

The Biodiversity of Mvé Lakéné Plateau




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The biodiversity of Mvé Lakené

Prepared by

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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 perform a series of tasks.

These tasks were defined accordingly:

1. Carry out botanical expeditions to identify Biodiversity Sanctuaries for micro-zoning in the landscape.

2. Develop a GIS map of the landscape identifying biodiversity hot spots based on the Pleistocene refuge theory

3. Construct a data-base for the botanical information

During this fiscal year Missouri Botanical Garden (MBG) has executed botanical activities in the Monts de Cristal landscape assessing the plant biodiversity of the Mvé Lakené. The first results and observations are presented here (task 1).

Miguel E. Leal

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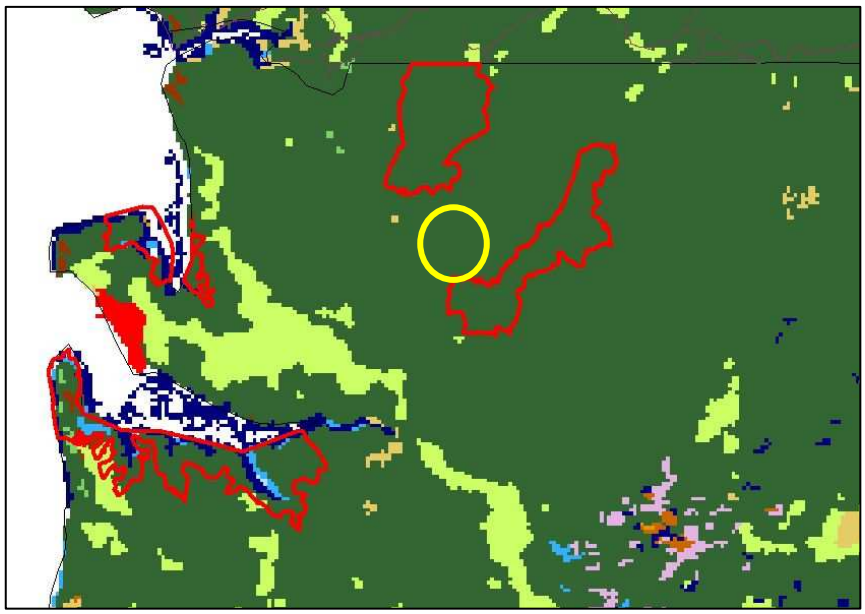
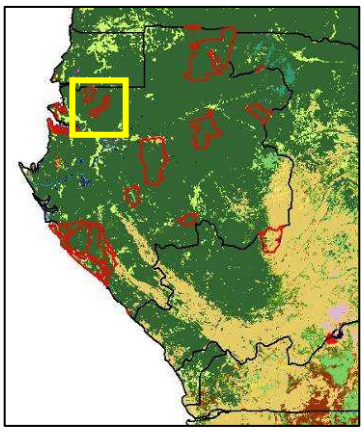
Introduction to Mvé Lakené





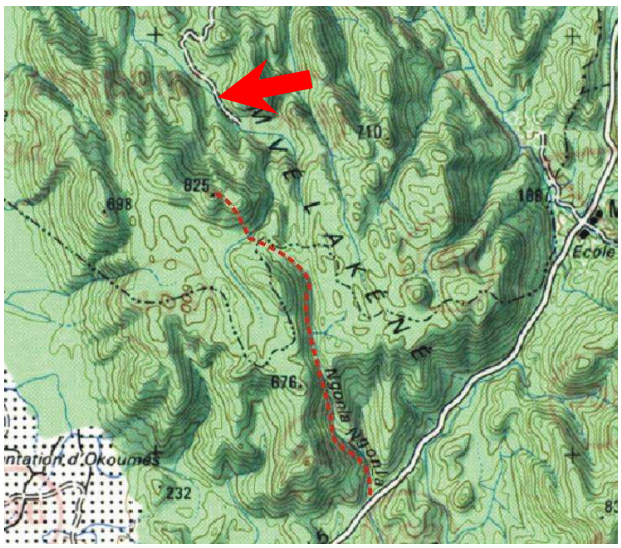
The forest cover in Gabon (dark green) and the National Parks Monts Sené and Mbe outlined in red and the Mvé Lakené Plateau (encircled in yellow). source Mayaux et al. 2003

The Mvé Lakéné Plateau

The Mvé Lakéne Plateau is situated in between Mont Sené and Mbé NP which may serve as a potential corridor between the two parks. Access onto the plateau is difficult, which is a good indication that logging companies have not or are less likely going to extract timber from the area. The only access road is north to the plateau, but this road was built at least 40 years ago and presumably no longer exists (see red arrow right). On a previous GIS analysis map the area was already identified as a potential area for conservation with a high level biodiversity and endemism.

