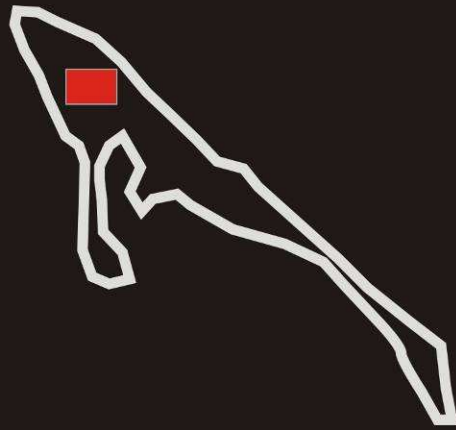


The Biodiversity
of



Mt Mekie



Missouri Botanical Garden

The biodiversity of Mt Mekié

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Missouri Botanical Garden
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Prologue

Missouri Botanical Garden was awarded a Central African Regional Program for the Environment (CARPE) subcontract from Conservation International (CI) to perform a series of tasks.

One of these tasks was defined accordingly:

- Re-evaluate the "Séries de Conservation" in the ERZ: logging Rougier

During this fiscal year Missouri Botanical Garden (MBG) has executed botanical activities in the landscape assessing the plant biodiversity of Mt Mekié.

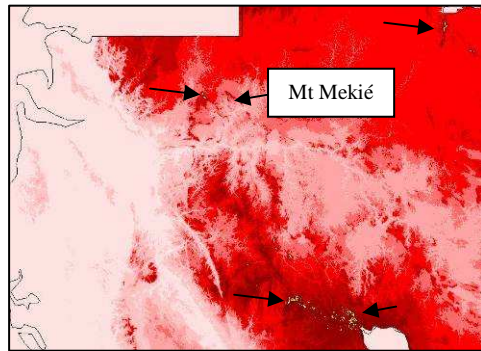
Miguel E. Leal

December 2008

Introduction

Mekié

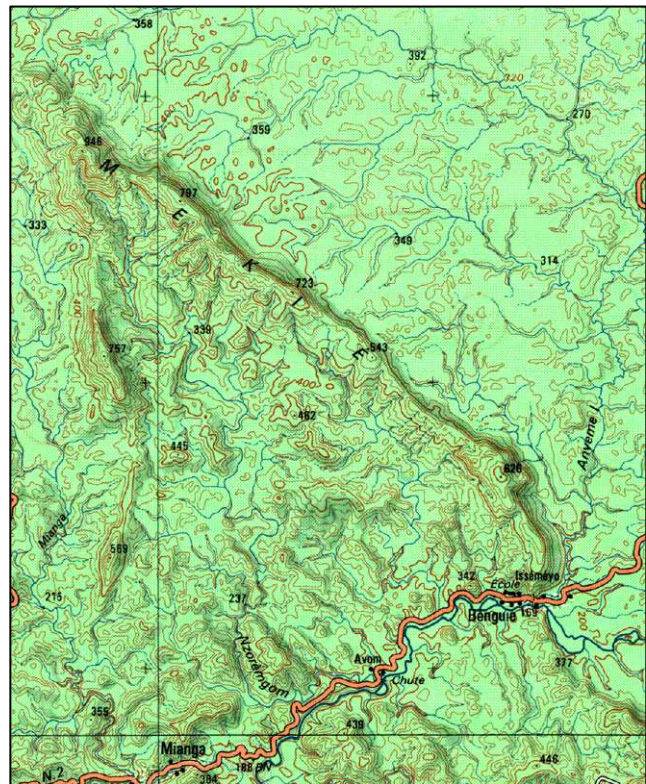
Mt Mekié is an isolated mountain range with an altitude reaching almost 1000m. This kind of mountainous habitat is rare in Gabon and experience has taught that these summits may be inhabited with rare and endemic species like in other parts of the MAMCI landscape. The range lies isolated on the interior plateau and it is relatively dry but surrounding plateau is even drier.



