The Biodiversity of Bouvala
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Prologue

Missouri Botanical Garden was awarded a Central African Regional Program for the Environment (CARPE) subcontract from the Wildlife Conservation Society (WCS) to carry out botanical expeditions to identify Biodiversity Sanctuaries for micro-zoning in the Massif du Chaillu landscape.

During this fiscal year Missouri Botanical Garden (MBG) has started the botanical survey of the flora around the Birougou National Park by assessing the plant diversity of the Bouvala area and the Mont Songo one of the highest areas in the Massif du Chaillu landscape.

The results and observations are presented here.

Tariq Stévart & Miguel E. Leal

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Introduction to Bouvala

The Massif du Chaillu is the largest elevated area (500m<) in Gabon and along with Belinga Mountain, one of the highest areas of Gabon. Despite the fact that it was recognized by different authors as a refuge area with a potentially high diversity of plant species, it remains poorly known and unexplored. Elevated areas in Central Africa are known to be centers of diversity and were proposed, according to different authors, as Pleistocene Refugia. These postulated refuges are key places for allopatric speciation and generally host a high number of endemic species (plants, reptiles, etc). They are therefore of high conservation concern. Extensive explorations in the Massif du Chaillu by MBG have been focused mainly around the Waka NP over the last few years. We now start gathering data to evaluate the biodiversity around Birougou NP. The area NW of Birougou NP was targeted first as it is the only part of this region easily accessible and also because there is no data on the forest exploitation in the area. Our biodiversity assessment aimed firstly to validate whether the forest was still botanically valuable for conservation, and also because of the recent discovery of *Begonia thomensis* in Gabon (a former endemic from Sao Tomé) which indicates to the potential high value of the area for the conservation of the Gabonese flora.

The Bouvala mountain massif is situated between Mont Birougou NP and Waka NP, east to the village of Dibandi. The Mont Songo reaching 1022 m, is the highest peak, and also the highest summit of the Massif du Chaillu landscape. Mean annual rainfall in the area is between 2000 and 2300mm. There is a probable orographic effect for the Mont Songo due to its high altitude. Slopes close to the top are very steep; slopes at the west bottom are almost flat. East to Mont Songo, the Bouvala plateau lies above 800 m and dissected by several small streams and ravines. The west and east side of the Bouvala Massif were studied.
Results

General characteristics
A total of 255 species were recorded. On average 66 species were present on a transect and differences between transects were low (except for Tr74 in the valley). The highest score was 75 morpho-species on Tr72 (Mont Songo) and the lowest, 55 species on Tr74 (valley). The average number of trees on a transect was 136 individuals and much lower in Tr74 (valley). Alpha-diversity was highly variable among transects (between 40.5 and 64.9). Higher values were encountered on Mont Songo (Tr72), and on the plateau in East Bouvala (Tr77). Unbiased diversity index was higher for Tr75 and Tr76.

<table>
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<th>Transect</th>
<th>spp</th>
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<td>66.83</td>
<td>136.17</td>
<td>52.77</td>
<td>40.58</td>
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</table>

The Euphorbiaceae, Burseraceae, Caesalpiniaceae were the dominant families in terms of individuals while *Santiria trimera* (Oliv.) Aubrév., *Pentadesma grandifolia* Baker f., *Garcinia conrauana* Engl. were by far the dominant species overall. These species are typical from submontane vegetation types.
Similarity
The cladogram shows that the transect on the summit of Mont Songo and on the eastern ridge are different from the others transects in species composition. The transects of on each plateau (800 – 860 m) are most similar, and so the transects in the valley (625 – 680 m). On the east side the transects (Tr75, Tr76, Tr 77) show a higher similarity with each other than with the transect close to Mont Songo (Tr72, Tr73, Tr 74).

Discussion
Similarity
The similarity in species composition between the west and east side of the Bouvala massif is relatively low, as they did not group together, which means that species turnover with distance is high. On other observation is that the transects on more exposed places like the summit and ridge are significantly different from the transect at a lower altitude but at a relatively short distance.

