Final Evaluation Report

Your Details	
Full Name	Radosoa A. Andrianaivoarivelo
Project Title	Food resource dynamics and distribution of natural habitats may determine the panmictic population structure of Madagascar fruit bats and improve their strategic management
Application ID	39083-B
Date of this Report	26 July 2024

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Recognize the key information on what makes it possible for the bats to move through long distance separating the day roosts			X	
List of plants (endemic or native or exotic) used as food resources eaten by the bats as food sources during their movement			X	
Understand habitat types facilitating the movement of bats between distant regions			X	
Characteristic of diurnal temporary roosts used during the movement		X		Few temporary roost localities have been found because of the absence of information from the local villagers we surveyed and no *Rousettus madagascariensis* roost in the study region was found during this research
Recommendations for the conservation and management of natural sites useful for the survival the Madagascar fruit bats which contribute to the maintenance of the Madagascar ecosystem biodiversity,			X	

2. Describe the three most important outcomes of your project.

a) Data collected in the 10 localities (spaced 25 to 40 km from each other) showed that the Madagascar fruit bats exploit native and exotic trees for their survival. Fruiting and flowering plant they feed on are distributed in various habitat types, such as degraded forest, farmland or agricultural land left as fallow and gallery forest. These plants provide nutrient useful by bats during their movement between roosts. Nine and 11 plant species exploited during dry and wet seasons respectively. Degraded habitat with mosaic vegetation (mixture of exotic and native plants) exploited by bats are still rich in endemic plants and present various plants species (146 identified species of which 41% endemic and 20 species not yet identified).

b) *Pteropus rufus* populations decrease and our estimation of the actual population size ranges from 43 to 53 % left compared to the estimate size in 2000 (MacKinnon 2003). The major threats to fruit bats are overhunting at roost, habitat deterioration (feeding site cleared and fruit and flower plants food of bats become rare) and habitat loss (emergent trees used as dormitory site of *Pteropu rufus* being cut).

c) The vegetation cover between 2000 and 2023 at 12 sites inspected (remote sensing analysis) shows a reduction of between 25% and 45%, and this would have affected the abundance of fruit and flowers supplying fruit bats. This loss of natural habitats could be considered as a hypothesis for the reduction in the population size of these animals.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

The start of the project was delayed due to the unavailability of the students we worked with and the delay in acquiring the research permit, which led us to postpone the date of the first mission by 2 months. This did not affect the validity of the data collected, as the field season was still on schedule.

4. Describe the involvement of local communities and how they have benefitted from the project.

Local communities have benefited from this project in two ways. Firstly, by direct payment, in the field during each mission we recruited individuals of legal age to accompany us as local guides or assistants. Two to three people per site (11 sites in the project area) worked with us. As well, apart from being employed, they were

taught about Madagascar's bats and their natural environment, as well as the benefits of these animals and their differences from other animal groups. Short training courses on the breeding of animals for domestic consumption or for selling such as pigs and poultry were also carried out at the four intervention sites.

5. Are there any plans to continue this work?

Of the 20 roosts of *Pteropus rufus* and *Rousettus madagascariensis* known between 2000 and 2007, during the course of this project we worked on six and analysed the evolution of the populations over the last 20 years. To provide more reliable data on changes in population size, we suggest continuing research to investigate changes in at least 13 roosting sites (newly occupied, abandoned, or occupied all the time). Awareness raising campaigns for residents living in fruit bat habitat should be carried out, in conjunction with projects to strengthen communities in terms of subsistence or IGA. Certain practices should be banned, and existing laws enforced. For example, illegal gold panners started to live near two of the six roosts studied. The change of roosts and the reduction in the population sizes at these sites can be understood as the animals' response to the imminent hunting at their daily roost.

6. How do you plan to share the results of your work with others?

A workshop session of the data was conducted on July 11, 2024, in the conference room of the Regional Direction of the Environment (Menabe) in Morondava. Staff from the Ministry of the Environment, officials from NGOs in the region and students and teacher-researchers at IESM University attended the workshop. The presentation covers the current situation of fruit bat populations in the Menabe Region, the change in natural habitats used by these animals and the recommendations for the long-term management of these animals. The participants contributed actively during the question-and-answer session.

We plan to conduct the same presentation at the University of Antananarivo before the end of the year. However, we are in the process of carefully organising the data and publishing them in a scientific peer review journal.

7. Looking ahead, what do you feel are the important next steps?

- To stabilise populations in roosts. raising awareness among communities living in areas occupied by fruit bats to not to hunt them is crucial as well as the installation of awareness panels near roosts.
- Tracking the movement of individuals to assess gene flow between populations in various regions and at the same time the plants exploited and disseminated to elucidate the regional ecological role of fruit bats. To this end, I propose the use of satellite radiotracking.

- To provide alternative foods for bats so that they can ensure the genetic exchange of indigenous and/or endemic plants throughout the ecosystem of western Madagascar, we recommend to introduce into the annual reforestation plan the plantation of trees useful to fruit bats such as baobabs (*Adansonia* spp), kapok trees (*Ceiba pentandra*), sarongaza (*Colvillea racemosa*);
- Reassessment of other roosts with a population size greater than 350 individuals around the year 2000 and inventories of new roosts occupied by bats with a population size greater than 350 individuals.
- As we have observed a reduction in population size of approximately 50% in the region which may also be the case throughout the island, we suggest changing the status of these animals in the IUCN red list to endangered species is conceivable.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

- We use Rufford Foundation logo on the posters (A3 size) we posted in 5 villages in February. The poster informs the villagers about the Madagascar fruit bats, their role in the people's life and the ecosystem as well as the threat caused by the human.
- We also used the Rufford Foundation logo in a big poster we presented during the workshop in Morondava (at the conference room of the Regional Direction of the Environment) and in the PowerPoint presentation we used during this event.

9. Provide a full list of all the members of your team and their role in the project.

Name	**Role in the project**
Fanirisoa Manjaka Andrianarivony,	University student, collecting data (University of Antananarivo)
Harisson, Halidi O. A. S. Rifadhuddine	Organising the workshop event and preparation of the presentation (University of Toliara)
Harison Manitra Manoa,	University student, collecting data (University of Antananarivo)
Radosoa A. Andrianaivoarivelo,	Principal Investigator (Association Aro Velona and University of Antanaanrivo)
Ramanamidona Safidy Arny,	Technical and administration assistance (Association Aro Velona)

Bruno Andriamanantena	Chauffeur
Sabine Raheliarisoa	Technician and trainer in livestock and agriculture

10. Any other comments?

The bat roosts included within the limits of the protected areas seem to be better protected against poaching so that the population is almost stable, let us cite the example of a dormitory of *Pteropus rufus* in the forest of Ambondrombe the population size is between 1500 to 1700 individuals. The site is part of the Madagascar Protected Areas system. Only one visit during the dry period was carried out because access is not possible during the rainy period, however the other sites located in areas far from protected areas were visited twice and only include a few dozen and rarely a hundred individuals.

Finally, we would like to thank The Rufford Foundation and A Better Life for Children for the support necessary to carry out this project. The "Mention Zoologie et Biodiversité Animale, University of Antananarivo" provided us with the research permit and granted its renewal in February 2024.