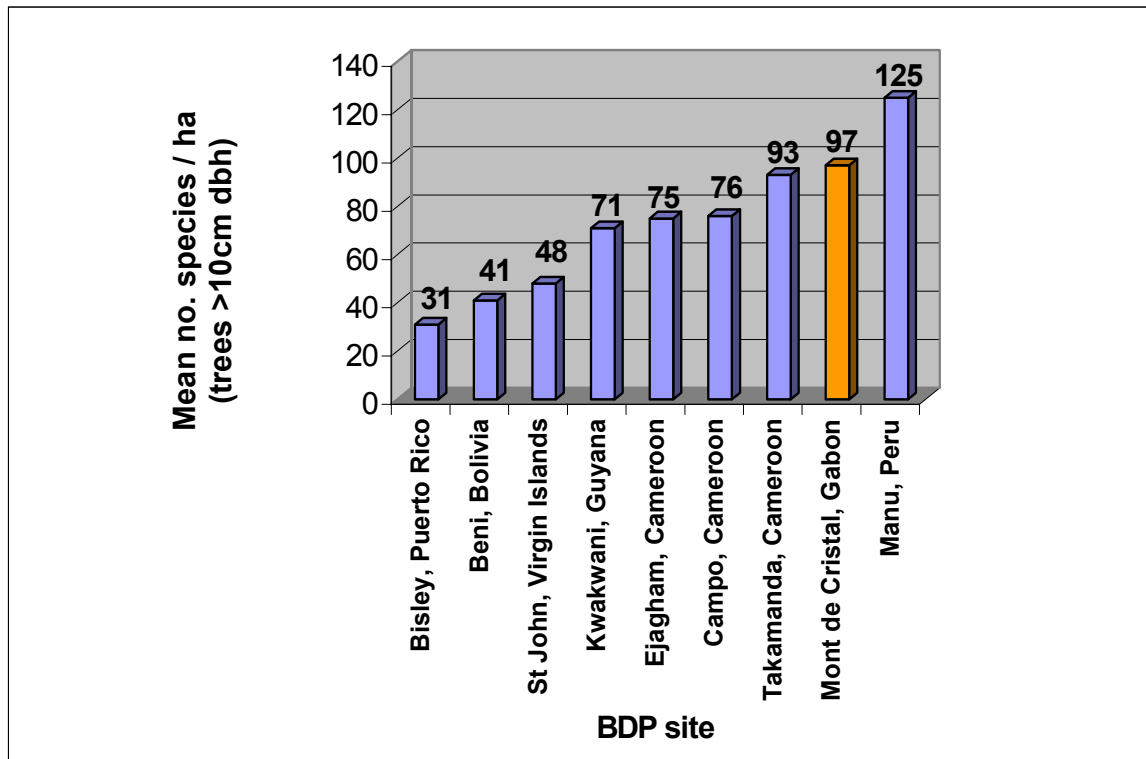
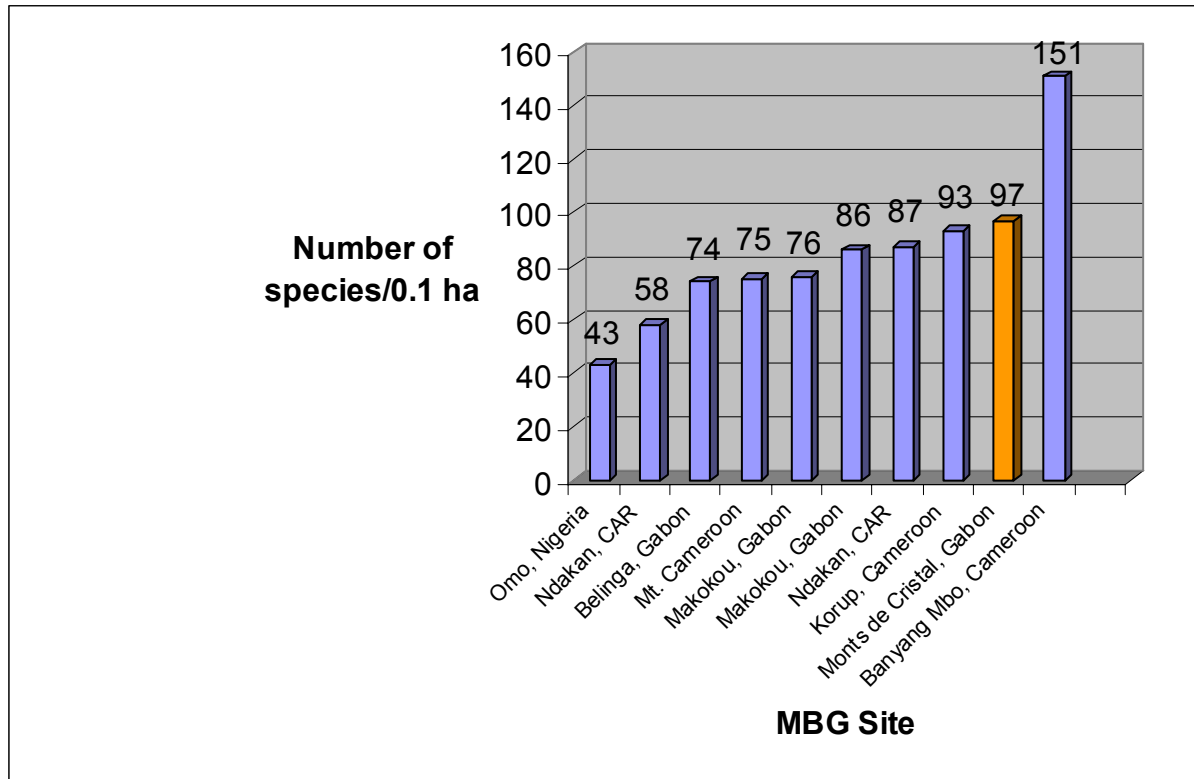


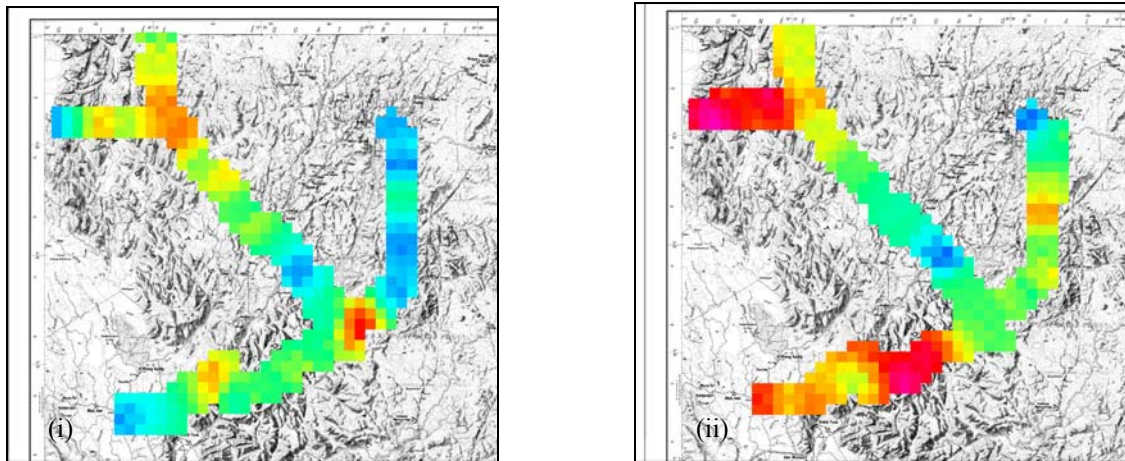
Figure 22. MBG 0.1 ha sites from Central Africa in comparison with the Monts de Cristal 1.0 ha plot.