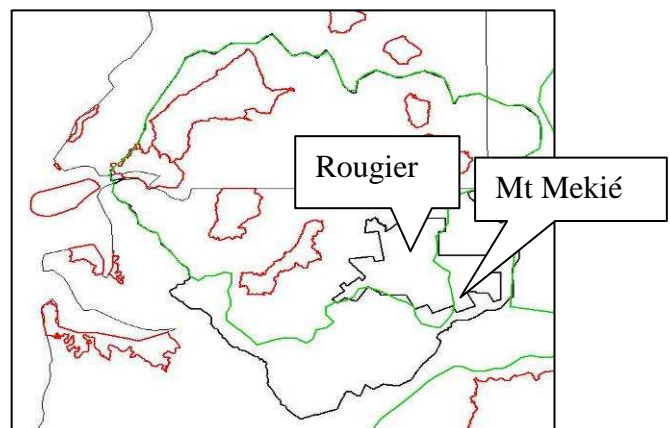
Map 2. Altitude in Gabon, areas of 1000m in yellow and indicated by arrows are; pink: 200m>, red: 300-500m, dark red : >500m .

Mt Mekié was initially not part of the Monte Alen Monte Cristal Inselberg (MAMCI) landscape, until recently the landscape limits were altered (see map 3).

Map 3. New landscape limit (outlined in black) and the location of Mt Mekié, and Rougier, old limit in green and parks in red.



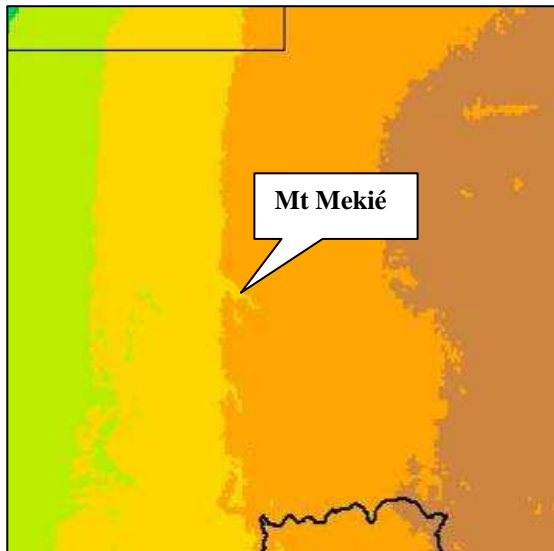
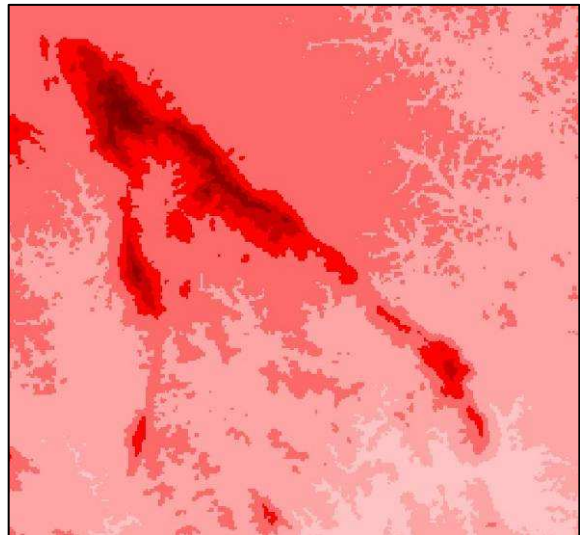
Map 1. Mt Mekié



Geomorphology

The Mt Mekié range clearly sticks out on the interior plateau (around 300m) The highest summit almost reaches 1000m and the main ridge going south east has an altitude between 700 and 825m. Slopes on the east side are steeper than on the west side, but still inclined at 45 degrees. Valleys tend to be narrow at the steep slopes and gradually widening towards the foothill.

Map showing the Mt Mekié Range. Source SRTM



Rainfall

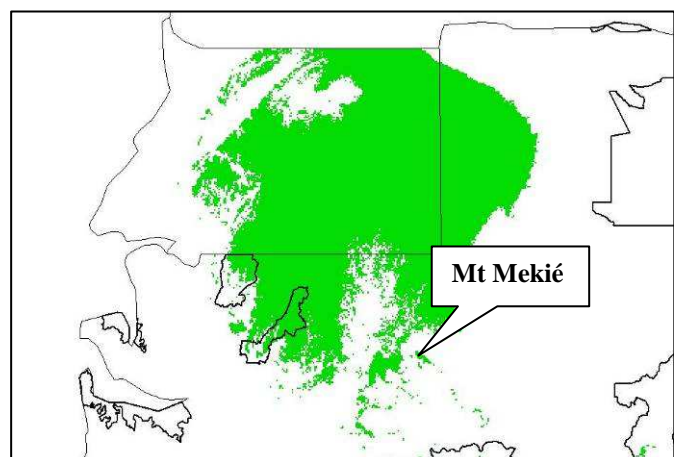
the extra input of rain fall by the orographic effect is clearly visible at Mt Mekié. Its protruding elevation augments the mean annual rain fall above the region zonal amount on the plateau. The higher altitudes receive between 1950 and 2000mm per year, whereas on the lower altitudes it drops below the 1940mm. But biodiversity may potentially be high, because the streams originating from the range irrigate the surrounding plateau, and counteracting drought stress.

