

Missouri Botanical Garden

# The biodiversity of Nkol Madouaka

Prepared by

**Dr M.E. Leal**

and

**Dr T. Stevart** (orchids)

Field team:

D.Nguema

P.Bissiemou

E.Mounoumoulossi

G.Dauby



Missouri Botanical Garden  
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## **Prologue**

Missouri Botanical Garden was awarded a Central African Regional Program for the Environment (CARPE) subcontract from the Conservation International (CI) to identify Biodiversity Sanctuaries (microzones) that complement the existing park system.

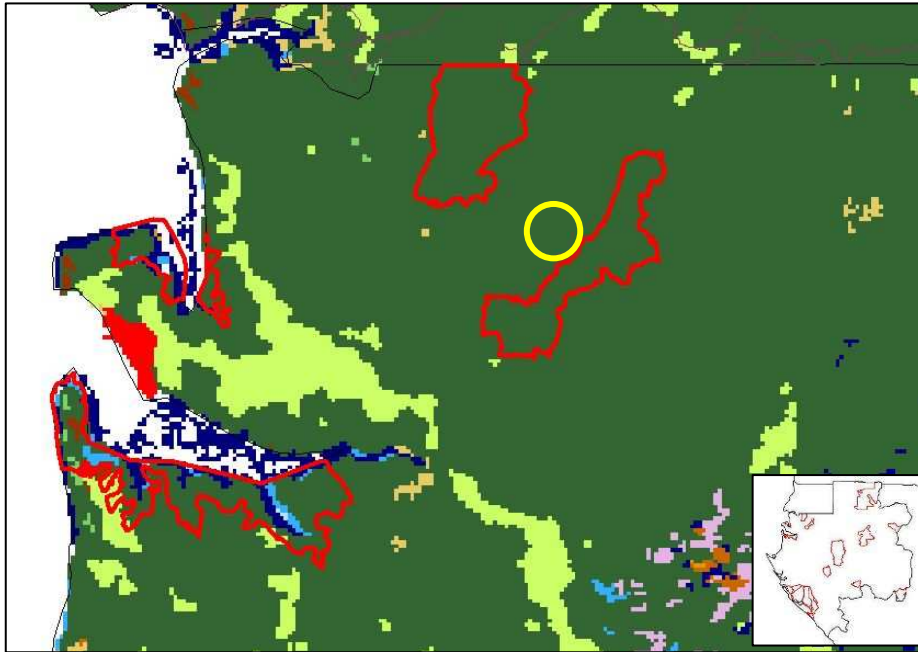
During this February Missouri Botanical Garden (MBG) has executed botanical activities in the Monts de Cristal landscape assessing the plant biodiversity of the Nkol Madouaka. The results and observations are presented here.

The author is a specialist in the Pleistocene Refuge Forest theory, vegetation-climate dynamics and the plant biodiversity of Gabon.

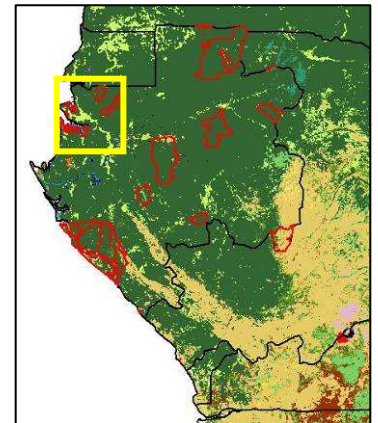
*Miguel E. Leal*

July 2007

# The biodiversity of Nkol Madouaka



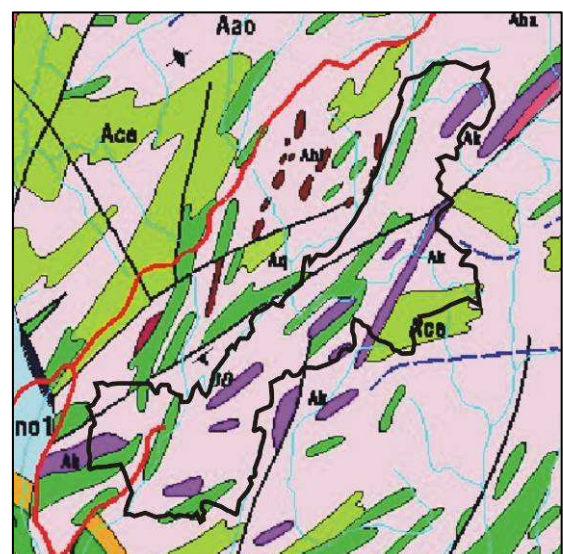
The vegetation of Monts de Cristal NP's (outlined in red) and the geographical position of the Nkol Madouaka (encircled in yellow).