As has been found to be the case with the CTFS plot network, lower diversity sites are more commonly situated in the drier tropics (Thomas, 2004). In these sites, it is clear that species richness is not as high as at sites with consistently high rainfall that falls for much of the year and without a pronounced dry season, such as Manu in Peru. The reputedly aseasonal nature of the climate of the Monts de Cristal (Wilks, pers. comm.) may certainly be one of the main reasons that this site exhibits such high species diversity.

The high heterogeneity of the area also contributes to the overall diversity of the Monts de Cristal. For example, it is interesting to note that diversity “hot spots” vary for different taxa, suggesting that high levels of diversity are encountered throughout the entire Monts de Cristal region. This is clear from the examples below where high levels of diversity recorded for the genus *Begonia*, do not necessarily correspond to those recorded for Caesalpinoid legumes.

Figure 23. Species richness for (i) Begonia and (ii) Caesalpinoid legumes. High levels of diversity are indicated by pink-red pixels, low diversity by yellow pixels (reproduced with permission of Lee White, WCS Gabon).



In common with Reitsma’s Oveng study site, on the eastern and drier slopes of the mountains, the Monts de Cristal vegetation is dominated by Burseraceae, Euphorbiaceae and Caesalpiniaceae. However, although a common representative of the Burseraceae, *Santiria trimera* is found on all BDP’s, the other two families exhibit remarkable changes in species composition, particularly between sites, but also, as has been discussed above, between individual BDP’s. The presence of narrowly distributed taxa such as *Bikinia durandii*, and other members of that genus, and the only representative of the Dipterocarpaceae in Africa, and seemingly endemic to Gabon, *Marquesia excelsa*, suggests the vegetation composition of the Monts de Cristal is unique to the region, despite obvious affinities with the Monts Doudou (Sosef *et al.*, 2004) and the Massif du Chaillu (Christy *et al.*, 2003). Subsequent identification of the remaining voucher specimens and further analysis of the data collected will provide more insights into the vegetation types, and their relative “importance” of the area.

As part of a larger Gabon plant database project with Missouri Botanical Garden, Wageningen University, and the Musée National d’Histoire Naturel in Paris, the Herbarium National du Gabon provided a list of the plants collected from the National Park with a 2 km buffer zone (Appendix 2) including collections made by MBG botanists. This list includes 545 taxa, which is drastically different from the 3,000 plant species estimated to occur in the Monts de Cristal by (de Wilde, cited in Davis *et al.*, 1994). However, it must be stressed that most of this collecting is centred in the immediate vicinity of the hydroelectric dams and thus large portions of the Monts de Cristal remain botanically unknown (Sosef, 2001). In comparing the species list of 152 taxa generated by our BDP’s (Appendix 3) identified to date, it appears that almost 100 of these vouchers serve as new species records for the Monts de Cristal area. This may in part be due to the presence full time tree climber who collected many of the canopy trees normally overlooked by botanists undertaking random collections of fertile material. However, this disparity underlines how even the most well collected locality in Gabon is still in need of more exploration. The depositing of the voucher material collected during this assessment into

the permanent collections in LBV and MO and adding it to the joint database will also increase our capacity for future biodiversity analyses in the region and will better document the distribution of plant diversity in Gabon CARPE landscapes. Efforts such as this add to the knowledge of biodiversity in each protected area. While some parks such as Lopé have had a concentrated floristic project for some years, enabling effective conservation initiatives, other areas, such as the Monts de Cristal parks, have none. Future efforts such as this one will undoubtedly add to the biodiversity knowledge of what is protected in each landscape in the Congo Basin.

Conclusion

The findings of our assessment of the vegetation of the Monts de Cristal certainly support the theory that the Pleistocene refugia of the Atlantic Equatorial Coastal forests that range from the Cross River basin to the Mayombe region are the greatest reservoirs of Africa's plant diversity. In this regard, the Monts de Cristal are undoubtedly one of the most important sites for plant diversity in Central Africa. Additionally, the documented diversity of Mbé National Park was increased by 18% with the addition of numerous canopy species as well as a significant range extension of *Korupodendron* originally noted uniquely from Korup National Park, Cameroun. The beta diversity argues favourably for the preservation of the Monts de Cristal as, in terms of diversity and endemism it ranks extremely high when compared to other areas in the region. Furthermore, this baseline data will be essential for understanding management implications in Mbé. With the proximity to Libreville and the subsequent pressures of bushmeat hunting, the existence of the forest as it stands now is at risk. Many trees are dependent upon animals for dispersal and sometimes are critical for triggering germination. Without decreasing the hunting in the Monts de Cristal, eventually the composition of the forest will change and diversity diminish. The monitoring system put in place by this project will help detect these potential and arguably deleterious changes.

The training and capacity building component of this field work will hopefully lead to a more standardised and comparable approach to vegetation assessments throughout the Congo Basin and the data generated will provide the biological baseline data required for the monitoring of forests for both natural and anthropogenic processes, within the CARPE Landscapes. Furthermore, the collaboration of a Cameroonian-Gabonese team strengthened the regional capacity to evaluate vegetation across the Congo Basin CARPE landscapes. With similar collaboration in the future, a region wide picture of landscape plant diversity will emerge along with a strong regional network of botanists able to undertake and analysis the data from such field assessments.

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Appendix 1: Occurrence of species by Plot (Figures represent number of individuals in each plot)