Geomorphology

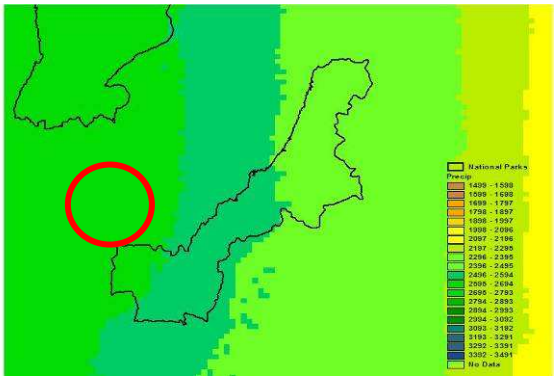
The flanks of the plateau are steep, but on the plateau topography becomes gentle. Most of the plateau has an altitude around 500m and the highest summit is 825m. Geomorphology is one of the primary forces determining species distributions and national maps are the only source of information (see right).



Map showing in more detail the Mvé Lakené Plateau and the way up (dotted red line).

Rainfall

Besides geomorphology rainfall is the other main force determining species composition. More importantly is soil moisture availability, but this factor is difficult to measure at a large scale, there fore mean annual rain fall is usually used. In the Monts de Cristal mean annual rainfall is high in the west and gradually decreases towards the east. There is also the orographic effect meaning that with altitude rainfall increases. This is especially clear in low rainfall areas, but it also exists in high rainfall areas.



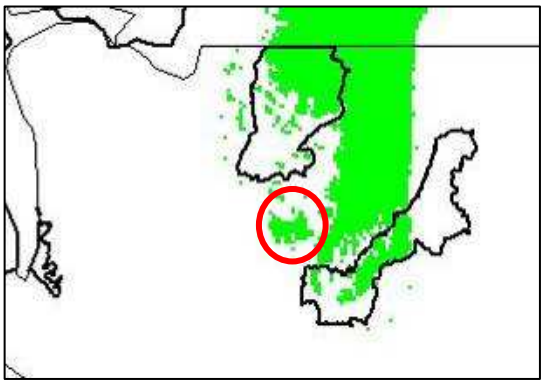
Mean rainfall over the Monts de Cristal, (gradient from dark green to orange= wet to drier.