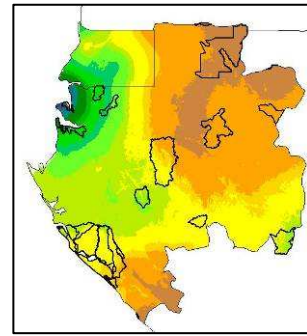
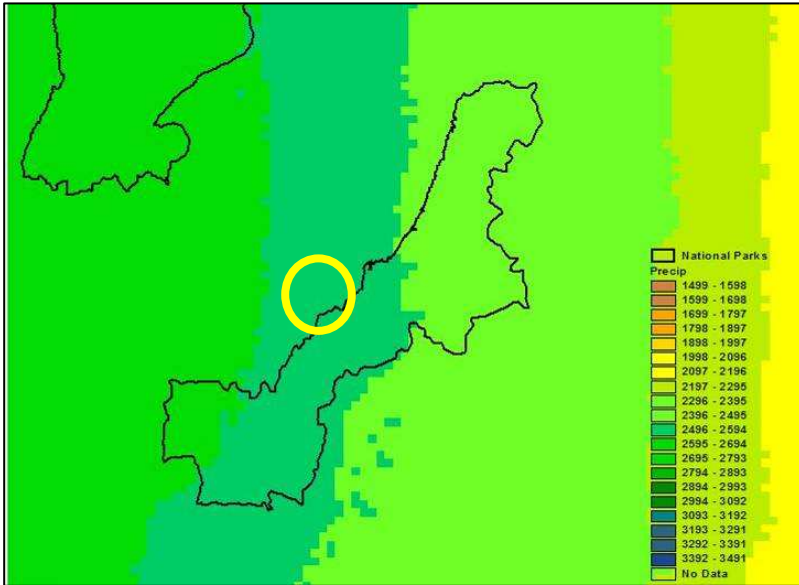
The forest cover in Gabon and Congo (dark green) and the flanking savannas (light brown) source: Mayaux et al. 2003

## The Monts de Cristal

The Monts de Cristal are the dissected edge of the interior Woleu-Ntem Plateau. The abrupt transition between the coastal lowland and interior plateau makes them stick out as mountains, which they are not by altitude (all summits are below 1000m) but most certainly by ruggedness. The rock these hills are made of are older than life and once buried deep below high mountains. As over the eons these eroded away the Monts de Cristal rocks surfaced. They became even further uplifted when the African continent collided with Europe creating the Alps and Pyreneans in Europe and in Gabon the Monts de Cristal.



Geological formations around Mbé NP and the Tchimbélé area (incircled in red).



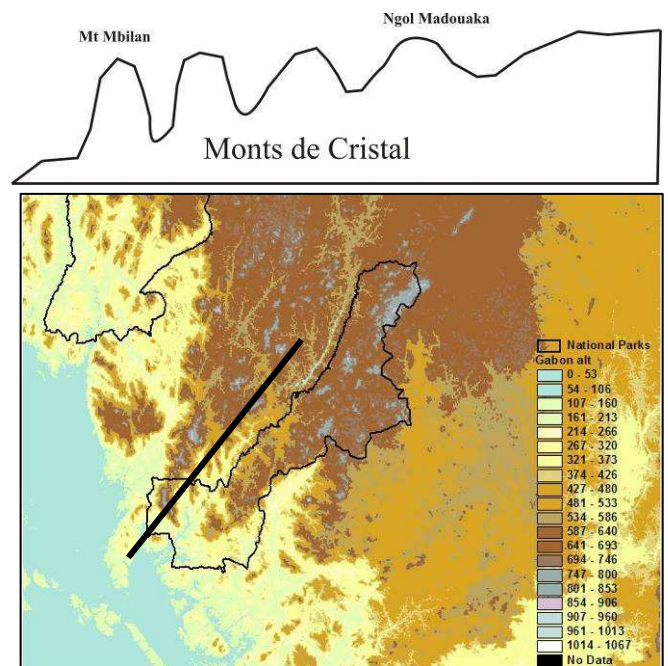
▲ Mean rainfall over Gabon, (gradient from blue-green-orange= wet to dry) showing that the SE is among the wetter parts of the country.

The National Parks (black outline) showing a rainfall gradient over the Plateaux from wet in the east to drier to the west.

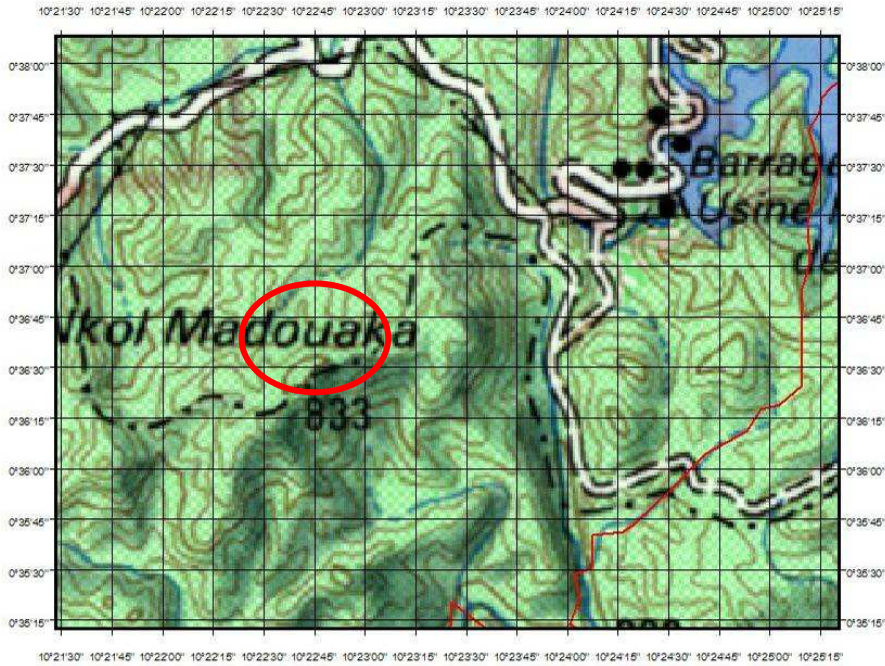
Now these hills are the canvas over which the oldest forest in Central Africa is spread. During ice ages in the Pleistocene, much of the Central African rain forest had made way for savannah as climate then was much drier than today. So, much of the present-day rain forest is not older than 10,000 years (the time since the last ice age) except in the Monts de Cristal.

