The Rufford Foundation
Final Report

Congratulations on the completion of your project that was supported by The Rufford Small Grants Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Michela Balestri
Project title	Ecological niche partitioning and conservation status of Fleurette's sportive lemurs and southern woolly lemurs in the lowland rainforest of Tsitongambarika
RSG reference	16946-1
Reporting period	April 2015-July 2016
Amount of grant	£4980
Your email address	michela.balestri-2013@brookes.ac.uk
Date of this report	02/09/2016

1. Please 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
Estimate activity and diet of the two species via behavioural observations to assess temporal niche partitioning and priority feeding trees for both species			X	In the 12 months of behavioural data collection, we collected 148 observation hours on *Avahi meridionalis* and 139 hours on *Lepilemur fleuretae*. The data had been collected via continuous sampling and overall percentages of behaviors are: resting (59.1% *Avahi meridionalis*, 56.1% *Lepilemur fleuretae*), moving (6.6% *Avahi meridionalis*, 9. % *Lepilemur fleuretae),* feeding (26.7% *Avahi meridionalis*, 29.6% *Lepilemur fleuretae)*. Percentages of out of sight are 26.1% for *Avahi meridionalis* and 32.9% for *Lepilemur fleuretae*. More precise estimations of activity patterns will be available by analysing the data collected via the accelerometers (which also have a temperature tag). We collected 110 different feeding trees belonging to 39 species for *A. meridionalis* and 92 feeding trees belonging to 25 species for *L. fleuretae*. A total of 15 tree species are in common between the study species. We collected and dried all the food items eaten during the study period. We collected the food intake for 17 food items out of 51 and we plan to extrapolate a curve "food intake/leaf weight" to estimate the food intake for the food items we did not collect (of which we have the leaf weight). From a preliminary analysis it resulted that *Avahi*

				meridionalis is strictly folivorous, whilst *Lepilemur fleuretae* is mainly folivorous (80.2% of leaves in the diet) but integrated his diet with flowers (10.4%), fruits (9.3%), and insects (0.1%).
Determine differences in habitat requirements between the two species by recording ranging patterns, characteristics of sleeping trees, and species-specific use of canopy.			X	We collected a total of 24 sleeping sites for *Avahi meridionalis* and 32 for *Lepilemur fleuretae*. Apart from *Brochoneura acumita* that accounted for 28% of the sleeping sites, *Avahi meridionalis* didn't seem to prefer other tree species for sleeping. On the other hand, *Lepilemur fleuretae* had some preferred trees, namely *Syzigium* sp. (34.4%), *Viguieranthus alternans* (31.3%), and *Albizia gummifera* (15.6%). We collected around 380 GPS points per animal and I will calculate ranging patterns via Ranges 8 software. The GPS points resulted from both triangulation and direct observations and were taken every hour.
Determine population densities via transects and group home-ranges			X	After performing transects over 14 months to determine primate densities, we walked a total of 119.0 km during the day and 104.5 km at night. We performed nine transects around once a month by daytime and once a month by night-time. Data will be analysed via Distance software and for now we calculated encounter rates: *Avahi meridionalis* (0.93 individuals/km), *Cheirogaleus major* (0.11 individuals/km), *Daubentonia madagascariensis* (0.02 individuals/km), *Eulemur collaris* (1.2 individuals/km), *Hapalemur meridionalis* (0.37 individuals/km), *Lepilemur fleuretae* (2.01 individuals/km), *Microcebus tanosi* (1.45 individuals/km).

Estimate hunting pressure on lemurs via semi-structured interviews on local villagers			X	Hunting pressure on lemurs has not been reported in the area since the installation of the research station. This is a good indicator that the presence of researchers, with the creation of new job opportunities, is an effective way to decrease human pressure on the forest. Also, densities of *Hapalemur meridionalis* and *Eulemur collaris* increased in the second part of the study by considering the data obtained performing the transects (although a statistical test is necessary), probably meaning that the hunting pressure in the area is decreasing after the installation of the research station. To evaluate the impact of hunting in the villages, we further performed household interviews in 10 villages close to the research station (no more than 8 km away) for a total of 74 interviews. Although an analysis is not available yet, it seems that villages close to the research station don't hunt anymore, while village's farther from the research station have a higher proportion of people hunting.
Train local assistants to support future research in the area			X	The two assistants were trained for collecting phenological and density data, and assisting during behavioural observations. Now they are assisting a research student in the area.
Initiate a programme to raise conservation awareness in the area by delivering presentations in Malagasy in five schools in villages close to Ampasy			X	We delivered four presentations (see point 4) and we asked teachers from the four municipalities close to the Tsitongambarika forest to test their knowledge on lemurs and their environment. In total, 42 teachers filled the questionnaires. The preliminary analysis suggested that teachers from Iaboahako who received the training

				around 1 year before, gave a higher percentage of right answers (median: 81.6%, quartiles: 64.5-84.2%) than the teachers from the other municipalities (Ampasy-Nahampoana: 47.4%, 42.1-63.2%; Mandromondromontra: 47.4%, 38.2-51.3%; Mahatalaky: 47.4%, 36.8-60.5%).