Species	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
AFROSTYRAX LEPIDOPHYLLUS	1	2	0	0	0
AIDIA MICRANTHA	0	0	0	0	1
AIDIA SP.	0	0	0	0	1
ANGYLOCALYX SP.	0	0	0	1	1
ANISOPHYLLEA SP. 1	32	9	3	8	2
ANISOPHYLLEA SP. 2	14	3	2	0	0
ANNICKIA CHLORANTHA	1	0	1	0	4
ANNONACEAE	0	2	0	0	1
ANOPYXIS KLAINIANA	1	0	0	1	0
ANTHONOTHA SP	0	0	1	2	1
ANTHOCLEISTA SP	3	0	0	0	0
APHANOCALYX MICROPHYLLUS	0	0	1	0	0
APOCYNACEAE	0	0	0	0	1
AUCOUMEA KLAINIANA	7	17	5	13	4
BAILLONELLA TOXISPERMA	0	0	0	0	1
BAPHIA SP.	0	1	0	0	1
BARTERIA FISTULOSA	0	0	2	0	0
BEILSCHMEIDIA SP.	3	13	8	15	21
BERLINIA SP.	2	0	2	1	1
BIKINIA DURANDII	0	0	0	7	10
BIKINIA LETESTUI	0	3	0	0	0
BIKINIA PELLEGRINII	0	3	1	5	0
BLIGHIA SP.	0	0	0	0	1
CAESALPINIACEAE	2	1	3	1	0
CALPOCALYX SP.	1	0	0	0	0
CANTHIUM SP.	19	0	0	1	0
CARAPA PROCERA	3	3	0	0	1
CARAPA SP.	0	0	0	0	7
CENTROPLACUS GLAUCINUS	0	7	7	10	3
CHRYSOPHYLLUM PRUNIFORME	0	0	0	0	2
CHRYSOPHYLLUM SP.	4	1	1	1	0
CLEISTANTHUS SP. 1	27	17	23	5	7
CLEISTANTHUS SP. 2	1	0	2	2	1
CLEISTANTHUS SP. 3	0	9	2	6	0
CLEISTANTHUS TETANDRA	0	1	0	0	0
COELOCARYON PREUSII	2	3	3	1	0
COELOCARYON SP.	0	1	0	0	0
COLA SP.	0	5	0	0	2
COPAIFERA RELIGIOSA	0	0	1	0	1
CORYNANTHE MAYUMBENSIS	0	0	0	1	0
COULA EDULIS	9	5	14	23	12
CRATERISPERMUM SP.	0	0	0	2	2
CROTON SILVATICUS	1	0	0	0	0
CROTON SP. 1	0	1	0	0	0
CRYPTOSEPALUM SP.	0	0	0	1	1
DACRYODES BUETTNERI	1	1	2	5	9
DACRYODES EDULIS	6	14	2	0	0
DACRYODES IGAGANGA	20	13	12	9	11
DACRYODES KLAINIANA	4	5	6	1	7
DACRYODES SP.	0	2	0	1	2
DANIELLIA SP.	0	0	1	0	0
DESBORDESIA GLAUDESCENS	0	0	0	3	10
DIALIUM SP. 1	24	6	6	0	0
DAILIUM SP. 2	18	27	24	5	8
DIALIUM SP. 3	2	1	2	1	1
DIALIUM TESSMANNII	0	0	0	2	1

Species	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
DICHOSTEMMA GLAUDESCENS	55	15	23	0	35
DIOSPYROS SP.	10	5	8	12	24
DIOGOA ZENKERI	0	12	14	1	2
DISCOGLYPREMNA CALONEURA	2	0	0	0	0
DISCOGLYPREMNA SP.	0	1	0	0	0
DRYPETES GOSSWEILERI	0	0	0	0	1
DRYPETES SP.	1	4	8	11	9
DUVIGNEAUDIA INOPINATA	0	0	1	0	0
ENTANDROPHRAGMA SP.	1	0	1	0	0
ERISMADELPHUS EXUL	0	1	3	5	0
ERISMADELPHUS SP. 1	4	0	1	2	1
ERISMADELPHUS SP. 2	1	0	0	0	0
EUPHORBIACEAE	2	0	45	4	1
FILLAEOPSIS DISCOPHORA	0	2	0	1	0
FUNTUMIA AFRICANA	1	0	0	0	0
GANOPHYLLUM GIGANTEUM	0	0	1	0	0
GARCINIA CONRAUANA	0	0	6	0	0
GARCINIA SMEATHMANNII	0	3	1	2	11
GARCINIA SP. 1	0	2	6	8	4
GARCINIA SP. 2	7	26	24	3	14
GILBERTIODENDRON BRACHYSTEGLIOIDES	0	0	1	0	6
GILBERTIODENDRON OGOUENSE	0	0	1	0	0
GILBERTIODENDRON SP.	0	8	0	1	7
GREWIA CORIACEA	9	0	0	0	0
GROSSERA SP.	1	0	0	0	0
GUAREA SP.	0	0	0	0	1
GUAREA THOMPSONII	0	0	0	1	0
GUIBOURTIA EHIE	0	3	4	3	3
HEISTERIA PARVIFOLIA	0	6	4	1	0
HUNTERIA SP.	0	0	0	0	1
HYMENOSTEGIA AFZELII	0	0	1	0	0
HYMENOSTEGIA KLAINII	3	0	2	0	0
HYMENOSTEGIA SP.	0	20	2	0	0
INDETERMINATE	0	9	1	48	23
IRVINGIA GABONENSIS	1	6	1	4	3
IRVINGIA ROBUR	0	0	0	1	0
ISOMACROBIUM SP.	0	2	0	0	0
ISOLONA SP.	1	0	0	0	0
KLAINEDOXA GABONENSIS	3	3	3	2	0
KLAINIATHUS GABONIAE	3	0	6	26	12
LAURACEAE	1	0	0	0	0
LECOMTEDOXA HEITZIANA	0	0	0	0	4
LECOMTEDOXA SP.	0	0	0	0	3
LOPHIRA ALATA	0	0	0	4	3
MACARANGA SP.	0	1	0	1	0
MAESOBOTRYA SP.	2	0	2	1	0
MAGNISTIPULA SP.	0	0	0	0	3
MANILKARA SP.	0	0	1	0	1
MAPANEA MEMBRANACEA	4	0	2	1	0
MARQUESIA EXCELSA	0	0	5	7	10
MARANTHES SP.	1	0	0	0	1
MELASTOMATACEAE	0	0	1	0	0
MEMECYLON SP.	0	2	1	6	15
MICRODESMIS SP.	6	16	28	14	5
MYRIANTHUS SERRATUS	0	1	2	0	0
NEOCHEVALIODENDRON STEPHANII	0	2	0	0	0
NEWTONIA DUPARQUETIANA	0	0	2	0	0
NEWTONIA GRIFFONIANA	0	1	0	0	0
NEWTONIA LEUCOCARPA	2	0	0	1	0

Species	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
NEWTONIA SP.	0	2	0	0	0
ODYENDYEA GABONENSIS	2	0	2	3	0
OLACACEAE	0	0	0	4	1
ONCOBA GLAUCA	3	0	0	0	0
OUBANGIA SP.	0	1	0	1	13
OURATEA SP.	0	0	0	0	1
PARKIA BICOLOR	2	3	0	0	1
PARABERLINA BIFOLIOLATA	0	0	0	0	6
PARINARI EXCELSA	1	1	0	0	0
PAUSINYSTALIA JOHIMBE	0	0	1	6	0
PAUSINYSTALIA MACROCERAS	0	4	5	1	1
PAUSINYSTALIA SP.	0	1	1	1	0
PELLEGRINIODENDRON DIPHYLLUM	0	0	0	4	21
PENTACLETHRA MACROPHYLLA	0	7	0	0	0
PENTACLETHRA SP.	0	0	0	0	1
PICRALIMA NITIDA	0	0	0	0	2
PLAGIOSTYLES AFRICANA	11	9	13	8	4
PLACODISCUS SP.	0	0	0	1	0
POLYALTHIA SUAVEOLENS	4	11	16	13	18
PORTERANDIA CLADANTHA	1	0	0	0	0
PROTOMEGABARIA STAFPIANA	1	1	9	0	0
PSYCHOTRIA GABONICA	2	0	0	0	0
PSYCHOTRIA SP.	0	0	0	1	0
PTEROCARPUS SOYAUXII	1	0	0	0	0
PYCNANTHUS ANGOLENSIS	0	1	0	1	1
RHABDOPHYLLUM SP.	2	0	0	0	1
RUBIACEAE	2	2	4	36	4
SANTIRIA TRIMERA	37	70	33	48	21
SAPIUM ELLIPTICUM	0	0	1	0	0
SAPINDACEAE	0	0	2	0	2
SAPOTACEAE	0	0	2	0	3
SCAPHOPETALUM BLACKII	0	5	3	0	2
SCHEFFLERA SP	0	0	0	0	1
SCOTTELIA CORIACEA	2	0	1	0	2
SCOTTELIA KLAINIANA	1	0	0	0	0
SCOTTELIA ZENKERI	0	0	0	11	2
SCYTOPETALUM KLAINIANUM	0	2	1	6	5
SCYTOPETALUM SP.	0	1	0	0	0
SCYPHOCEPHALIUM OCHOCOA	3	0	1	1	1
SCYPHOCEPHALIUM SP.	0	0	1	0	1
SINDEROPSIS LETESTUI	0	12	7	3	2
SORINDEIA SP.	1	3	2	4	6
STACHYORTHYSUS STAUDTII	20	6	7	0	0
STAUDTIA GABONENSIS	0	0	1	0	0
STAUDTIA STIPITATA	0	0	2	1	4
STREPHONEMA MANNII	0	1	0	0	0
STREPHONEMA SP.	0	2	3	0	0
STROMBOSIA GRANDIFOLIA	1	2	1	4	7
STROMBOSIA PUSTULATA	1	2	2	3	0
STROMBOSIA SCHEFFLERI	5	4	1	2	1
STROMBOSIOPSIS SERENII	5	0	3	0	1
STROMBOSIOPSIS TETANDRA	21	34	23	9	4
STRYCHNOS SP.	3	0	0	0	0
SWARTZIA FISTULOIDES	0	1	0	0	0
SYMPHONIA GLOBULIFERA	0	0	0	6	5
SYNSEPALUM SP.	0	0	0	1	7
SYZYGIUM SP.	0	0	2	0	1
TABERNASMONTANA CRASSA	2	0	0	0	0
TAPURA SP.	0	7	0	0	1