In Monts de Cristal forest was able to persist because typically for then climate low clouds floated in from the ocean which were blow against hills creating misty conditions. So, although regional climate was dry these misty conditions compensated for the drought stress. Even today when the entire country experiences a dry season of at least two months these hills receive rain by the same mechanism.

Because of these circumstances the forest of the Monts de Cristal is climatically stable. In other words this forest will persist despite ongoing global warming. Deforestation of the Monts de Cristal would be reinforced global warming. Therefore, it protection should have the highest priority.



Elevation map of the Monts de Cristal and the profile from the edge to the interior



**View of Nkol Madouaka on the national map (see left circled in red)**

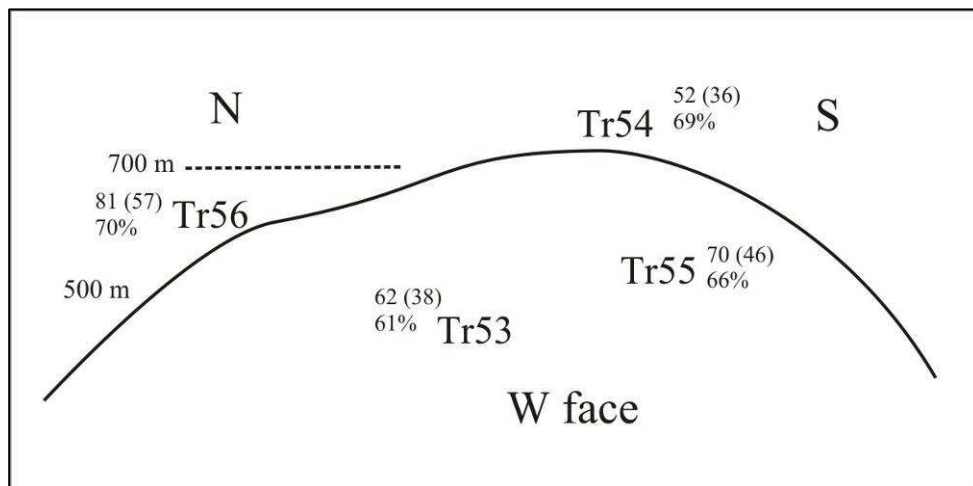
### ***Nkol Madouaka***

Nkol Madouaka is situated at the interior of the Monts de Cristal at the zone where the topography gradually becomes less rugged and more gentle like further on the Woleu-Ntem Plateau. Nkol Madouaka is the highest summit in the area with an altitude of 833m. North of the summit the topography is relatively gentle, with valley bottoms descending to only 600m, compared to the south where off the main ridge the southern slopes quickly descends to 500m.

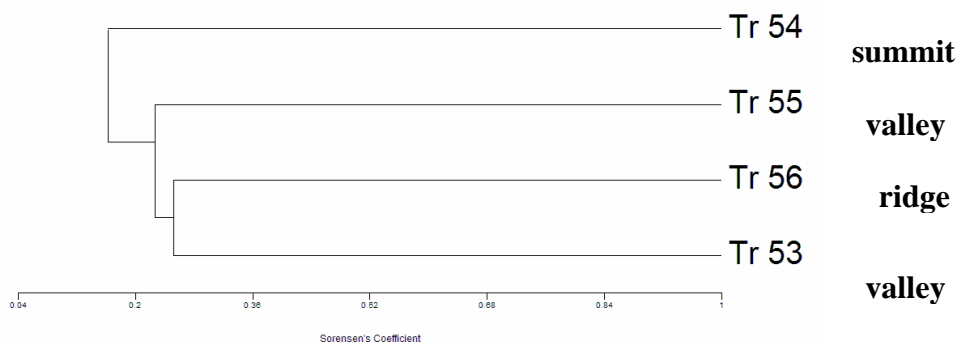
Topography is one of the principle factors determining species composition of the forest in rugged terrain and the effect of altitude and aspect on species composition was shown for the Mt Mbilan site (see biodiversity report on Mt Mbilan). Within this setting the north-west side of the Nkol Madouaka was assessed first, because it was assumed to be the wettest side. The assumption was that biodiversity should for those reasons be highest on this side of the summit.

Experience suggests that biodiversity is lowest on the more exposed places like the main ridge and highest summit, because exposed places experience more environmental extremes, drought stress and disturbance from tree falls. Valleys have a more sheltered environment which would allow a higher diversity of understory plants with shallow root systems.

As the slope and difference in altitude between summit and valley are less pronounced then at the edge of the Monts de Cristal, species turnover (the number of species only present on a single transects) is expected to be lower.



**Profile of the Nkol Madouaka showing the distribution of the transects (T) from bottom to summit and aspect, the figures at each transect are the total number of species, between brackets the number of species restricted to that transect (endemic) and the percentage.**



**Cladogram showing the relationship (similarity) between the different transects, close e.g. Tr 53 and Tr 56 or distant e.g. Tr 53 and Tr 54.**

### Methods

The transects used to record species composition were 200 m long and 5 m wide. Every individual with a diameter at breast height (dbh) of 5 cm and greater was recorded and identified or vouchered for identification in the herbarium of Libreville. Often voucher specimens were without flowers or fruits in which case species were identified only on sterile e.g. leaf characteristics. Such identifications are less confident and referred to as morpho-species. Similarity between the transects was calculated by using the Sørensen index. Sørensen index is  $S_{12}/[0.5(S_1+S_2)]$  where  $S_{12}$  is the number of shared species between two transects and  $S_1$  is the total number of species in transect 1 and similarly  $S_2$ .