Mean rainfall in north east , (gradient from dark green to orange= wet to drier. Source Worldclim Hijmans et al. 2005

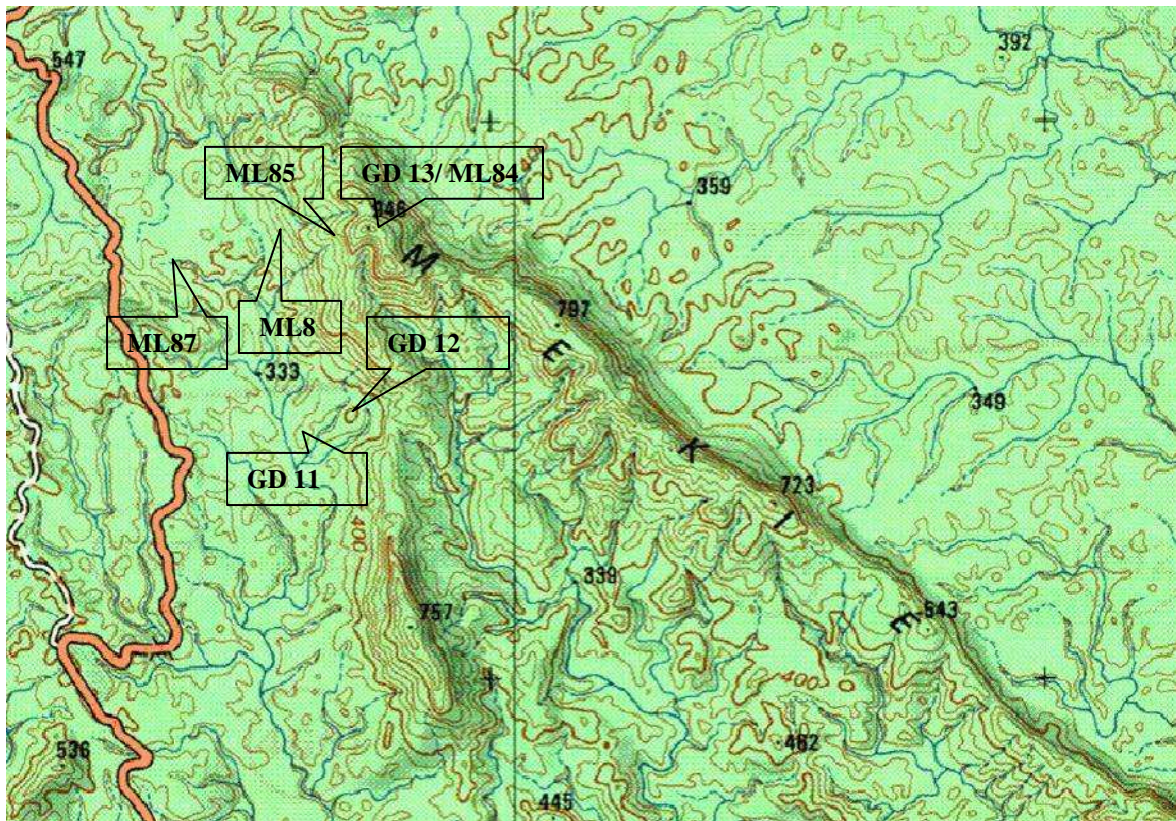
Pleistocene forest refugia

By overlapping areas with mean annual rainfall above 1800 mm and an altitude above 500m, the so-called humid forest refuge areas are identified. These refuge areas are drier than the wet refuge areas receiving >2300mm of rain fall.

Therefore, these forests are predicted to be lower in species richness, but they still are a conservation priority because rare and endemic species may occur.



Map of Gabon showing the humid (>1800mm) refuge areas (light green).