Species	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
TETRABERLINA BIFOLIOLATA	8	9	6	0	11
TRICHILIA SP.	2	0	0	1	0
TRECVLIA AFRICANA	0	0	0	0	1
TRECVLIA OBOVOIDEA	1	0	0	0	0
TRICHOSCVPHA ABUT	0	0	2	0	1
TRICHOSCVPHA ACUMINATA	4	1	2	4	5
TRICHOSCVPHA ARBOREA	1	0	0	0	0
TRICHOSCVPHA SP.	1	3	0	0	6
TRICALYSIA SP.	2	1	0	0	1
UAPACA GUINEENSIS	36	4	2	0	0
UNKNOWN (DEAD)	2	8	6	1	6
VITEX DONIANA	1	2	0	0	0
VITEX SP.	0	0	0	0	1
WARNECKIA SP.	0	1	5	19	15
XANTHOXYLUM HEITZII	1	0	0	0	0
XANTHOXYLUM MACROPHYLLUM	1	0	0	0	0
XYLOPIA AETHIOPICA	2	0	0	2	0
XYLOPIA MACROPHYLLUM	1	0	0	0	0
XYLOPIA PHLLOIOLONE	0	0	3	0	1
XYLOPIA QUINTASII	0	1	1	0	0
XYLOPIA SP.	1	1	1	8	3
XYLOPIA STAUDTII	6	0	2	4	4
ZENKERELLA SP.	0	0	0	0	2

APPENDIX 2: CHECKLIST NATIONAL PARK MTS DE CRISTAL EASTERN PART

Based on NHN WAG database info February 2003

(Based on an initial number of 963 records, 545 'taxa'; if for a family the specimens are only identified up to family level still the family name is mentioned)

(No verification of taxonomical status of names or doubtful species records)

Johan L.C.H. van Valkenburg, CENAREST/Herbier National du Gabon

ACANTHACEAE

Acanthus latisepalus C.B.Clarke
Brillantaisia lancifolia Lindau
Dischistocalyx T.Anders. ex Benth.
Dischistocalyx grandifolius C.B.Clarke
Dischistocalyx hirsutus C.B.Clarke
Dischistocalyx strobilinus C.B.Clarke
Mendoncia phytocrenoides (Gilg) Benoist
Phaulopsis angolana S.Moore
Physacanthus Benth.
Physacanthus batanganus (G.Braun & K.Schum.) Lindau
Physacanthus nematosiphon (Lindau) Rendle & Britten
Pseuderanthemum tunicatum (Afzel.) Milne-Redh.
Stenandrium guineense (Nees) K.Vollesen

ADIANTACEAE

Adiantum L.

AMARYLLIDACEAE

Crinum L.

ANACARDIACEAE

Sorindeia Thouars
Sorindeia winkleri Engl.
Trichoscypha acuminata Engl.
Trichoscypha bijuga Engl.
Trichoscypha ealaensis Van der Veken
Trichoscypha laxiflora Engl.

ANNONACEAE

Anonidium mannii (Oliv.) Engl. & Diels
Anonidium mannii (Oliv.) Engl. & Diels var. *brieyi* (De Wild.) R.E.Fr.
Cleistopholis glauca Pierre ex Engl. & Diels
Cleistopholis patens (Benth.) Engl. & Diels
Piptostigma macranthum Mildbr. & Diels
Uvaria klaineana Engl. & Diels
Xylopia L.

APOCYNACEAE

Baijsea leonensis Benth.
Hunteria macrosiphon Omino
Landolphia P.Beauv.
Landolphia buchananii (Hallier f.) Stapf
Landolphia dewevrei Stapf
Landolphia glabra (Pierre ex Stapf) Pichon
Landolphia glandulosa (Pellegr.) Pichon
Pleiocarpa mutica Benth.
Rauvolfia mannii Stapf
Strophanthus thollonii Franch.
Tabernaemontana L.
Tabernaemontana divaricata (Jacq.) Willd.
Tabernaemontana letestui (Pellegr.) Pichon
Tabernanthe iboga Baill.
Vahadenia laurentii (De Wild.) Stapf
Voacanga psilocalyx Pierre ex Stapf

ARACEAE

Anubias Schott.
Anubias barteri Schott
Anubias barteri Schott var. *glabra* N.E.Br.
Anubias gillettii De Wild. & T.Durand
Cercestis Schott.
Colocasia
Culcasia panduriformis Engl. & K.Krause
Culcasia parviflora N.E.Brown
Culcasia rotundifolia Bogner
Culcasia striolata Engl.

ARISTOLOCHIACEAE

Pararistolochia macrocarpa (Duch.) Poncy

ASPLENIACEAE

Asplenium L.
Asplenium africanum Desv.
Asplenium barteri Hook.
Asplenium dregeanum Kunze
Asplenium mannii Hook.

BALSAMINACEAE

Impatiens L.
Impatiens hians Hook.f.
Impatiens hians Hook.f. var. *hians*
Impatiens macroptera Hook.f.
Impatiens pseudomacroptera Grey-Wilson

BEGONIACEAE

Begonia L.
Begonia (filicibegonia) Hook.f.