<b>Nkol Madouaka</b>	<b>Tr 53</b>	<b>Tr 54</b>	<b>Tr 55</b>	<b>Tr 56</b>	<b>average</b>
spp	62	52	70	81	66
n	100	131	121	130	120.5
alpha	69.6	31.8	69.3	91.9	65.7
endemism	38	36	46	57	44.3
%	61	69	66	70	66.7

<b>Mt Mbilan</b>	<b>Tr 2</b>		<b>Tr 3</b>		<b>Tr 6</b>		<b>Tr 5</b>		<b>average</b>
	500m	700m	500m	700m	500m	700m	500m	700m	
spp	68	48	63	63	63	63	63	63	60
n	141	133	138	149	138	149	149	149	137.3
alpha	51.6	27.0	44.8	41.2	44.8	41.2	41.2	41.2	41.1
%	51	60	56	68	56	68	68	68	56

**Biodiversity characteristics for Nkol Madouaka and Mt Mbilan for transects of similar altitude.**

## **Results**

### *General characteristics*

The total recorded species was 211 species. On average 66 species were present on a transect. The highest score was 81 species on Tr56 on the ridge and the lowest 52 species on Tr54 at the summit. Species restricted to a single transect (endemic) varied between 36 (61 %) and 57 (70 %). The number of trees on a transect was in general higher on the ridge and summit than in the valley 130 and 110 on average, respectively. Alpha-diversity varied a lot between summit and ridge, 31.8 and 91.9, respectively and the two valley transects varied little 69.6 and 69.3, respectively.

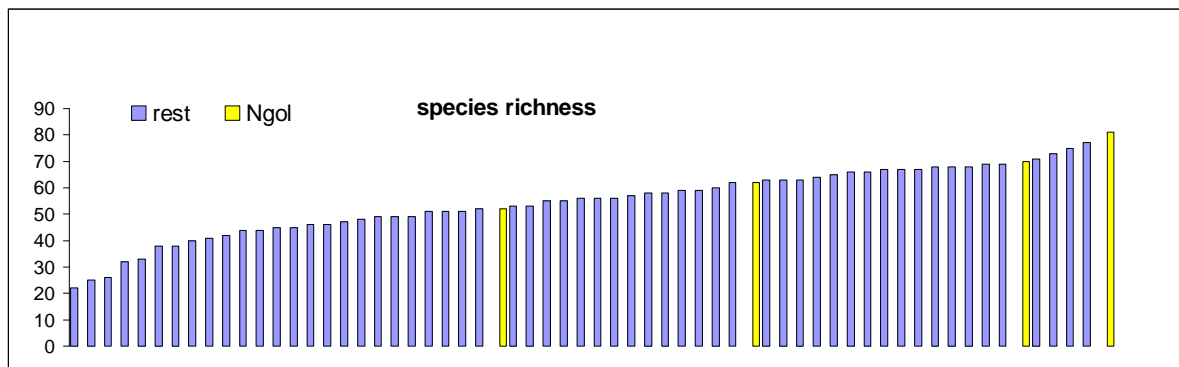
### *Similarity*

The cladogram (see above) shows a gradient in species composition with the summit transect (Tr 54) at one end and one valley transect (Tr53) at the other end. The summit transect is most dissimilar from the other transects. The valley transects are not grouped and neither the exposed transects on the summit and ridge. The summit transect (Tr54) is most similar the closest valley transect (Tr55) and similarly for the ridge Tr56 and its closed valley transect Tr53).

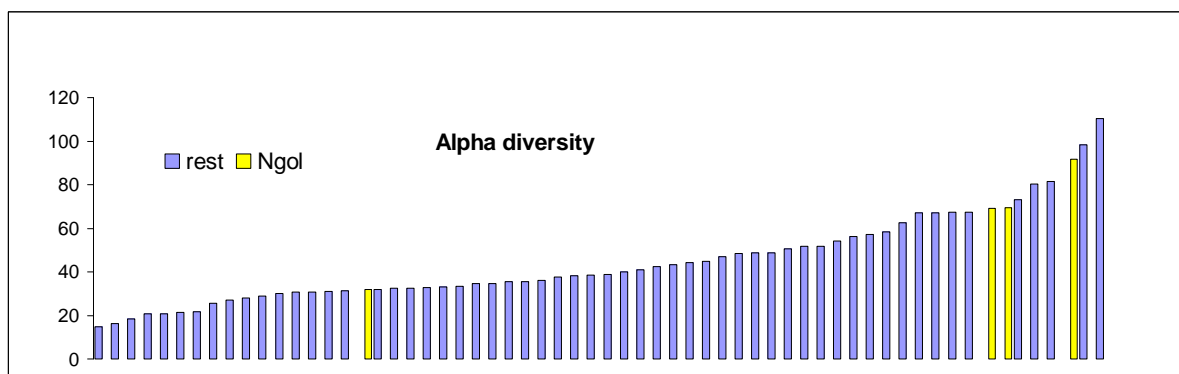
### *Endemism/species turnover*

Species turnover i.e. the percentage of transect endemics, varied between 61 and 70% (see table above). The highest level of endemism was at the main ridge transect (Tr56) and lowest at the summit (Tr54). Endemism on the valley transects was almost the same, 38 (Tr53) and 36 (Tr55). Species turnover at Nkol Madouaka is high compared to Mt Mbilan at similar altitudes (see table above).





Graph showing species richness in Nkol Madouaka (yellow bars) and other sites in Gabon (blue bars).



Graph showing Alpha diversity in Nkol Madouaka (yellow bars) and other sites in Gabon (blue bars).

