Project summary

AFROBIODRIVERS

African biodiversity dynamics:
interactions between ecological
processes and conservation actions

Principal Investigator: **Hervé Fritz (CNRS)**

Start and finish: **2012-2016**

Co-funding organization: **Région PACA**

While Africa has been home to exceptional biodiversity so far, the proven decline of its large, iconic mammals represents a significant ecological and economic threat to most countries of the continent. The AfroBioDrivers project provides tools to better understand and anticipate these declines in order to put in place sustainable protection solutions.

Context and objectives

Mammal populations do not move in the same way across regions and countries. In southern Africa, after spectacular extinctions in the 19th century, the effectiveness of the reintroduction and protection measures put in place has led to an increase in the numbers of emblematic species, particularly white rhinoceros and elephants, as well as many species of antelopes. Conversely, in other regions these populations are experiencing declines, particularly in East Africa and West Africa, where the situation seems to be the most worrying. While there are a lot of data in sub-Saharan Africa, those for Central and West Africa are scattered, heterogeneous and have never been published in detail.

The aim of the AfroBioDrivers project was to fill this gap by analyzing the profiles and processes that led to changes in the status of large mammals in Central and

West Africa. This would allow an assessment of the influence of various ecological and anthropogenic factors on these populations, in order to be able to contribute effectively to the monitoring and the policy of management of the biodiversity in these regions.

To do this, the Afrodrivers project set itself the following objectives:

1. to gather all existing data and set up a database that can serve as a monitoring and management tool,

2. to improve methods for analyzing spatial and temporal trends of populations,

3. to identify the main drivers of change, both ecological and anthropogenic, by analyzing and modeling long-term trends, and

4. to develop decision support models for conservation.

Methods and approaches used for the project

CESAB offers ideal conditions for researchers; it brings together scientists with complementary profiles supported by a postdoctoral fellow who devotes his energy to the service of the full-time project. AfroBioDrivers has therefore been able to increase the amount of information available on large mammal communities. The team was able to analyze and link data from four different counting methods (air / ground / sample / exhaustive) using Bayesian models, with the specificity of correcting each method. CESAB is thus responsible for archiving unique and irreplaceable data accessible in the form of metadata through a portal. This database can be updated by other data producers on wild mammals in West and Central Africa to get a better picture of the status and trends of these populations.

Principal conclusions

One of the objectives formulated under the Aichi Convention requires the increase of protected areas. However, this strategy can lead to the creation of «paper parks», areas theoretically protected «on paper», but which do not have the means to implement these ambitions. This explains why some «protected» areas are still suffering a significant decline in numbers of large mammals; this is particularly the case for the majority of protected areas in Central and West Africa, such as the North Central African Republic [RCA] and Waza (Figure 1 bottom), whose dominant species are declining or even disappearing.
In other areas, on the other hand, protection against hunting and poaching has had very positive effects, resulting in the maintenance or substantial increase in numbers. This is notably the case of the buffalo in the Zakouma site in Chad (Figure 1 top), whose population has increased from 1000 to about 10,000 individuals, and six species of medium-sized ungulates, despite a collapse of elephant populations since the year 2000.
On other sites as Nazinga Burkina, W National Park of Niger and Comoé Ivory Coast), the number of dominant species remain.
Effective hunting management and anti-poaching systems are key to limiting or reversing the decline of large mammal populations.
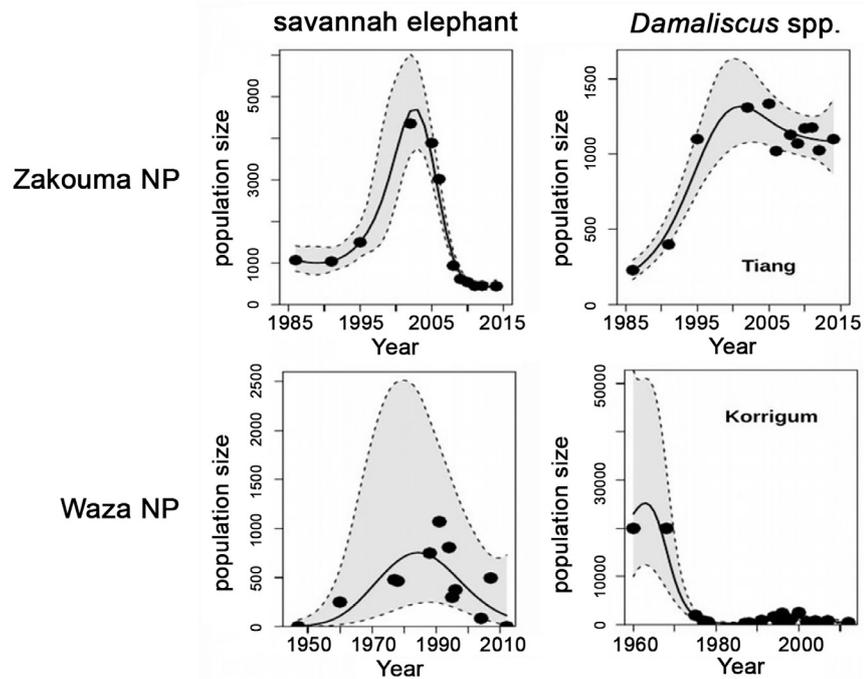
Figure 1 - <u>Top</u> : Zakouma National Park (Chad). The african savanna elephant (*Loxodonta africana*) and the red-fronted gazelle (*Gazella rufifrons*) have suffered a collapse of their respective populations since the year 2000. Populations of dominant species, for example two species of antelope (e.g. *Damaliscus lunatus tiang*) (right) and the buffalo (*Syncerus caffer*) increased by a factor of about ten between the 1980s and the 1990s. Four other ungulates did not show a significant change in population.
<u>Bottom</u> : Northern Central African Republic (Waza National Park). The populations of elephant and all the antelopes collapsed from tens of thousands of animals to a few hundred between the 1960s and the 1990s.
The models used are semi-parametric spline models of the GAM family. All results are statistically significant

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

Most of the data collected for the AfroBioDrivers project was archived on behalf of government departments, who supported the project by providing a copy of the historical data. Among the data collected, some are only available at CESAB, the non-computer originals having been burned during recent events. Part of the CESAB database is freely accessible and the other subject to the agreement of the authorities or the producer (NGOs, cooperative agencies, etc.). A computerized copy of the metadata is made available to the competent authorities managing the protected areas. These data can be consulted and supplemented for monitoring management of African mammal populations.

The results of the AfroBioDrivers project have helped to strengthen actions relevant to conservation in Africa by demonstrating the following three points:

1. Different methods can ensure the effectiveness of protected areas, from intergovernmental support for ecotourism (Zakouma, Chad) to the integrated use of wildlife at the village level (Nazinga, Burkina). These solutions must be adapted to each site according to the human populations involved.

2. The populations of large mammals in West and Central Africa can be maintained or even strengthened if long-term conservation measures are applied.

3. To ensure the protection of an area, the quality of management of protected areas is more important than their extent. The Aichi Protocol has suggested an increase in the size of protected area, but limiting these areas while strengthening their protection could be a better strategy in this part of the world.

The project led to the implementation of a new, innovative and effective heterogeneous data analysis methodology that offers new perspectives in wildlife monitoring.

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