Begonia ampla Hook.f.
Begonia auriculata Hook.f.
Begonia clypeifolia Hook.f.
Begonia elaeagnifolia Hook.f.
Begonia elatostemmoides Hook.f.
Begonia erectocaulis Sosef
Begonia erectotricha Sosef
Begonia heterochroma Sosef
Begonia hirsutula Hook.f.
Begonia komoensis Irmsch.
Begonia letouzeyi Sosef
Begonia longipetiolata Gilg
Begonia macrocarpa Warb.
Begonia minutifolia N.Hallé
Begonia poculifera Hook.f. var. *poculifera*
Begonia sciaphila Gilg ex Engl. var. *longipedunculata* R.Wilczek
Begonia scutulum Hook.f.
Begonia sessilifolia Hook.f.
Begonia squamulosa Hook.f.
Begonia subscutata De Wild.
Begonia susaniae Sosef

BURMANNIACEAE

Burmannia congesta (Wright) Jonker
Gymnosiphon Blume
Gymnosiphon longistylus (Benth.) Hutch.

BURSERACEAE

Dacryodes le-testui (Pellegr.) Lam
Santiria trimera (Oliv.) Aubrév.

CACTACEAE

Rhipsalis baccifera (J.S.Muell.) Stearn

CAPPARACEAE

Ritchiea macrantha Gilg

CELASTRACEAE

Apodostigma pallens (Planch. ex Oliv.) Wilcz.
Salacia L.
Salacia regeliana J.Braun & K.Schum.

CHRYSOBALANACEAE

Dactyladenia staudtii (Engl.) Prance & F.White
Parinari Aubl.

COMBRETACEAE

Combretum Loefl.
Combretum bracteatum (Laws.) Engl. & Diels
Combretum exellii Jongkind

Combretum mannii Engl. & Diels

COMMELINACEAE

Aneilema R.Br.

Commelina longicapsa C.B.Clarke

Palisota bogneri Brenan

Palisota hirsuta (Thunb.) K.Schum.

Palisota lagopus Mildbr.

Palisota mannii C.B.Clarke

Stanfieldiella Brenan

Stanfieldiella oligantha (Mildbr.) Brenan

COMPOSITAE

Eclipta prostrata (L.) L.

Elephantopus L.

Erlangea misera (Oliv. & Hiern) S.Moore

Gutenbergia

Spilanthes uliginosa Sw.

CONNARACEAE

Agelaea pentagyna (Lam.) Baill.

Agelaea poggeana Gilg

Connarus L.

Manotes expansa Sol. ex Planch.

Rourea calophylla (Gilg ex Schellenb.) Jongkind

CUCURBITACEAE

Cogniauxia podolaena Baill.

Momordica L.

Momordica parvifolia Cogn.

CYATHEACEAE

Cyathea camerooniana Hook.

CYPERACEAE

Cyperus difformis L.

Cyperus halpan L.

Fimbristylis dichotoma (L.) Vahl

Fuirena umbellata Rottb.

Hypolytrum scaberrimum Boeck.

Mapania africana Boeck. ssp. *africana*

Mapania amplivaginata K.Schum.

Mapania mannii C.B.Clarke

Mapania mannii C.B.Clarke ssp. *mannii*

Mapania pubisquama Cherm.

Mapania purpuriceps (C.B.Clarke) J.Raynal

Pycreus cataractarum C.B.Clarke

Rhynchospora corymbosa (L.) Britt.

DENNSTAEDTIACEAE

Lonchitis currorii (Hook.) Mett. ex Kuhn

DICHAPETALACEAE

Dichapetalum heudelotii (Planch. ex Oliv.) Baill.

Dichapetalum heudelotii (Planch. ex Oliv.) Baill. var. *hispidum* (Oliv.) Breteler

Dichapetalum madagascariense Poir.

Dichapetalum staudtii Engl.

Dichapetalum tetrastachyum Breteler

DILLENACEAE

Tetracera alnifolia Willd.

DIOSCOREACEAE

Dioscorea minutiflora Engl.

Dioscorea smilacifolia De Wild.

DRACAENACEAE

Dracaena Vand. ex L.

Dracaena acaulis Baker

Dracaena phanerophlebia Baker

DRYOPTERIDACEAE

Lastreopsis davalliaeformis (Tardieu) Tardieu

Triplophyllum dimidiatum (Mett. ex Kuhn) Holttum

Triplophyllum varians (Moore) Holttum

EBENACEAE

Diospyros L.

Diospyros hoyleana F. White

Diospyros physocalycina Gürke

Diospyros zenkeri (Gürke) F. White

ERYTHROXYLACEAE

Aneulophus africanus Benth.

EUPHORBIACEAE

Alchornea floribunda Müll.Arg.

Alchornea hirtella Benth.

Argomuelleria macrophylla Pax

Crotonogyne Müll.Arg.

Drypetes Vahl

Drypetes magnistipula (Pax) Hutch.

Duvigneaudia inopinata (Prain) J.Léonard

Grossera paniculata Pax

Maesobotrya Benth.

Maesobotrya klaineana Pierre ex Pax

Maesobotrya longipes (Pax) Hutch.

Maesobotrya staudtii (Pax) Hutch.

Manniophyton fulvum Müll.Arg.

Microdesmis afrodecandra Floret, A.M.Louis & J.M.Reitsma
Pentabrachion reticulatum Müll.Arg.
Pogonophora letouzeyi Feuillet
Protomegabaria stapfiana (Beille) Hutch.
Tetrorchidium didymostemon (Baill.) Pax & K.Hoffm.
Tetrorchidium gabonense Breteler
Uapaca Baill.

FLACOURTIACEAE

Homalium africanum (Hook.f.) Benth.
Oncoba flagelliflora (Mildbr.) Hul
Oncoba glauca (P.Beauv.) Planch.
Phyllobotryon spathulatum Müll.Arg.

GENTIANACEAE

Neurotheca loeselioides (Spruce ex Prog.) Baill.

GLEICHENIACEAE

Dicranopteris linearis (Burm.) C.B.Clarke

GNETACEAE

Gnetum africanum Welw.

GRAMINEAE

Centotheca lappacea (L.) Desv.
Eragrostis squamata (Lam.) Steud.
Guaduella marantifolia Franch.
Isachne buettneri Hack.
Olyra L.
Panicum brevifolium L.
Paspalum paniculatum L.
Puelia ciliata Franchet
Sorghum arundinaceum (Desv.) Stapf

GRAMMITIDACEAE

Grammitis serrulata (Sw.) Sw.

GUTTIFERAE

Garcinia kola Heckel
Garcinia lucida Vesque
Garcinia mannii Oliv.
Harungana madagascariensis Lam. ex Poir.
Mammea africana Sabine
Vismia rubescens Oliv.

HERNANDIACEAE

Illigera vespertilio (Benth.) Baker f.

HYMENOPHYLLACEAE

Trichomanes L.

ICACINACEAE

Alsodeiopsis rubra Engl.
Desmostachys brevipes (Engl.) Sleumer
Lasianthera africana P.Beauv.
Leptaulus holstii (Engl.) Engl.
Rhaphiostylis fusca (Pierre) Pierre

IRVINGIACEAE

Irvingia gabonensis (Aubry-Lecomte ex O'Rorke) Baill.

LAURACEAE

Beilschmiedia Nees

LECYTHIDACEAE

Napoleonaea talbotii Baker f.

LEGUMINOSAE-CAES.