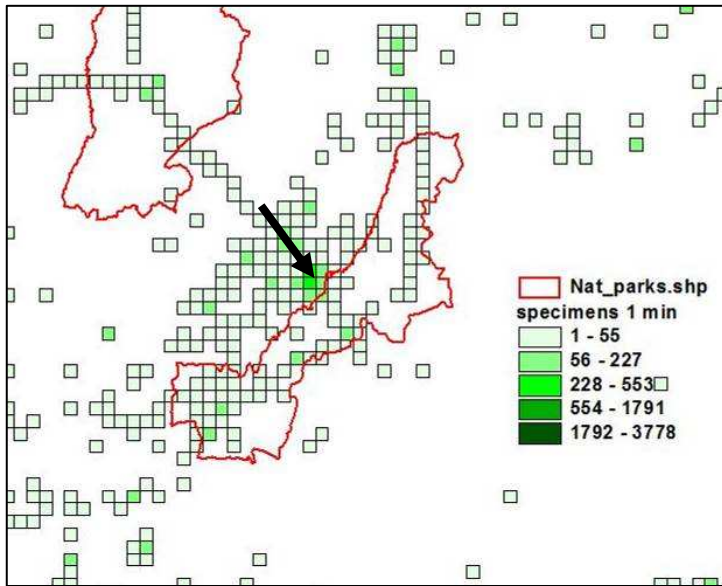
## Discussion

The cladogram shows that species composition is most similar between the transects Tr53 (valley) and Tr56 (ridge), which are closest to each other, followed by the valley transect Tr55 and then the transect on the summit (Tr54). Based on environmental differences it was expected that the valley transects would group followed by the ridge transect first and then the summit transect.

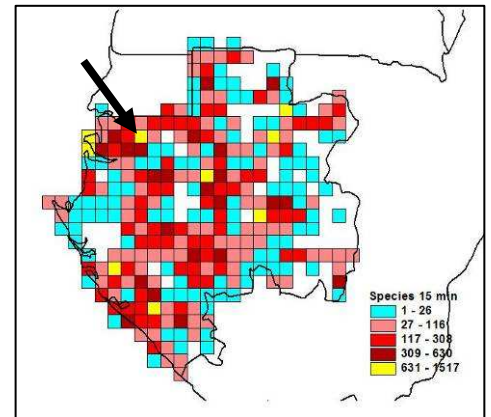
This shows that the similarity in species composition between first two transects (Tr53 and Tr56) is the best explained by distance. The second valley transect (Tr55) is situated closest to the transect on the summit, but it still groups more closely to the other transects. This is because summits in general have a different environment from valleys. The summit and the ridge transects were expected to group more closely, because of their similarity of exposedness.

The exceptionality of the summit is also illustrated comparing alpha-diversity values (see the graph above). The summit transect is way off from the other transects, which are at the high end of the graph. A similar pattern has been observed for Mt Mbilan (see table above).

The Nkol Madouaka site has higher biodiversity values (species richness and alpha-diversity) than Mt Mbilan site at similar altitudes (see the tables above). At Mt Mbilan the highest biodiversity values are measured at the lower altitudes (100-300m). Also species turnover was higher at Nkol Madouaka than at the Mt Mbilan. They were expected to be lower as the topography is less pronounced, which is one of the main factors determining species turnover.



Collection densities calculated for 1 min degrees grid cells.



Species densities calculated for 15 min degrees grid cells

### General collecting and orchids

Tchimbelé is one of the best collected sites in Gabon (see above). The easy accessibility of Tchimbelé power dam from Libreville (3 hours drive) and the comfortable facilities of Tchimbelé has favored botanical collecting. Most of the collecting has been road side collecting and day trip walks in the forest around the dam. The highest peak in the vicinity is Nkol Madouaka and despite the 20 years of botanical collecting has never been visited until this mission.



unknown  
Commelinaceae

In total some 112 specimens were collected and their full identification is in process, but there are already some interesting finds for the orchids.



Unknown  
species



Aerangis nov. sp.?

## Orchid diversity

A total of 33 orchid taxa were collected during our survey of the Nkol Maduaka Mountain, in which 10 were new for the Tchimbélé area. The number of orchid taxa in the Tchimbélé area is now equal to 96. It represents 76% of the orchid known from the Monts de Cristal.

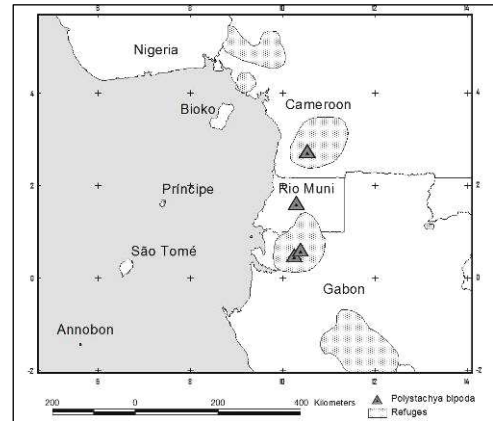
We also collected new specimens of two rare orchids which are endemic to the West Central Africa:

*Polystachya bipoda* Stévant, limited to the submontane forest that occurs above 600-700 m in North Gabon, Rio Muni and South Cameroon



(map 1). This species was only known from three localities.

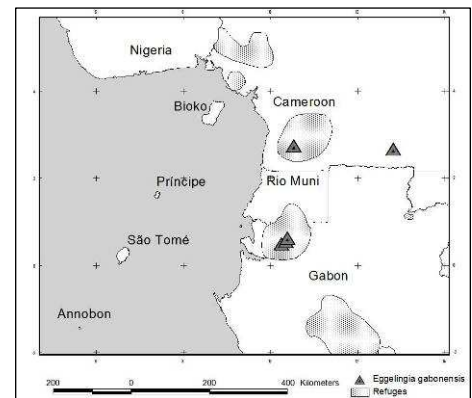
In Gabon, the only specimen was collected in Mont Mbilan, which is presently under threat.



