Project Update: March 2019

1- Brief description of the project

As a reminder, in September 2018, the project that aimed to evaluate the effect of low seedling densities on the dynamic and viability of *Adansonia perrieri* and *Adansonia suarezensis* population has been approved for funding by Rufford Foundation small grant. Specifically, our objectives are: (1) to assess the stability of the population dynamics in equilibrium; (2) Identify if baobabs studied are at absolute risk of extinction in the future; (3) Identify the consequences of low seedling recruitment on vital rate of baobab from sensitivity analysis; (4) Identify if seedling herbivores have a significant effect on seedling recruitment and should be considered in the conservation measure; (5) to propose conservation solutions.

The two species studied have a restricted distribution in northern Madagascar, both are classified as Endangered by IUCN. Data obtained from the satellite images made by Vieilledent et al. (2013) showed that there are only 99 individuals of *A. perrieri* and 150.000 individuals of *A. suarezensis*.

In this report, we will give some progress of the project.

2- Co-funding and collaboration

In the framework of the correct working of the project, I'd like to inform you that additional funding has been obtained from the British Ecological Society (BES) under Ecologists in Africa grant programme for carbon dating. The purpose is to find out the age structure of the actual baobab population. This information is essential for the construction of the matrix data on the viability of baobab species studied.

Moreover, we are now working in collaboration with the NGO Madagasikara Voakajy (MaVoa) researchers who also have baobab conservation actions in northern Madagascar. This collaboration will be very useful especially on the implementation of the recommendations for the conservation, in particular on the ecological restoration of the baobabs.

3- Activities

The first field trips were made when the rain weather really started in January and February 2019. A total of six sites were visited:

- The botanical trail and a fragmented forest of Ambondromifehy (E 049°13.559', S 22°51.875') as well as Matsabory Maika forest (E 049°13.886, S 12°51.294') for *A. perrieri*.
- Mahory (E 049°25.556', S 12°82.161') and Betsipotika forest (E 049°25.556', S 12°82.161') as well as the new protected area Montagne des Français for *A. suarezensis* (E 049°20,155', S12° 10,002')

Diameters at breast height (DBH) of adult baobabs populations were taken; seed production and seedlings were counted. A total of 83 seedlings were labeled for monitoring (60 for *A. suarezensis* and 23 for *A. perrieri*) (Fig. 1, 2, 3). During the fieldwork, two paraecologists with good knowledge of the forest and baobab were hired and trained to follow the seedlings once a week. The parameters they will be noted are the approximate age, the phenological stage (leafy or deciduous), the health status (sign of disease or wilting, dead); the sign of predation of the seedlings

and their behavior if observed. For this, paraecologists have been equipped with smartphones to take photos of their follow-up and to be able to take pictures and send photos via mobile internet.

Figure 1: A few days old seedling of *A. suarezensis*

Figure 2: Three-months-old seedling of A. perrieri

Figure 3: Observation and labeling of seedlings

4- Preliminary findings

A total of 24 adults from three populations of *A. perrieri* and 60 adults of *A. suaresensis* from three populations have been identified. The most of the trees belong to the 150-200 cm diameter class for *A. suarezensis* (53, 33% of adult trees) against 90-120 cm and 150-200cm for *A. perrieri* (respectively 33, 33% and 25% of adult trees). There are no individuals belonging to the 10-30cm diameter class, which usually corresponds to the sapling stage in *A. perrieri* (Fig. 4, 5). The largest DBH range

for both species is about 200cm for both species. It suggests that most of the trees belong to the oldest age class.

For *A. perrieri*, only 23 seedlings were inventoried (Fig. 6). We found that the Mahory site is most suitable habitat to *A. suarezensis* (Fig. 7). The species has a normal curve of natural regeneration (inverse J curve) where there are more than 500 seedlings. However, the sapling number drops sharply, indicating high levels of seedling mortality (Fig. 5). In any case to our knowledge, this is the only natural habitat of baobabs known where there are saplings.