Anthonotha macrophylla P.Beauv.
Aphanocalyx cynometroides Oliv.
Aphanocalyx heitzii (Pellegr.) Wieringa
Aphanocalyx microphyllus (Harms) Wieringa ssp. *microphyllus*
Berlinia bracteosa Benth.
Bikinia coriacea (J.Morel ex Aubrév.) Wieringa
Bikinia durandii (F.Hallé & Normand) Wieringa
Bikinia grisea Wieringa
Bikinia le-testui (Pellegr.) Wieringa
Bikinia le-testui (Pellegr.) Wieringa ssp. *le-testui*
Bikinia pellegrinii (A.Chev.) Wieringa
Brachystegia mildbraedii Harms
Dialium L.
Dialium angolense Welw. ex Oliv.
Dialium bipindense Harms
Gilbertiodendron unijugum (Pellegr.) J.Léonard
Guibourtia ehie (A.Chev.) J.Léonard
Hymenostegia klainei Pierre ex Pellegr.
Hymenostegia talbotii Baker f.
Julbernardia pellegriniana Troupin
Pellegriniodendron diphyllum (Harms) J.Léonard
Tetraberlinia bifoliolata (Harms) Hauman

LEGUMINOSAE-MIM.

Acacia pentagona (Schum.) Hook.f.
Entada gigas (L.) Fawcett & Rendle
Pentaclethra macrophylla Benth.
Tetrapleura tetraptera (Schum. & Thonn.) Taub.

LEGUMINOSAE-PAP.

Baphia Afzel. ex Lodd.
Dalbergiella gossweileri Baker f.
Dalhousiea africana S.Moore

Desmodium ramosissimum G.Don
Millettia harmsiana De Wild.
Zornia durummuensis De Wild.
Zornia latifolia Sm.

LILIACEAE

Chlorophytum comosum (Thunb.) Jacq. var. *petiolatum* (Baker) A.D.Poulsen & Nordal
Chlorophytum comosum (Thunb.) Jacq. var. *sparsiflorum* (Baker) A.D.Poulsen & Nordal
Chlorophytum occultum A.D. Poulsen & Nordal

LINACEAE

Hugonia L.

LOGANIACEAE

Anthocleista laxiflora Baker
Mostuea neurocarpa Gilg
Strychnos aculeata Solered.

LOMARIOPSIDACEAE

Bolbitis fluviatilis (Hook.) Ching
Lomariopsis Fée
Lomariopsis hederacea Alston
Lomariopsis rossii Holttum

LORANTHACEAE

Globimetula cornutibracteata Balle ex Polhill & Wiens
Globimetula dinklagei (Engl.) Tiegh.

LYCOPODIACEAE

Huperzia staudtii (Nessel) Pic.Serm.

MALPIGHIACEAE

Acridocarpus longifolius (G.Don) Hook.f.

MARANTACEAE

Halopogon azurea (K.Schum.) K.Schum.
Haumania dankelmaniana (J.Braun & K.Schum.) Milne-Redh.
Hypselodelphys violacea (Ridl.) Milne-Redh.
Marantochloa mannii (Benth.) Milne-Redh.
Megaphrynium Milne-Redh.
Sarcophrynium brachystachyum (Benth.) K.Schum.
Sarcophrynium schweinfurthianum (Kuntze) Milne-Redh.

MEDUSANDRACEAE

Soyauxia Oliv.

MELASTOMATACEAE

Amphiblemma molle Hook.f.
Amphiblemma setosum Hook.f.
Amphiblemma soyauxii Cogn.

Calvoa hirsuta Hook.f.
Dicellandra barteri Hook.f.
Dicellandra barteri Hook.f. var. *escherichii* (Gilg) Jacq.-Fél.
Dicellandra barteri Hook.f. var. *magnifica* (Mildbr.) Jacq.-Fél.
Dicellandra descoingsii Jacq.-Fél.
Dinophora spenneroides Benth.
Heterotis decumbens (P.Beauv.) Jacq.-Fél.
Medinilla mannii Hook.f.
Memecylon L.
Memecylon sitanum Jacq.-Fél.
Spathandra blakeoides (G.Don) Jacq.-Fél.
Tristemma mauritianum J.F.Gmel.

MELIACEAE

Guarea glomerulata Harms
Guarea leonensis Hutch. & Dalziel
Heckeldora staudtii (Harms) Staner

MENISPERMACEAE

Kolobopetalum auriculatum Engl.
Penianthus Miers
Sarcolophium suberosum (Diels) Troupin

MORACEAE

Dorstenia L.
Dorstenia dinklagei Engl.
Dorstenia mannii Hook.f.
Dorstenia poinsettiifolia Engl.
Dorstenia poinsettiifolia Engl. var. *angusta* (Engl.) Hijman & C.C.Berg
Dorstenia poinsettiifolia Engl. var. *librevillensis* (De Wild.) Hijman & C.C.Berg
Ficus L.
Ficus conraui Warb.
Ficus lutea Vahl
Ficus ottoniifolia (Miq.) Miq.
Ficus ovata Vahl
Scyphosyce manniana Baill.

MYRISTICACEAE

Scyphocephalum mannii (Benth.) Warb.
Staudtia

MYRSINACEAE

Ardisia Sw.

OCHNACEAE

Ouratea Aubl.
Ouratea calantha Gilg
Ouratea congesta (Oliv.) Engl. ex Gilg
Ouratea mannii (Oliv.) Engl.
Ouratea turnerae (Hook.f.) Hutch. & Dalziel

Sauvagesia erecta L.

OLACACEAE

Coula edulis Baill.

Heisteria zimmereri Engl.

Olax L.

Olax latifolia Engl.

Ptychopetalum petiolatum Oliv.

OLEACEAE

Jasminum L.

OLEANDRACEAE

Nephrolepis biserrata (Sw.) Schott

Nephrolepis undulata (Afzel. ex Sw.) J.Sm.

Oleandra distenta Kunze

ONAGRACEAE

Ludwigia L.

ORCHIDACEAE

Ancistrochilus thomsonianus (Rchb.f.) Rolfe

Ancistrorhynchus Finet

Ancistrorhynchus capitatus (Lindl.) Summerh.

Ancistrorhynchus clandestinum (Lindl.) Schltr.

Ancistrorhynchus crystalensis Cribb & Laan

Angraecum Bory

Angraecum bancoense Burg

Angraecum gabonensis Summerh.

Angraecum multinominatum Rendle

Angraecum pungens Schltr.

Angraecum subulatum Lindl.

Bulbophyllum Thouars

Bulbophyllum acutebracteatum De Wild.

Bulbophyllum acutebracteatum De Wild. var. *rubrobrunneopapillosum* (De Wild.) J.J.Verm.

Bulbophyllum bequaertii De Wild.

Bulbophyllum calyptratum Kraenzl. var. *calyptratum*

Bulbophyllum cochleatum Lindl.

Bulbophyllum distans Lindl.

Bulbophyllum falcatum (Lindl.) Rchb.f.

Bulbophyllum falcatum (Lindl.) Rchb.f. var. *velutinum* (Lindl.) Vermeulen

Bulbophyllum saltatorium Lindl.

Bulbophyllum sandersonii (Hook.f.) Rchb.f. ssp. *sandersonii*

Bulbophyllum schinzianum Kraenzl. ex De Wild. & T.Durand

Chamaeangis

Cyrtorchis Schltr.

Eulophia horsfallii (Batem.) Summerh.

Graphorkis lurida (Sw.) Kuntze

Habenaria Willd.

Habenaria procera (Sw.) Lindl.