**Map1: distribution of *Polystachya bipoda* Stévant (7 specimens, 4 localities)**

The other species is *Eggingia gabonensis* P.J.Cribb & Laan which was previously known by four specimens. This tinny orchid is restricted from south Cameroon to North Gabon (map 2). The two specimens collected in Nkol Maduaka were growing in the upper part of the Canopy in a small valley.

Distribution of both species fit well the forest refuge which extends in South Cameroon, Rio Muni and North Gabon. This area should be considered as a single conservation unit.



**Map2: distribution map of *Eggingia gabonensis* P.J.Cribb & Laan (6 specimens, 5 localities)**

## **Conclusions**

This study was carried out to find out how biodiversity continued further away from the edge of the Monts de Cristal. The difference in rainfall and geology between the edge and interior does not clearly causes distinct changes in biodiversity. Only the lower maximum daily temperatures may give the flora and in particularly orchids a stronger submontane character. The Nkol Madouaka site has a higher biodiversity and a higher species turnover at higher altitude compared to similar altitudes at the edge of Mt Mbilan, which make it one of the sites with the highest plant diversity of Gabon and Central Africa.

## **Acknowledgements**

This project was funded by USAID's Central African Regional Program for the Environment in collaboration Conservation International and the Wildlife Conservation Society. The project thanks for the permission of CENAREST/ the Herbar National du Gabon to work in the area and access there facilities. Photo's were taken by Miguel Leal and Tariq Stevart.



**APPENDIX 1: ORCHID CHECKLIST OF THE TCHIMBÉLÉ AREA**  
(Based on an initial number of 210 records, 86 'taxa', LGE: Lower Guinean Endemics)

SPECIES	LGE	Total	Ngol
1 Aerangis nov. sp.?			1
2 Ancistrorhynchus capitatus (Lindl.) Summerh.		9	1
3 Ancistrorhynchus crystalensis P.J.Cribb & Laan	1	6	
4 Ancistrorhynchus tenuicaulis Summerh.		3	
5 Angraecum affine Schltr.		3	
6 Angraecum bancoense W.J.van der Burg		8	1
7 Angraecum distichum Lindl.		1	
8 Angraecum eichleranum Kraenzl. var. curvimentatum Szlach. & Olsz.	1	1	
9 Angraecum gabonense Summerh.		1	
10 Angraecum sp. nov. 2	1	2	
11 Bolusiella talbotii (Rendle) Summerh.		4	1
12 Bulbophyllum acutibracteatum De Wild. var. acutibracteatum		1	
13 Bulbophyllum acutibracteatum De Wild. var. rubrobrunneopapillosum (De Wild.) J.J.Verm.		1	1
14 Bulbophyllum calyptratum Kraenzl. var. calyptratum		1	
15 Bulbophyllum calyptratum Kraenzl. var. graminifolium (Summerh.) J.J.Verm.		1	
16 Bulbophyllum capituliflorum Rolfe		2	
17 Bulbophyllum cochleatum Lindl. var. bequaertii (De Wild.) J.J.Verm.		1	1
18 Bulbophyllum cochleatum Lindl. var. cochleatum		2	
19 Bulbophyllum comatum Lindl. var. comatum	1	1	1
20 Bulbophyllum coriscense Rchb.f.	1	1	
21 Bulbophyllum falcatum (Lindl.) Rchb.f. var. falcatum		1	
22 Bulbophyllum falcatum (Lindl.) Rchb.f. var. velutinum (Lindl.) J.J.Verm.		5	1
23 Bulbophyllum intertextum Lindl.		9	1
24 Bulbophyllum cf maximum			1
25 Bulbophyllum minutifolium Stévant	1	1	
26 Bulbophyllum oreonastes Rchb.f.		3	
27 Bulbophyllum pumilum (Sw.) Lindl.		4	
28 Bulbophyllum resupinatum Ridl. var. filiforme (Kraenzl.) J.J.Verm.		3	1
29 Bulbophyllum resupinatum Ridl. var. resupinatum		1	
30 Bulbophyllum saltatorium Lindl. var. albociliatum (Finet) J.J.Verm.		3	1
31 Bulbophyllum saltatorium Lindl. var. calamarium (Lindl.) J.J.Verm.		1	
32 Bulbophyllum sandersonii (Hook.f.) Rchb.f. var. sandersonii		1	
33 Bulbophyllum scaberulum (Rolfe) Bolus var. scaberulum		1	
34 Bulbophyllum schimperianum Kraenzl.		1	
35 Bulbophyllum schinzianum Kraenzl. var. schinzianum		1	1
36 Bulbophyllum subligaculiferum J.J.Verm.	1	1	
37 Calypstrochilum christyanum (Rchb.f.) Summerh.		2	
38 Calypstrochilum emarginatum (Sw.) Schltr.		2	
39 Chamaeangis ichneumonea (Lindl.) Schltr.		2	
40 Cyrtorchis aschersonii (Kraenzl.) Schltr.		4	1
41 Cyrtorchis chailluana (Hook.f.) Schltr.		2	1
42 Cyrtorchis henriquesiana (Ridl.) Schltr.	1	1	
43 Cyrtorchis ringens (Rchb.f.) Summerh.		1	
44 Cyrtorchis seretii (De Wild.) Schltr.		1	
45 Diaphananthe aff. laticar sp. nov. 2	1	1	
46 Diaphananthe sp. nov. 1	1	1	
47 Diceratosteles gabonensis Summerh.		1	
48 Dinklageella liberica Mansf.		1	
49 Eggelingia clavata Summerh.		1	
50 Eggelingia gabonensis P.J.Cribb & Laan	1	1	1
51 Eulophia horsfallii (Batem.) Summerh.		3	