Map showing the transects (TR) above.

Transect layout

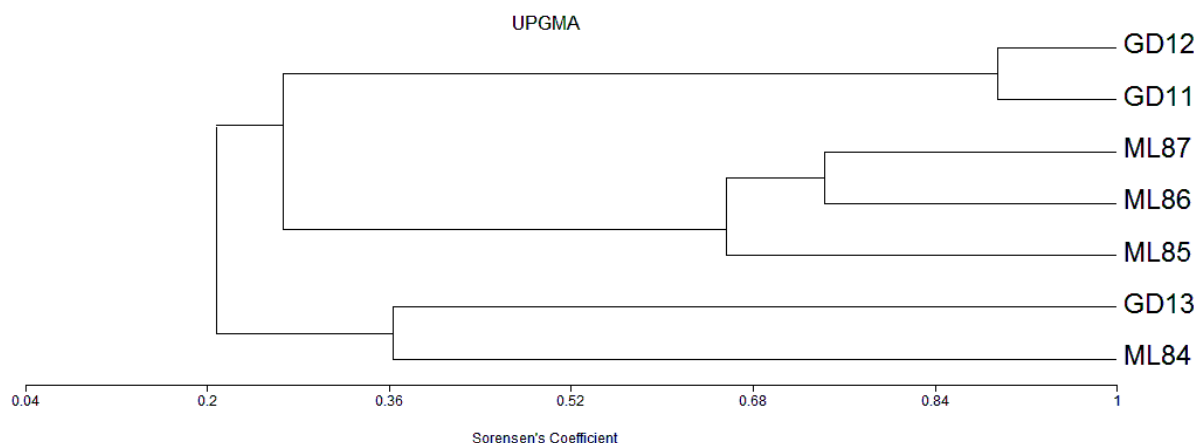
Topography and altitude are strong driving forces for species composition, and transects were placed along the altitudinal gradient on the west side.

In this particular case two different sampling methods were used. G. Dauby recorded species in one type of habitat (GD11, GD12, GD13), whereas M. Leal records species over a local moisture gradient at one altitude, sampling more habitat to minimize replication and to inventory at a catchment level (ML84, ML85, ML86, ML87). Therefore, the outcome of the GD transects and ML transects may reveal different biodiversity characteristics.

G. Dauby put in transects that the highest summit (GD13) and further away from the summit in to the south at 400m (GD11, GD12). M. Leal also put in a transect at the summit (ML84) for comparison with GD13, and further transects along the western slope at 700m (ML86) and 500m (ML85) and on the plateau (ML87) further to the west.

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 coefficient in a multivariate analysis, UPGMA.



Mt Mekie	GD11	GD12	ML 87	ML 85	ML 86	ML 84	GD13
altitude	360m	390m	400m	500m	700m	940m	940m
individuals	85	75	53	90	78	113	131
species	49	43	31	45	47	24	21
endemic	29	25	13	32	30	19	15
endemic%	59.2	58.1	41.9	71.1	63.8	79.2	71.4

Results

General characteristics

GD

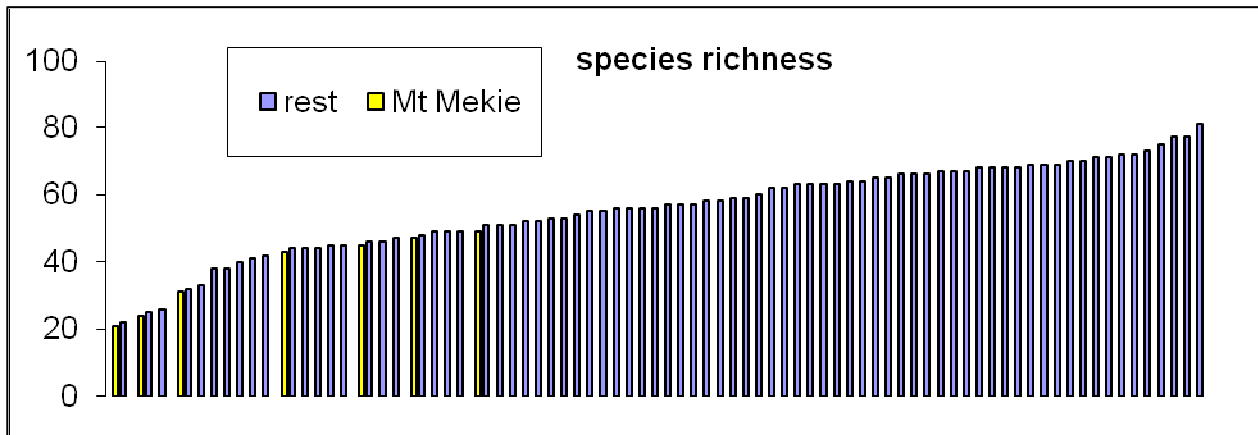
In total 90 species were recorded on 3 transects. On average 37 species were present on a transect and differences between the 3 transects were mainly between the transect on the summit GD13 and the other two transects on the lower slopes (GD11, GD 12).