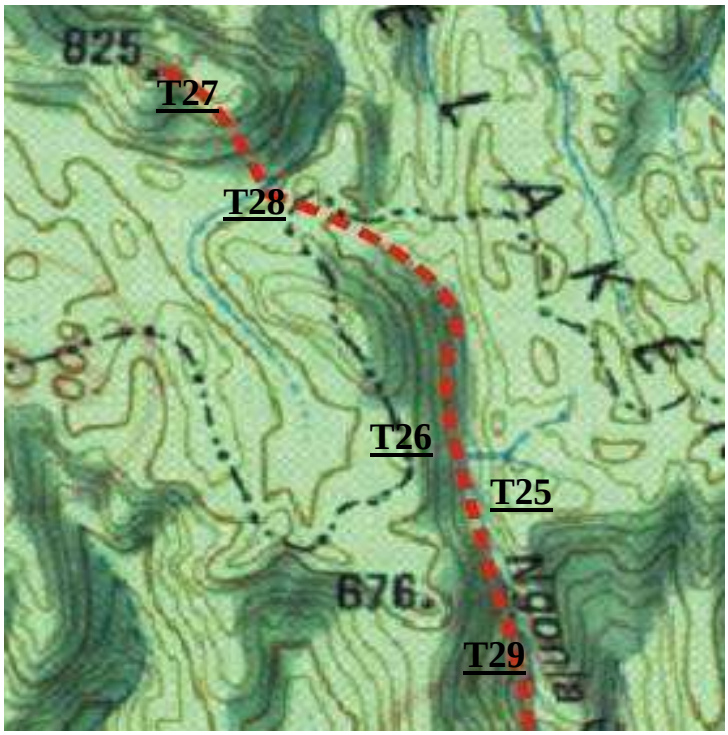
Geology

Geologically the plateau is not very different from the rest of the Monts de Cristal, which is dominated by orthogneis (Aao) and gneiss (Aco) rock formations from the Archeen (at least 2600 Myrs ago). Geology in general determines the geomorphology of the area, as rock formation erode differently and types of soils.

GIS model

The model developed over the years during CARPE phase II has been refined which allows locating Pleistocene forest refuge areas in more detail. In the model altitude > 500m and rainfall > 2.5m is overlapped in GIS. The areas identified are also revered to as climatically stable forests, which with climate change have to highest conservation priority. The Mvé Lakené plateau was identified as one of such areas (see right encircled in red). In green are the identified super wet refuge areas.





Map showing the large plateau and the walk (red dotted line) and transects (T).

The summit of Mvé Lakené

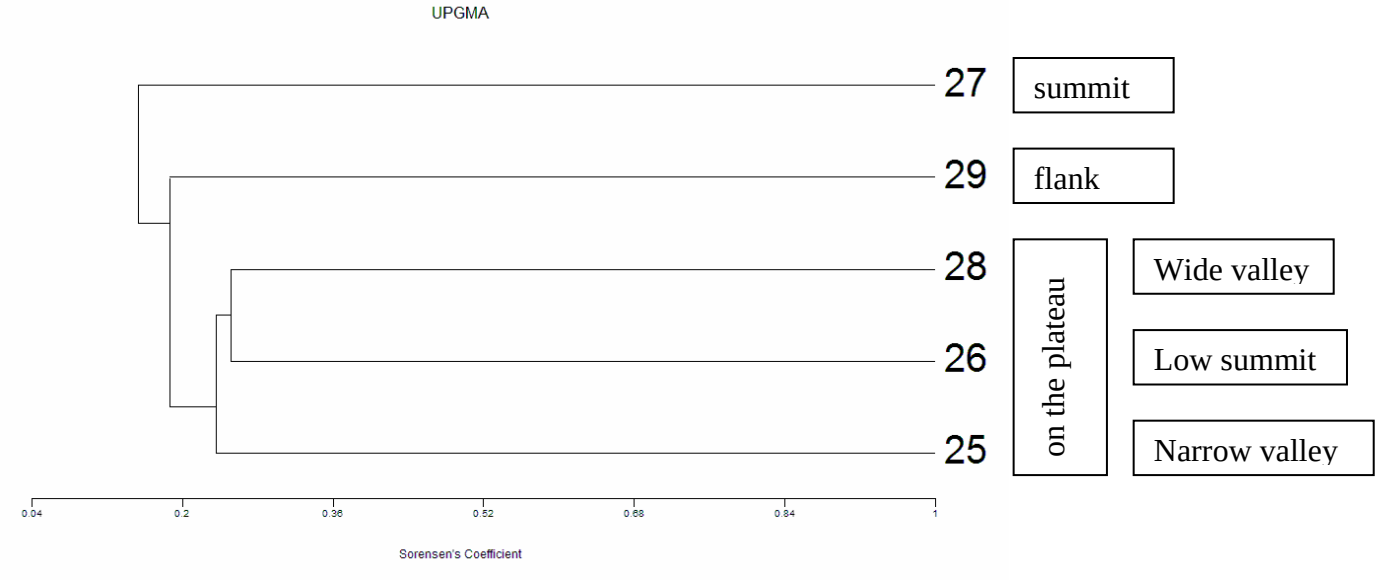
Transect layout

The plateau is situated at the western edge of the Monts de Cristal next to the coastal region. Previous fieldwork has shown that topography is a strong force driving species composition. Therefore transects were placed at the flank (Tr29), on the highest summit (Tr27), a lower summit (Tr26), a narrow valley (Tr25) and a wide valley (Tr28).