52	<i>Eulophia magnicristata</i> Szlach. & Olsz.		1	
53	<i>Graphorkis lurida</i> (Sw.) Kuntze		2	
54	<i>Habenaria buntingii</i> Rendle		1	
55	<i>Habenaria gabonensis</i> Rchb.f.		1	
56	<i>Habenaria procera</i> (Sw.) Lindl.		7	
57	<i>Liparis caillei</i> Finet		1	
58	<i>Liparis</i> cf. <i>goodyeroides</i>			1
59	<i>Liparis epiphytica</i> Schltr.		1	
60	<i>Liparis gracilentata</i> Dandy	1	1	1
61	<i>Liparis mulindana</i> Schltr.		1	
62	<i>Listrostachys pertusa</i> (Lindl.) Rchb.f.		4	1
63	<i>Manniella gustavi</i> Rchb.f.			1
64	<i>Phaius mannii</i> Rchb.f.		1	1
65	<i>Plectrelminthus caudatus</i> (Lindl.) Summerh. var. <i>caudatus</i>		3	
66	<i>Polystachya</i> aff. <i>kubale</i> sp. nov. ?		3	
67	<i>Polystachya albescens</i> Ridl. subsp. <i>albescens</i>		3	
68	<i>Polystachya batkoi</i> Szlach. & Olsz.		1	
69	<i>Polystachya bipoda</i> Stévant			1
70	<i>Polystachya bifida</i> Lindl.			1
71	<i>Polystachya calluniflora</i> Kraenzl.		1	1
72	<i>Polystachya calyptrata</i> Kraenzl.		1	
73	<i>Polystachya</i> cf. <i>adansoniae</i>			1
74	<i>Polystachya fractiflexa</i> Summerh.		1	
75	<i>Polystachya fulvilabia</i> Schltr.		2	
76	<i>Polystachya galeata</i> (Sw.) Rchb.f.		1	
77	<i>Polystachya laxiflora</i> Lindl.		1	
78	<i>Polystachya moniquetiana</i> Stévant & Geerinck	1	1	
79	<i>Polystachya odorata</i> Lindl. var. <i>odorata</i>		7	
80	<i>Polystachya polychaete</i> Kraenzl.		2	
81	<i>Polystachya pyramidalis</i> Lindl.	1	7	
82	<i>Polystachya ramulosa</i> Lindl.		3	
83	<i>Polystachya rhodoptera</i> Rchb.f.		9	1
84	<i>Polystachya seticaulis</i> Rendle		2	
85	<i>Polystachya supfiana</i> Schltr.	1	3	1
86	<i>Polystachya tessellata</i> Lindl.		13	1
87	<i>Polystachya victoriae</i> Kraenzl.		4	
88	<i>Rangaeris trilobata</i> Summerh.	1	4	
89	<i>Solenangis</i> cf. <i>scandens</i>			1
90	<i>Solenangis clavata</i> (Rolfe) Schltr.		1	
91	<i>Stolzia elaidum</i> (Lindl.) Summerh.		1	1
92	<i>Tridactyle anthomaniaca</i> (Rchb.f.) Summerh.			1
93	<i>Tridactyle armeniaca</i> (Lindl.) Schltr.		1	1
94	<i>Tridactyle brevicealcarata</i> Summerh.		1	
95	<i>Tridactyle lagosensis</i> (Rolfe) Schltr.			1
96	<i>Tridactyle truncatiloba</i> Summerh.	1	4	1
	Total	17	210	33
			86	

## Appendix 2 common species

	Tr 53	Tr 56	Tr 55	Tr 54
Duguetia 53d	1	3		
Oubanguia africana	1	2		
Hymenostegia klaineana	1	1		
Paraphyadathe flagelliflora Mildbr.	1	1		
Pentaclethra macrophylla Benth.	1	1		
Strombosia grandifolia	1	1		1
Dichostemma glaucescens Pierre	7	8	18	
Heisteria parvifolia Sm.	1	1	3	
Plagiostiles africana	3	1	1	
dacryodes klaineana	2	3	2	
Scaphopetalum blackii Mast	2	1	1	
Greenwayodendron suaveleus	1	5	1	
Santiria trimera	4	4	3	4
Garcinia mannii	4	1	4	2
Tetraberlinia bifoliolata (Harms) Hauman	3	3	3	6
Strombosiopsis tetrandra Engl.	1	9	2	4
Dacryodes macrophylla (Oliv.) Laur.	1	5	2	3
Garcinia smeathmannii (Planch. & Triana) Oliv	1	3	1	9
Bikinia le testui		3	2	2
Dialium pachyphyllum		4	3	
Coula edulis		2	2	
Enantia chlorantha Oliv.		1	1	
Hymenostegia floribunda			2	3
Campylospermum 54c			1	2
Diospyros hoyleana			1	1
Mareyopsis longifolia (Pax) Pax & K.Hoffm.			1	2
Anisophyllea myriosticta J.J.Floret		3		1
Dn 600		1		2
Guibourtia ehie	3		1	
Diogoia zenkeri	2		2	
Strombosia pustulata	1		2	
Dacryoddes buetneri	1		1	
Anisophyllea polyreura	1			2
Baphia 53d	1			3