The summit transect is very different in the sense that it is species poor (21 species) with many individuals (131). Especially, *Garcinia smeathmanii* was very abundant (56 individuals). Species restricted to a single transect (endemic) was lowest on the summit transect (GD13) with only 15 species, but in terms of percentage it had the highest value (71.4%). This is mainly because the other two transects on the lower slope shared 15 species and only 4 species with summit transect.

ML

In total 115 species were recorded on 4 transects. On average 37 species were present on one transect. The main difference was between the transect on the summit ML84 and the other three transects lower along the western slope (ML85, ML86 and ML87). Surprisingly, the transect at 700m (ML86) was more similar in species composition with the one 400m (ML87) at than with the transect at 500m (ML85), despite the longer distance and the difference in altitude.

Also ML84 on the summit was very different and species poor (24 species) with many individuals (113) like GD13. Again, *Garcinia smeathmanii* was very abundant (49 individuals). Otherwise, species restricted to a single transect (endemic) was higher on the ML transects than on the GD transects. ML87, the transect in the lowland was the one with only 13 species, and in terms of percentage it had the lowest value (41.9%).



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

Discussion

Species richness

In terms of species richness Mt Mekie was the site with the lowest values. In particular, the summit of Mt Mekie had the lowest ever recorded species richness on all the transects in Gabon. The two transects also have the highest recorded abundance of a single species on a transect, *Garcinia smeathmannii* with 56 and 49 individuals on GD13 and ML84, respectively. There were no striking differences in bedrock between the summit and its slopes. Therefore, it is more likely that a freak event in the past like several large tree falls due to a storm may have facilitated this species to become dominant at the summit.

Similarity

Both transects at the summit (GD13 and ML84) clearly grouped out from the rest, showing that the species composition on the summit was clearly different from rest. A bit worrying is that the next split is between the transect done by the GD method and the ML method. The only other reason beside the sampling difference could be species turnover with distance as there is a some distance between the GD transects and the ML transects.

It remains unclear why ML86 at 700m showed more similarity in species composition with ML87 in the lowland than with ML85 at 500m close by. For conservation the mid altitude zone between 500 and 700m is important as it was the most species rich, and although the summit and potentially the main ridge are relatively species poor it is also the habitat with the new and endemic species (see below).

Conclusion

The biodiversity on the Mt Mekie is below average compared at a national level, but the new endemic species on the summit also shows that these forests nonetheless have been stable in the past and hence will to a certain extent be climatically resilient in the future. Protecting the forest on this range will also indirectly protect the biodiversity on the plateau as the streams running down from these hills will also supply the riverine forests with additional water, and hence some protection against drought stress.

General collecting

More than 150 species were collected (Leal *et al.* 2174-2296 and Dauby *et al.* 125 specimens), their full identification is still pending and field notes are being entered into the database.

Several rare species were encountered like *Anonidium floribundum* Pellegr., and the liana *Monanthotaxis le-testui* var. *hallei*, two endemic species of Gabon. And it is already clear that a new species of *Calvoa* (Melastomataceae) has been found. We also collected the second specimen of a still undescribed *Keetia* species (Rubiaceae), which was known only from Ivindo before.



Another remarkable observation was that there were very few orchids in the canopy, which indicated to dry atmospheric conditions.

Keetia spec.
nov.

Acknowledgements

This project was funded by USAID's Central African Regional Program for the Environment in collaboration with the Conservation International, and the Rougier Gabon. We thank Olivier Lachenaud for the identification of several specimens of G.Dauby collection. The head of sustainable management, Eric Chezeaux is accredited for organizing the permission to access the concession to do this mission.