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 revered 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.



Cladogram showing the relationship (similarity as distance in UPGMA) between the transects, close e.g. Tr 26 and Tr 28 or distant e.g. Tr 27 and Tr 25.

Mvé	**T25**	**T26**	**T27**	**T28**	**T29**	average
F-alpha	47.3	42.5	34.6	31.9	67.3	44.7
species	55	67	57	53	77	62
n	104	163	145	136	144	138
endemic	33	39	41	30	56	40
end%	60	58	73	58	73	64

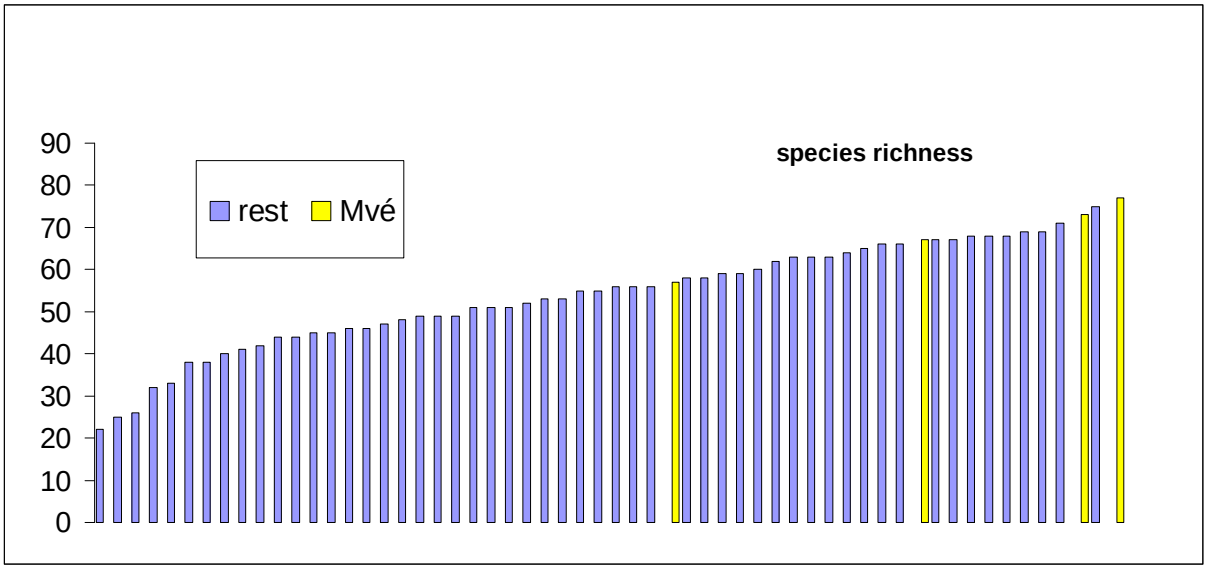
Results

General characteristics

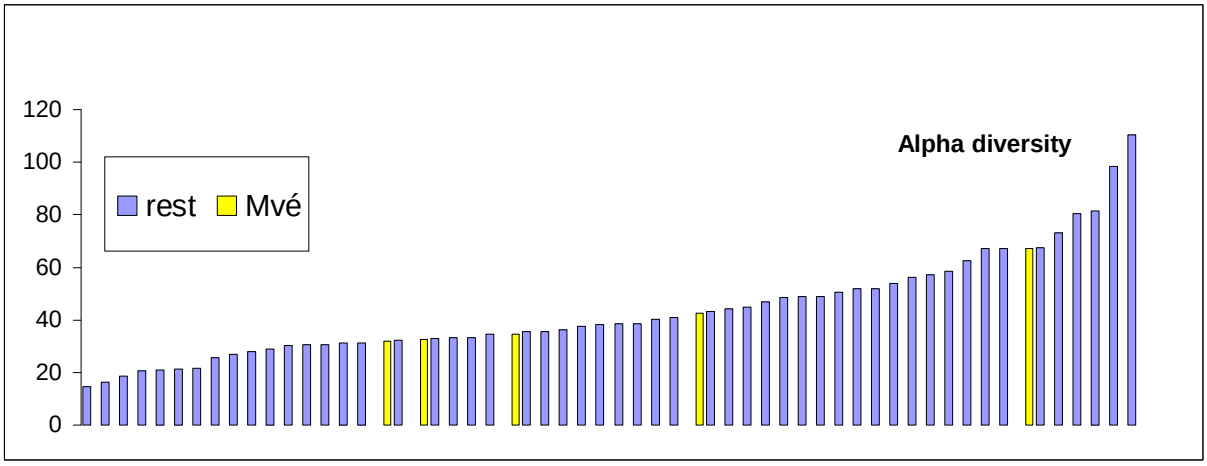
On the five transects 386 species were recorded (see the above table). On average 62 species were present on a transect and differences between transects considerable. The highest score was 77 species on Tr29 and the lowest 53 species on Tr28. Species restricted to a single transect (endemic) varied between 30 (58%) and 56 (73%). The number of trees on a transect was lowest on Tr25 in the narrow valley and highest on Tr26 on the summit and ridge above that same valley. F- alpha-diversity varied between 31.9 and 67.3 with lowest value from the wide valley (Tr28) and highest value from the flank of the plateau (Tr29).