## Appendix 2 transect restricted species

	Tr 55		Tr 55
Apocinaceae 55a	4	Ongokea gore (Hua) Pierre	1
Cleistanthus 55a	4	Pancovia 55b	1
Anisophylla 55a	3	Plagiosiphon 55b	1
Warneckia 55c	3	Rapdophyllum 55a	1
Anisophylla myrosticta	2	Sapindaceae 55d	1
Cola 55d	2	Sindoropsis le testui	1
Dialium 55d	2	Sorindeia 55a	1
Syzygium 55a	2	Staudtia stipitata	1
Trichoscypha 55a	2	Strephonema 55d	1
Aphanocalyx microphylus	1	Synsepalium 55b	1
Baphia 55a	1	Trichoscypha 55d	1
Berlinia 55a	1	Warneckia 55a	1
Calpocalyx 55d	1	Warneckia 55a2	1
Cleistanthus 55a2	1	xylophia 55c	1
Cola 55d2	1		
Dacryodes 55b	1		
Dactyladenia 55b	1		
Dactyladenia 55d	1		
Dialium 55c	1		
Dichaetanthera africana	1		
Diospyros melocarpa	1		
Erismadelphus 55c	1		
Euphorbiaceae 55b	1		
Gambeya 55d	1		
Garcinia 55c	1		
Gilbertiodendron 55a	1		
Klainedoxa gabonensis	1		
Leonardoxa 55a	1		
Leonardoxa africana (Baill.) Aubrév	1		
Maesobotrya 55c	1		
Octochosmus 55c	1		
Octocosmus africanus	1		



## Appendix 2 transect restricted species

	Tr 53		Tr 54
Mamea africana	8	Allophylus 54c	1
Aucoumea kaineana	6	Baphia 54a	5
Aubrevilla 53c	2	Beilschmiedia 54b	2
Beilschmiedia 53b	2	Calpocalyx 54d	1
Cola 53d	2	Campylospermum 54a	2
Kleistanthus 53c	2	Cleistanthus 54a	4
Trichilla 53a	2	Dacryodes 54a	1
Beilchmiedia 53a	1	Dacryodes 54c	1
Beilschmiedia 53d	1	Dacryodes 54d	1
Bikinia 53b	1	Dacryodes heterotricha	1
Centroplacus glocinus	1	Dactyladenia 54a	1
Cleistanthus 53c2	1	Dialium 54d	1
Coelocaryon preussii	1	Drypetes 54a	1
Dacryodes letestui	1	Duguetia 54a	1
Dactyladenia 53c	1	Duguetia 54d	2
Dialium 53b	1	Euphorbiaceae spp 6	14
Diospyros 53d	1	Euphorbiaceae sp 54b	3
Drypetes 53b	1	Garcinia lucida Vesque	2
Drypetes gossweleri	1	Napoleona 54c	4
Eriocoelum 53a	1	Newtonia 54a	1
Eriocoelum 53c	1	Ochnaceae 54c	1
Euphorbiaceae 53d	1	Pentadesma grandifolia Baker f.	1
Garcinia conrauana	1	Piptostigma 54b	7
Hymenostegia 53c	1	Rubiaceae 54a	2
Maesobotria 53d	1	Rubiaceae 54c	1
Masularia Acuminata	1	Rubiaceae 54d	1
Napoleona 53d	1	Sibangea 54b	3
Oncoba 53d	1	Strephonema 54d	1
Pancovia 53d	1	Synsepalium 54c	4
Plagiosiphon 53d	1	Synsepalum 54a	4
Plagiosiphon 53d2	1	Syzygium 54a	4
Pseudospondias 53b	1	Trichilia 54c	2
Scytopetalum klaineanum	1	Trichoscypha 54a	1
Syzyguim 53c	1	Trichoscypha 54b	1
Trichoscypha 53b	1	Trichoscypha 54b2	1
Uapaca 53d	1	Warneckia 54d	1
Zanthoxylum heitzii	1		
Zanthoxylum macrophylla	1		

## Appendix 2 transect restricted species (continued)

	<b>Tr 56</b>		<b>Tr 56</b>
Grewia 56b	3	Manilkara 56d	1
Anisophyllea purpurascens	2	Microdesmis afrodecandra	1
Dacryodes 56b	2	Odyendea gabonensis (Pierre) Engl.	1
Trichilia 56b	2	Plagiosiphon 56d	1
Xylopia 56b	2	Protomegabaria 56c	1
Anopyxis klaineana (Pierre) Engl.	1	Psychotria 56d	1
Anthonatha 56a	1	Rapdophyllum 56a	1
Beilchmiedia 56a	1	Rhapdophyllum 56c	1
Beilchmiedia 56b	1	Rubiaceae 56b	1
Berlinia 56a	1	Rubiaceae 56d	1
Bikinia 56a	1	Sibangea 56a	1
Bikinia 56c	1	Sibangea 56c	1
bikinia pellegrinni	1	Sibangea 56d	1
Campylospermum 56a	1	Strephonema 56b	1
Carapa procera	1	Trichoscypha 55b	1
Cleistanthus 56b	1	Trichoscypha 56a	1
cleistanthus 56c	1	Trichoscypha 56a2	1
Cleistanthus 56d	1	Trichoscypha 56b	1
Cola nitida	1	Trichoscypha 56d	1
cyncephalum 56a	1	Trichoscypha arborea	1
Cyncephalum 56a2	1	Warneckia 56c	1
Dacryodes 53b	1	Xylopia 56a	1
Dacryodes normandii	1	Xylopia 56c	1
Dactyladenia 56c	1		
Desbordesia glaucecens	1		
Dialium 56b	1		
Diospyros 56d	1		
Drypetes 56a	1		
Drypetes 56a2	1		
Eriocoelum 56b	1		
Garcinia 56c	1		
Grewia 56c	1		
Irvingia grandifolia	1		

