FRB
FONDATION POUR LA RECHERCHE SUR LA BIODIVERSITÉ

CESAB
CENTRE FOR THE SYNTHESIS AND ANALYSIS OF BIODIVERSITY

Project summary

RAINBIO

African biodiversity dynamics: Interactions between ecological processes and conservation actions

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As a result of climate change and anthropogenic pressures such as deforestation for timber exploitation or urbanization, Africa's tropical rainforests are undergoing major changes. In order to be able to effectively preserve these fragile environments with a high diversity of species, it is essential to be able to assess their current state and estimate their evolution in the coming years.

Context and objectives

Sustainable management of an environment requires a complete and up-to-date database on the abundance, nature and distribution of the species present in this environment. These information can be linked with other factors to develop models and scenarios. As for Africa's tropical rainforests, a large amount of data has already been collected, but these remain difficult to access and incomplete.

The project Rainbio aimed to fill these gaps:

- By creating and maintaining a free database of African tropical plants and compiling existing data from public or private sources.
- By analysing metadata in order to be able to accurately generate scenarios on the biodiversity dynamics of tropical rainforests in Africa.

This involved, on the one hand, identifying areas of «high research priority» for which data are currently insufficient, and on the other hand, defining regions with «high conservation priority» that were likely to experience major changes.

Methods and approaches used for the project

CESAB has brought together a wide range of skills and expertise on the Rainbio project: botanists, specialists in modelisation, paleoclimatologists, population geneticists and phylogeneticists. They collected and compiled information from 13 databases, representing more than 600,000 data on 22,000 species. The Rainbio team proceeded to clean up, standardize and verify the quality of the data obtained. The information was then analysed and compared with the statistic software R in order to establish models and scenarios.

Principal conclusions

The information collected through the Rainbio project provides a better understanding of the dynamics and distribution of vegetation in Africa's tropical rainforests.

First, the inventory of species present in Africa's rainforest made it possible to identify different bioregions, territories determined according to the communities of species present. Among the main results obtained within the framework of Rainbio:

- A total of 16 bioregions have been identified in tropical Africa. This information confirms previous analyses, while supplementing them. New regions have emerged, such as Sao Tome. Others have been redefined with more precise information, particularly in West Africa.
- Lower Guinea (3b) is the bioregion with the greatest diversity of vascular plant species (classification grouping all sap plants, excluding in particular mosses, fungi and certain algae). A high level of plant biodiversity is also observed in East Africa (regions 2 and 7).
- Herbaceous species of shrubs dominate all bioregions, particularly in dry areas. Not surprisingly, trees are mainly found in forest regions.
- The bioregions identified are distinguished from each other by the biological types of which they are composed (trees, vines, herbaceous plants, etc.). While trees are characteristic of forest areas, herbaceous plants make it possible to distinguish different bioregions in East Africa and bushes, distributed throughout the country, provide more general information.

The identification and study of these bioregions allowed us to identify areas of low diversity, areas where important species turnovers are observed, or areas with vegetation that differs from the surrounding regions.

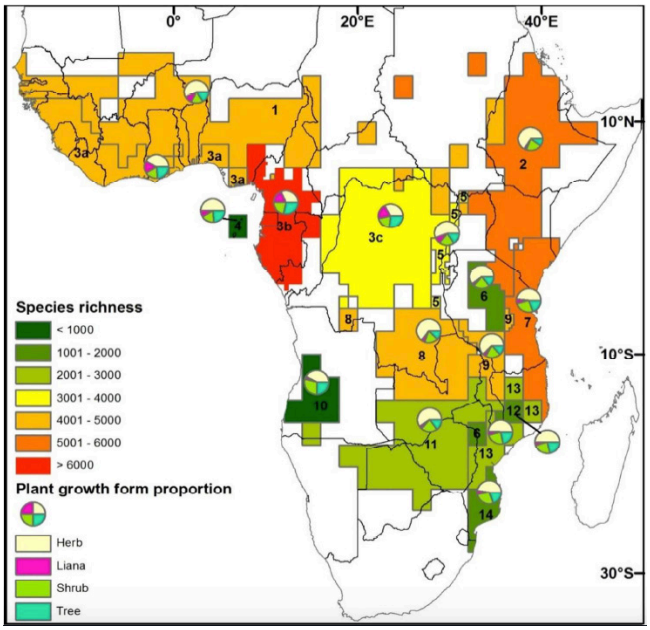

Figure : Plant species diversity patterns for the 16 bioregions of tropical Africa[1].
Pie charts indicate for each region the proportion ofherb, tree, shrub and liana species. The colour indicates the range of species richness per bioregion.

Anticipated (or actual) impact of these results for science, society, and public and private decision making

The Rainbio project has made it possible to:

- Make available to scientists a database containing all the current knowledge that has been collected on the flora of tropical rainforests.
- Draw up an inventory of biodiversity in this area.
- Define bioregions according to the types of plants and plant groups most commonly present. This is the most comprehensive bioregion census established to date.
- Identify sensitive areas characterised by a high proportion of threatened species, and those where major changes are to be expected in the coming years, such as species loss, migration or substitution. These changes are likely to have significant ecological but also economic impacts, particularly with regard to timber exploitation - through a reduction in the number and nature of species present.
- Establish exploratory scenarios of the evolution of biodiversity in these regions in order to be able to make informed and adapted decisions. Among the influencing factors studied for the scenarios, we can mention the use of fossil or renewable energies, or the possible implementation of a sustainable forest management policy.

Rainbio results confirm the importance of rapidly implementing sustainable management solutions that will conserve the high-biodiversity of African tropical forests. A better understanding of the effects of climate change and anthropogenic factors on the biodiversity of African tropical rainforests promotes the development of appropriate and large-scale conservation policies. The data from Rainbio can be used to limit the effects of climate change on Africa's rainforests, prepare people for climate change and anticipate its effects.

For more information about Rainbio: http://rainbio.cesab.org

1. Droissart V, Dauby G, Hardy OJ, Deblauwe V, Harris DJ, Janssens S, MacKinder BA, Blach-Overgaard A, Sonké B, Sosef MSM, Stévart T, Svenning JC, Wieringa JJ & Couvreur TLP (2018) Beyond trees: Biogeographical regionalization of tropical Africa. *Journal of Biogeography*, **45**, 1153–1167. doi: 10.1111/jbi.13190.

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