Species richness
In term of species richness some of the transects in Bouvala have the highest values recorded for all transects in and around Waka NP and also the average of around 67 is higher, 64 and 55 for transects in West Waka and NE Waka. In terms of fisher-alpha diversity, the Bouvala transects only have an average diversity compared to all other transects in the region There is no clear indication that transects from one end of the massif are richer than the other or that transects at higher altitude are richer than the lower ones.
Conclusion
The biodiversity of the Bouvala area was assessed to identify botanically interesting forests outside the park as compensation area for the logged part of Waka National Park and Birougou National Park. This assessment showed that this mountain massif harbors a rich submontane forest indicated by the presence of *Pentadesma grandifolia* Baker f. and *Garcinia conrauana* Engl. In species richness several transects had the highest values recorded for the region, but in alpha fisher index values only average. This area could be proposed as a submontane sanctuary because it harbors non logged vegetation rich in rare and endemic plant species.
General collecting

Full identification of the 221 specimens collected during this mission is still ongoing and revealing some interesting findings. One of them is the rare liana *Begonia thomeana* C.DC., collected for the first time in Gabon in February 1983 which was at that time endemic to the island of Sao Tome in the Gulf of Guinea (see inset). It is now collected for the second time in Gabon on Mont Songo, one of the two sites surveyed during this mission.

Several specimens of rare submontane plants were collected, among which *Voyeria primoloides*, a saprophytic herb that grows only in places with a lot of light, usually near summits and ridges.

![Begonia thomeana](image)

*Begonia thomeana*

The Rubiaceae family was the dominant family in terms of frequency in the under storey. In this family, we collected *Chassalia tchibangensis* Pellegr., endemic to Gabon, which was only known from three specimens in the checklist of Gabon (Sosef et al, 2006).
Orchid diversity in Bouvala area

A total of 44 orchid taxa were collected during our survey of the Mont Songo Mountain representing 18% of the orchid known from Gabon. We also collected two rare orchid species which are endemic to the West Central Africa: *Polystachya bipoda* Stéwart, limited to the submontane forest that occurs above 600-700 m in North Gabon, Rio Muni and South Cameroon. In Gabon, it was also collected on Mont Mbilan and Ngol Maduaka. The other species is *Eggelingia gabonensis* P.J.Cribb & Laan, a tiny orchid restricted from south Cameroon to North Gabon. The two specimens collected in Ngol Maduaka were growing in the upper part of the canopy in a narrow valley.

We also collected two orchid species that are new for Gabon: *Polystachya riomunensis* Stéwart & Nguema and *Tridactyle anthomoniaca* (Reich. f.) Summerh. subsp. *nana* P.J.Cribb & Stéwart. *P. riomunensis* was only known from Rio Muni (Monte Alen NP). Its ecology remained unknown and hence its conservation status could not be assessed until now. The species occurs frequently in the Bouvala area along streams and in swampy areas. *T. anthomoniaca* var *nana* is a typical species of the submontane forest of Central Africa. It is quite common in this vegetation type in Cameroon and Rio Muni, but its area of occurrence is quite limited. Finally, we collected a species of *Angraecum* (Orchidaceae) close to *A. pyriforme* in the wettest ravines of the area. It differs from all others *Angraecum* from central Africa and may be a new species.

Potential distribution maps of these species were created using a GIS analysis based on 20 climatic layers (see next page). This method is used to predict potential area of occurrence and therefore helps to assess their conservation status. Compilation of these maps is a tool to identify areas of endemism and sites of concern for the conservation. Both species are endemic to the West Central Africa and seem to be restricted to mountain area and overlapping with the postulated forest refugia (their potential distributions are shown below).
Potential distribution map of *Tridactyle anthropomoniaca* (Rchb. f.) Summerh. subsp. nana P.J.Cribb & Stévart (map made by Vincent Droissart, ULB). Triangles indicate points used for modelling. Darker colours show areas with better predicted conditions.

Potential distribution map of *Polystachya riomuniensis* Stévart & Nguema (map made by Vincent Droissart, ULB). Triangles indicate points used for modelling. Darker colours show areas with better predicted conditions.
Acknowledgements

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References