Similarity

The cladogram (see above) shows the two extremes of the plateau are most different in species composition (Tr 27 and 29) and that the transects on the plateau (except the summit Tr27) resemble each other most in species composition (Tr 25, Tr 26, Tr 28). The level of endemism is also highest on the summit (Tr27) and flank (Tr29) 73 species each.



Graph showing species richness on the plateau (yellow bars) and other sites in Gabon (blue bars).



Graph showing Alpha diversity on plateau (yellow bars) and other sites in Gabon (blue bars).

Discussion

The cladogram shows that species composition in part is determined by geomorphology. Despite minor topographical differences the transects on the plateau grouped together, with the transect on the flack as an outgroup. Remarkable is that the low summit (Tr26) and wide valley (Tr28) were more similar than with the narrow valley (Tr25), located closer to each other and the two valley did not group more closely. Species composition on the highest summit (Tr27) was grouped outside all other transects meaning that it bore little resemblance with the rest. Endemism on the summit was also highest together with the transect on the flank, but Fisher-alpha diversity was among the lowest among all transects.

Comparing the Mvé transects with other transects in Gabon it is striking to observe that there is a significant difference when its biodiversity is measured as species richness and as Fisher-alpha diversity (see previous graphs). In ecological studies it is standard to measure biodiversity only in Fisher-alpha values, which in this case would not have been ranged Mvé Lakené as high compared to other sites in Gabon as measured in species richness. This shows the shortcoming of only using one measure. Looking at species richness the Mvé are above average in biodiversity, and looking at Fisher-alpha diversity mostly average. It should be noted that the transects in the graphs are among the richest in all of Central Africa.

Not all transects on Mvé Lakené had an equally high level of biodiversity, showing that even in a small area as the plateau considerable differences can exist. The lower diversity on the plateau may have to do with forest history. Drier climatic phases during the Holocene would have caused deforestation in areas with a gentle topography. This underlines that it is important to incorporate relief or Holocene forest refuge areas in the GIS analysis.

Conclusion

The Mvé Lakené Plateau was suggested as a corridor between the two national parks of the Monts de Cristal. In GIS analysis it was identified as a super wet refuge area. Its biodiversity is average (Fisher-alpha) or high (species richness) noted that the transects used for comparison are among the highest in Central Africa. Especially, the transect on the flank had a high biodiversity value indicating that the flanks of the plateau have a highest conservation priority of the plateau. Also important is forest on the highest summit as its species composition grouped out with all the other transects on the plateau. This forest is most likely to disappear with global climate change.

General collecting

57 species were collected, their full identification is still pending and field note data is being encoded into the landscape database. But there are some preliminary notes and observations. The forest on the highest summit was a low forest with Cyperaceae in the understorey very much like the forest on Monte Mitra peak at 1000m in Equatorial Guinea (see right). On that same top a new species of *Amphiblemma* was discovered (see below). Also the new species *Calvoa maculata* was also encountered on the plateau together with the new record *Korupodendron songweanum*.

Calvoa maculata

Forest on the top

Amphiblemma spec. nov.

Acknowledgements

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