In disturbed habitat, there are no or little seedling inventoried like that of the case of Ambondromifehy (Fig. 8) and the one of the edge of the new protected area Montagne des Français. Indeed, these areas are points of passage of local population, cattle (especially zebu) and cart, which may kill the seedlings already fragile. Furthermore even in intact forests (Fig. 9), some trees produce no fruit or seedling. Only 25% of the tree produces seedlings in *A. perrieri* compared to 22.44% in *A. suarezensis*.

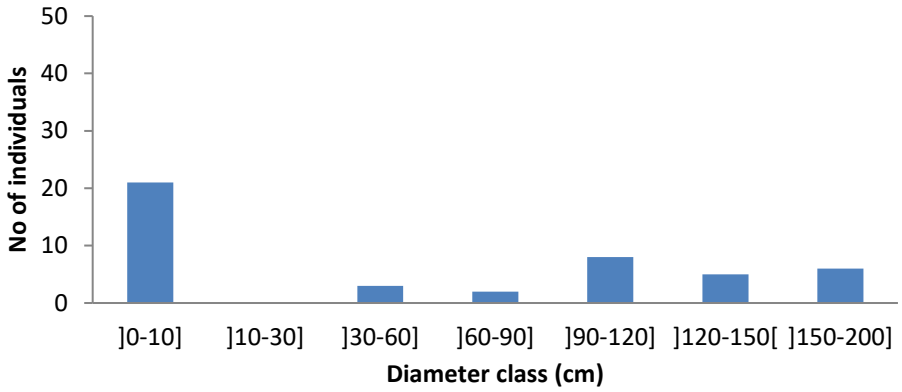

Figure 4: Diameter class distribution of *A. perrieri*

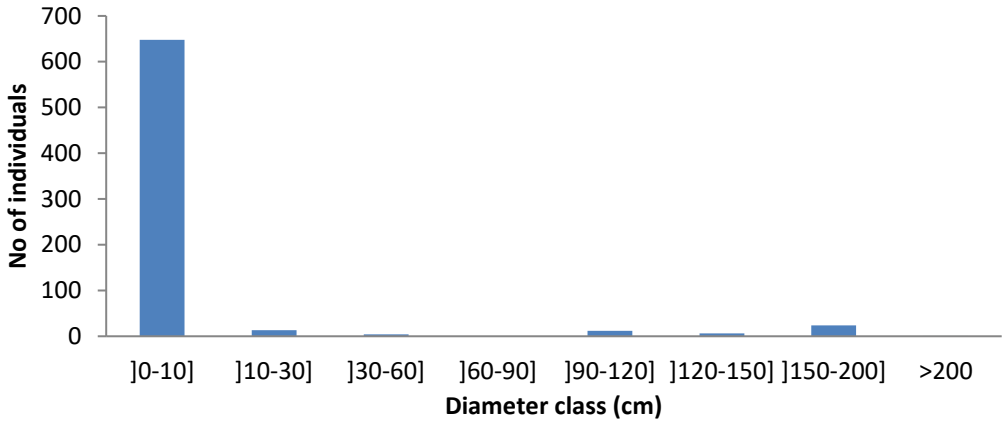

Figure 5: Diameter class distribution of A. suarezensis

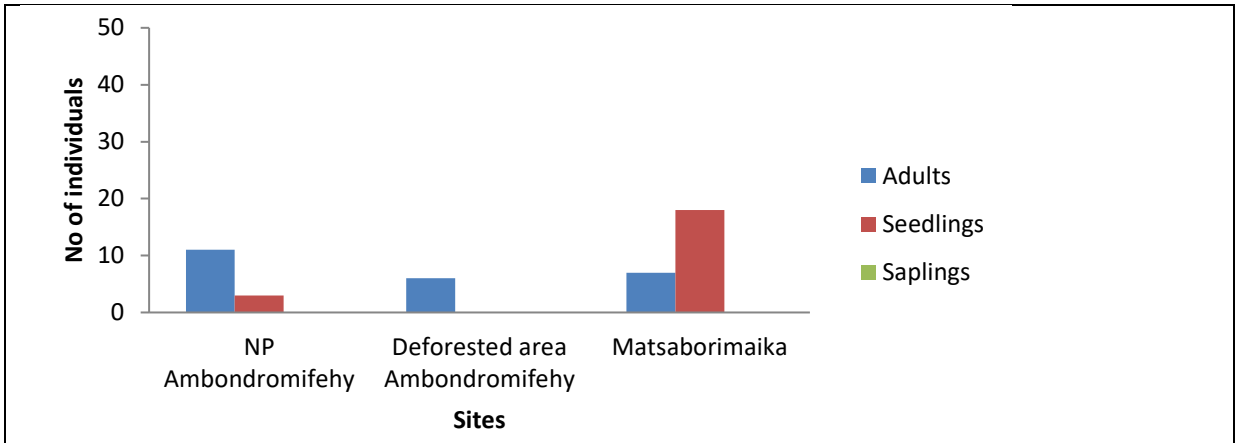

Figure 6: Adults and seedling density of *A. perrieri*

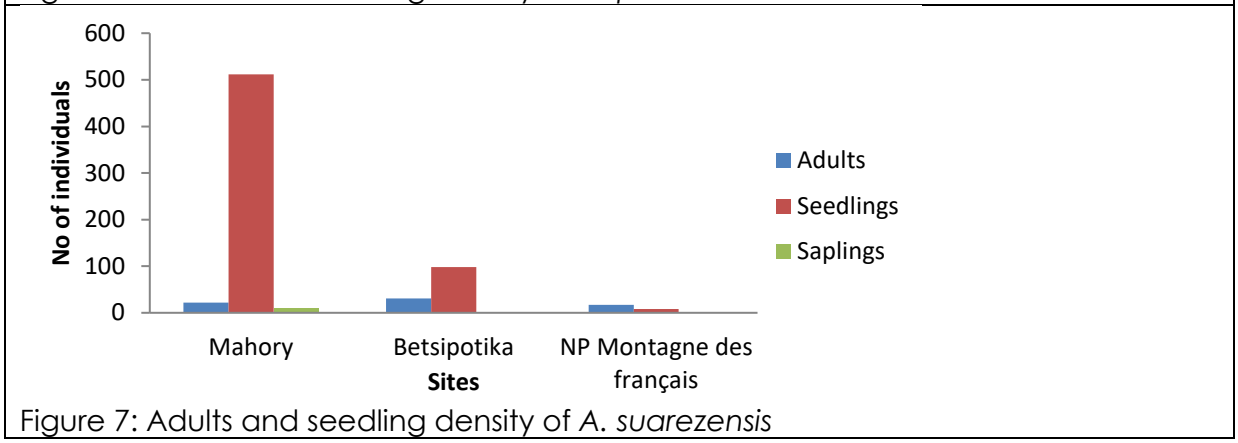

Figure 7: Adults and seedling density of *A. suarezensis*


Figure 8: Disturbed habitat of A. suarezensis in Ambondromifehy. Figure 9: Intact forest of Ambondromifehy.

Several threats to seed and seedling development have been identified. The seeds are eaten by insects inside the fruits (Fig. 10). The seeds germinate often in the wet fruit while it is not yet open (Fig. 11), letting little chance to seedlings to survive because: (i) they are not able to break the fruit covering, and (ii) they are too close to each other and are in competition for resources. Almost all identified seedlings

have leaves eaten by insects. We encountered snails in the site (Fig. 12) but had not yet seen them eating the baobab seedlings. After only a few weeks of follow-up, while the rainy season is not over, some seedlings are already dead.

For adult trees, the biggest threat seems to be old age added by bad weather. Several old baobabs are killed by lightning or by cyclones (Fig. 13).



Figure 10: seeds eaten by predator. Figure 11: young seedlings that have developed into a closed fruit.


Figure 12: Achatina sp. Figure 13: an old A. perrieri killed by a cyclone.

From these preliminary results, it is clear that there are some factors that limit seed germination and the seedlings development in baobabs. It appears that *A. perrieri* is much more threatened than *A. suarezensis.*

5- Next steps

The next steps of the project are:

- Remote collection of data from paraecologists planned for one year. The objective of the monitoring is to know the survival rate of the seedling and to identify the fruit predators as well as seedlings herbivore of baobabs.
- Data processing.
- Collection of core samples for radiocarbon dating planned for the dry season.
- Construction of Matrix of the Baobab Life stage taking into account the multiple limiting factors.