Habenaria weileriana Schltr.
Listrostachys pertusa (Lindl.) Rchb.f.
Plectrelminthus caudatus (Lindl.) Summerh.
Polystachya Hook.
Polystachya carnosa P.J.Cribb & Podz.
Polystachya fractiflexa Summerh.
Polystachya pobeguinii (Finet) Rolfe
Polystachya rhodoptera Rchb.f.
Polystachya seticaulis Rendle
Polystachya tessellata Lindl.
Rangaeris trilobata Summerh.
Tridactyle tridactylites (Rolfe) Schltr.

OXALIDACEAE

Biophytum zenkeri Guill.

PALMAE

Oncocalamus macrospathus Burret
Podococcus barteri G.Mann & H.Wendl.

PANDANACEAE

Pandanus Parkinson

PASSIFLORACEAE

Adenia reticulata (De Wild. & T.Durand) Engl. var. *reticulata*
Efulensia clematoides C.H.Wright
Passiflora L.

PINACEAE

Pinus jeffreyi Balf.

PIPERACEAE

Peperomia rotundifolia (L.) H.B.& K.

POLYGALACEAE

Aroxima liberica Stapf

POLYGONACEAE

Afrobrunnichia erecta (Asch.) Hutch. & Dalziel

POLYPODIACEAE

Microgramma lycopodioides (L.) Copel.
Microsorium punctatum (L.) Copel.

PTERIDACEAE

Afropteris repens (C.Chr.) Alston
Pteris L.
Pteris linearis Poir.

RUBIACEAE

Aidia Lour.
Aidia micrantha (K.Schum.) F.White
Aidia rubens (Hiern) Taylor
Argostemma africanum K.Schum.
Bertiera Aubl.
Bertiera arctistipula N.Hallé
Bertiera batesii Wernham
Bertiera bicarpellata (K.Schum.) N.Hallé
Bertiera breviflora Hiern.
Bertiera racemosa (G.Don) K.Schum.
Chassalia Comm. ex Poirét
Chazaliella
Chazaliella letouzeyi Robbr.
Commitheca Bremek.
Craterispermum caudatum Hutch.
Cuviera DC.
Ecpoma
Ecpoma hiernianum (Wernham) N.Hallé & F.Hallé
Gaertnera Lam.
Gaertnera dinklagei K.Schum.
Gardenia imperialis K.Schum.
Geophila obvallata (Schumach.) F.Didr.
Heinsia crinita (Afzel.) G.Taylor
Hymenocoleus Robbr.
Ixora L.
Ixora aneimenodesma K.Schum. ssp. *aneimenodesma*
Ixora hippoperifera K.Schum.
Ixora inundata Hiern
Ixora minutiflora Hiern ssp. *chasalliensis* De Block
Ixora minutiflora Hiern ssp. *minutiflora*
Lasianthus Jack
Lasianthus batangensis K.Schum.
Leptactina arnoldiana De Wild.
Massularia acuminata (G.Don) Bullock ex Hoyle
Morinda L.
Mussaenda arcuata Lam. ex Poir.
Mussaenda tenuiflora Benth.
Oxyanthus formosus Hook.f. ex Planch.
Oxyanthus gracilis Hiern
Oxyanthus setosus Keay
Pauridiantha Hook.f.
Pauridiantha hirtella (Benth.) Bremek.
Pauridiantha mayumbensis (R.Good) Bremek.
Pauridiantha micrantha (Hiern) Bremek.
Pavetta L.
Pavetta microthamnus K.Schum.
Pentalonchia humilis Hook.f.
Pouchetia A.Rich. ex DC.
Pseudosabicea N.Hallé

Pseudosabicea aurifodinae N.Hallé
Pseudosabicea batesii (Wernham) N.Hallé
Pseudosabicea floribunda (K.Schum.) N.Hallé
Pseudosabicea proselyta N.Hallé
Pseudosabicea segregata (Hiern) N.Hallé
Psychotria L.
Rothmannia talbotii (Wernham) Keay
Rutidea DC.
Sabicea Aubl.
Sabicea carbunica N.Hallé
Sabicea duparquetiana Baill. ex Wernh.
Sabicea duparquetiana Baill. ex Wernh. var. *duparquetiana*
Sabicea najatrix N.Hallé
Stelecantha cauliflora (Good) Bremek.
Tarenna Gaertner
Tarenna pallidula Hiern
Temnopteryx sericea Hook.f.
Tricalysia A.Rich. ex DC.
Trichostachys Hook.f.
Trichostachys aurea Hiern
Uragoga le-testui De Wild.
Virectaria Bremek.
Virectaria angustifolia (Hiern) Bremek.

SAPINDACEAE

Allophylus L.
Allophylus cobbe (L.) Räusch.
Chytranthus Hook.f.
Deinbollia maxima Gilg
Eriocoelum Hook.f.

SAPOTACEAE

Delpydora macrophylla Pierre
Lecomtedoxa heitziana (A.Chev.) Aubrév.
Neolemonniera batesii (Engl.) Heine
Synsepalum seretii (De Wild.) Pennington
Zeyherella le-testui Aubrév. & Pellegr.

SCYTOPETALACEAE

Brazzeia Baill.
Brazzeia soyauxii (Oliv.) Tiegh.

SOLANACEAE

Solanum L.
Solanum torvum Sw.

STERCULIACEAE

Cola duparquetiana Baill.
Cola ficifolia Mast.
Cola marsupium K.Schum.

Leptonychia Turcz.
Scaphopetalum thonneri De Wild. & T.Durand
Sterculiaceae Bartl.

THYMELAEACEAE

Dicranolepis baertsiana De Wild. & T.Durand
Octolepis casearia Oliv.

TILIACEAE

Ancistrocarpus densispinosus Oliv.

ULMACEAE

Trema Lour.

UMBELLIFERAE

Centella asiatica (L.) Urb.
Hydrocotyle L.

URTICACEAE

Boehmeria macrophylla Hornem.

VERBENACEAE

Clerodendrum fuscum Gürke
Clerodendrum splendens G.Don
Clerodendrum volubile P.Beauv.
Vitex L.

VIOLACEAE

Hybanthus Jacq.
Rinorea Aubl.
Rinorea kamerunensis Engl.
Rinorea talbotii (Baker f.) De Wild.

VITACEAE

Cissus L.
Cissus barteri (Baker) Planch.
Cissus diffusiflora (Baker) Planch.
Cissus dinklagei Gilg & Brandt
Cissus leonardii Dewit
Cissus petiolata Hook.f.
Cissus planchoniana Gilg
Leea guineensis G.Don

VITTARIACEAE

Vittaria owariensis Fée

ZINGIBERACEAE

Aframomum Schumann
Costus dubius (Afzel.) K.Schum.
Costus englerianus K.Schum.

Costus letestui Pellegr.
Costus ligularis Baker
Costus phaeotrichus Loes.
Renealmia L.f.
Renealmia congoensis Gagnep.

Appendix 3: Synonymized species list for the Monts de Cristal 1 ha plots

Anacardiaceae

Sorindeia Thou.
Trichoscypha abut Engl. & Brehmer
Trichoscypha acuminata Engl.
Trichoscypha arborea A.Chevalier

Anisophyllaceae

Anisophyllea R.Br. ex Sabine
Anopyxis klaineana Pierre

Annonaceae

Annickia chlorantha (Oliver) A.K.van Setten & P.J.M.Maas
Isolona Engl.
Polyalthia suaveolens Engl. & Diels
Xylopi aethiopia A.Rich.
Xylopi phloiodora Mildbr.
Xylopi quintasii Pierre ex Engl. & Diels
Xylopi staudtii Engl. & Diels

Apocynaceae

Funtumia africana Stapf
Hunteria Roxb.
Picalima nitida Th. & H.Dur.
Tabernaemontana crassa Benth.

Burseraceae

Aucoumea klaineana Pierre
Dacryodes buettneri (Engl.) H.J.Lam
Dacryodes edulis (G.Don) H.J.Lam
Dacryodes igaganga Aubrev. & Pellegr.
Dacryodes klaineana (Pierre) H.J.Lam
Santiria trimera (Oliver) Aubrev.

Caesalpineaceae

Anthothona P. Beauv.
Aphanocalyx microphyllus (Harms) J.J.Wieringa
Berlinia Sol. ex Hook.f. & Benth.
Bikinia durandii (F.Hallé & Normand) J.J.Wieringa
Bikinia le-testui (Pellegr.) J.J.Wieringa
Bikinia pellegrinii (A.Chev.) J.J.Wieringa
Copaifera religiosa J.Leonard
Cryptosepalum Benth.
Dialium tessmannii Harms
Fillaeopsis discophora Harms
Gilbertiodendron brachystegioides (Harms) J.Leonard
Gilbertiodendron ogoouense (Pellegr.) J.Leonard
Guibourtia ehie (A.Chev.) J.Leonard
Hymenostegia afzelii Harms
Hymenostegia klainei Pierre ex Pellegr.
Isomacrolobium Aubrev. & Pellegr.
Neochevalierodendron stephanii (A. Chev.) J. Léonard
Paraberlinia pellegriniana Troupin = *Paraberlinia bifoliolata* Pellegr.
Pellegriniodendron diphyllum (Harms) J.Leonard
Scorodophloeus zenkeri Harms

Sindoropsis le-testui (Pellegr.) J.Leonard
Stachyothyrsus staudtii Harms
Swartzia fistuloides Harms
Tetraberlinia bifoliolata (Harms) Hauman
Zenkerella Taub.

Chrysobalanaceae

Magnistipula Engl.
Maranthes Blume
Parinari excelsa Sabine

Combretaceae

Strephonema mannii Hook.f.

Dichapetalaceae

Tapura Aubl.

Dipterocarpaceae

Marquesia excelsa R.E.Fr.

Ebenaceae

Diospyros L.

Euphorbiaceae

Croton sylvaticus Hochst. Ex Krauss
Dichostemma glaucescens Pierre
Discoglyprena caloneura Prain
Drypetes gossweileri S.Moore
Duvigneaudia inopinata (Prain) J.Leonard
Grossera Pax
Klaineanthus gaboniae Pierre ex Prain
Macaranga Thou.
Maesobotrya Benth.
Maprounea membranacea Pax & K.Hoffm.
Plagiostyles africana Prain ex De Wild.
Protomegabaria stapfiana Hutchinson
Sapium ellipticum Pax
Uapaca guineensis Müll.Arg.

Flacourtiaceae

Oncoba glauca Planch.
Scottellia coriacea A.Chevalier
Scottellia klaineana Pierre

Guttiferae

Garcinia conrauana Engl. Note: Lebrun and Stork note as a poorly known taxon from FWTA
Garcinia smeathmannii (Planch. & Triana) N.Robson ex Spir
Symphonia globulifera L.f.

Irvingiaceae

Desbordesia glaucescens Tiegh.
Irvingia robur Mildbr.
I. gabonensis Baill. ex Lanen.
Klainedoxa gabonensis Pierre

Lauraceae

Bielschmeidia Pancher & Sebert

Loganiaceae

Anthocleista Afzel. ex R.Br.

Strychnos L.

Melastomataceae

Memecylon L.

Warneckea Gilg

Meliaceae

Carapa procera DC.

Entandrophragma C.DC.

Guarea Allem. ex L.

Trichilia P.Browne

Mimosaceae

Calpocalyx Harms

Newtonia duparquetiana (Baill.) Keay

Newtonia griffoniana Baker f.

Newtonia leucocarpa (Harms) Gilbert & Boutique

Parkia bicolor A.Chevalier

Pentaclethra macrophylla Benth.

Moraceae

Myrianthus serratus (Trecul) Benth.

Treculia africana Decne.

Treculia obovoidea N.E. Br.

Myristicaceae

Coelocaryon preussii Warb.

Pycnanthus angolensis (Welw.) Exell

Scyphocephalum chrysothrix Warb. = *S. ochocoa* Warb.

Staudtia kamerunensis var. *gabonensis* (Warb) Fouilloy = *S. gabonensis* Warb. = *S. stipitata* Warb.

Myrtaceae

Syzygium Gaertn.

Ochnaceae

Lophira alata Banks ex Gaertn.f.

Ouratea Aubl.

Rhabdophyllum Tiegh.

Olacaceae

Diogoa zenkeri (Engl.) Exell & Mendonca

Heisteria parvifolia Sm.

Strombosia grandifolia Hook.f. ex Benth.

Strombosia pustulata Oliver

Strombosia scheffleri Engl.

Strombosiopsis sereinii Breteler

Strombosiopsis tetrandra Engl.

Pandaceae

Centroplacus glaucinus Pierre

Microdesmis Hook.f.

Papilionaceae

Angylocalyx Taub.

Baphia Afrel. ex Lodd.

Pterocarpus soyauxii Taub.

Passifloraceae

Barteria fistulosa Mast.

Rubiaceae

Aidia micrantha (K.Schum.) Bullock ex F.White

Aoranthe cladantha (K. Schum.) Somers = *P. cladantha* (K.Schum.) Keay

Canthium Lam.

Corynanthe mayumbensis (Good) N.Halle

Craterispermum Benth.

Pauridiantha Hook.f.

Pausinystalia johimbe (K. Schum.) Pierre ex Beille

Pausinystalia macroceras J.D. Kenn.

Psychotria gabonica Hiern

Tricalysia A.Rich. ex DC.

Rutaceae

Zanthoxylum macrophyllum Nutt.

Zanthoxylum holtzianum (Engl.) P.G. Waterman

Sapindaceae

Blighia Kon.

Eriocoelum Hook.f.

Ganophyllum giganteum (A.Chev.) Hauman

Placodiscus Radlk.

Sapotaceae

Baillonella toxisperma Pierre

Lecomtedoxa nogo (A. Chev.) Aubrev. = *Lecomtedoxa heitzana* (A.Chev.) Aubrev.

Manilkara Adans.

Synsepalum (A.DC.) Daniell

Scytopetalaceae

Oubanguia Baill.

Scytopetalum klaineanum Pierre

Simaroubaceae

Odyndyia gabonensis (Pierre) Engl.

Sterculiaceae

Cola Schott & Endl.

Scaphopetalum blackii Mast.

Styracaceae

Afrostryax lepidophyllus Mildbr.

Tiliaceae

Grewia coriacea Mast.

Verbenaceae

Vitex doniana Sweet

Vochysiaceae

Erismadelphus exsul Mildbr.