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

The main problem encountered was that Qit Madagascar Minerals cannot have employees in the field station due to safety reasons. In fact, at the beginning of last year security procedures had been increased and they still have to guarantee a security plan for employees in Ampasy. For this reason, they only guaranteed logistic support for the study period. Fortunately, this was not a big problem for my study since Asity Birdlife Madagascar helped me in choosing local assistants and other logistic problems *in situ*. The only side effect is represented by the higher costs I had to sustain in the field. In fact, I planned a per diem of around £3.50 at Ampasy based on my previous experience with Qit Madagascar Minerals, while I paid around £7 per diem. However, this was not a problem since I completed the study with the funds received.

Another problem is that the data collection had been difficult for all the rainy season since the area is particularly wet. As a consequence, the increasing of water level in rivers nearby the research station created problems in reaching the observation areas. This limited the observation hours for all the wet season (all months from December 2015 until July 2016 were very wet with more than 200 mm of rain per month). This in a usual issue in rainforests and I plan to tackle it statistically (e.g. split the behavioural data seasonally and not monthly if it creates problems with the analysis).

Also, two animals, one *Avahi* and one *Lepilemur*, were killed by a predator, the fossa. The two animals were equipped with accelerometers (we equipped eight animals with accelerometers, please see the budget). I planned to capture other two animals in February but captures with blowpipes were not feasible and I continued with the animals captures before. No other animals were killed by fossa.

3. Briefly describe the three most important outcomes of your project.

Firstly, the ecological information collected on the Endangered *Avahi meridionalis* and the Critically Endangered *Lepilemur fleuretae* are novel and will be essential to plan long-term conservation actions (e.g. this study will allow estimating the size of the remaining populations of these two threatened lemurs which are essential for the IUCN listing). The acquisition of new data on these two target species will be also crucial for ex situ conservation and breeding programmes considering that these two genera do not survive in captivity and in view of a further reduction of their habitat.

This project is also pivotal to facilitate future research in the TGK area. This area represents one of the largest expansions of lowland rainforest in Madagascar but very little is known about its animal and plant community. Thus, data on this habitat will represent a significant contribution to understand the complexity of the Malagasy environment. The establishment of a permanent research station necessary for this long-term field project will also have the indirect but vital result of increasing the protection of the resident species. The importance of establishing a field station has been highlighted repeatedly as one of the few effective actions to increase animal protection in a given area.

Thirdly, this study is also important to provide essential biodiversity information in the area of TGK to ASITY Birdlife Madagascar, the organization managing the area. ASITY in collaboration with Qit Madagascar Minerals (QMM) agreed to manage the area of Ampasy as one of the offset sites for the mining in the coastal region. This context thus represents a rare opportunity to implement the recommendations derived from our research. Offset sites have been selected to achieve a net positive conservation impact by private companies, but, without accurate estimates of animal populations over time, their effectiveness is unclear.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

I delivered four presentations (one each month from July to October) to local teachers from four villages nearby the research station to give information about the importance of biodiversity, the animals, and the forest. This is particularly important to raise awareness in local communities, starting from children. I performed these training days with the collaboration of Asity Madagascar that is responsible for the management of the area. Also, we organised a special event for children for the World Lemur Day the 31st of October. The event was successful and attracted many

people from the villages. We organised several games for children involving questions about the forest and lemurs. The training for the two local guides was successful and they are now able to work with me and other researchers, helping on behavioural observations and plants identification.

Local benefits are already evident since the installation of the field station brought new job opportunities. In fact, apart from the assistants I hired, many other local people are working with me (e.g. porters to bring food and equipment to the field station, people that helped in the installation of the field camp, people selling me food). I am confident that the benefits of the presence of the research station will decrease the impact of these people on the forest. Local people, in fact, had and effective impact on the forest before the installation of the research station, as demonstrated by the reports on the forest use made by Asity Birdlife Madagascar. Hunting pressure on lemurs has not been reported in the area since the installation of the research station. This is a good indication that the presence of researchers, with the creation of new job opportunities, is an effective way to decrease human pressure on the forest.

5. Are there any plans to continue this work?

We plan to continue working on the study species in the area with other students from Oxford Brookes University. Another PhD student will stay in Ampasy for 1 year working on sensorial aspects of *Avahi* and *Lepilemur*. The research station will be the priority field station of the Nocturnal Primate Group of Oxford Brookes University in Madagascar. We thus plan to facilitate the protection of the area in the future.

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

I plan to do at least five publications on peer-reviewed journals. I also plan to deliver presentations at international congresses and at my University.

7. Timescale: Over what period was the RSG used? How does this compare to the anticipated or actual length of the project?

I started the project at the end of April 2015 and I plan finished the project in mid-July 2016. This timescale is in perfect time with the timescale proposed in the application.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
One return flight for one MSc students from Madagascar (Antananarivo-Fort Dauphin-Antananarivo)	280	0	280	The Malagasy student was not available.
One return flight for the principal investigator: £800 (London-Antananarivo-London) and £280 (Antananarivo-Fort Dauphin-Antananarivo)	1080	870	210	I found a deal on the return flight Paris-Antananarivo at £590.
Subsistence payments and facilities for the principal investigator at the Ampasy field station (380 days, following the collaboration agreement with QMM)	1330	2960	-1630	The collaboration agreement with QMM was not as planned. They are providing logistics but I managed to hire assistants and buy food in collaboration with Asity Madagascar. This resulted in higher costs (around £7 per diem).
Subsistence payments and facilities for the Malagasy MSc student at the Ampasy field station (100 days, following the collaboration agreement with QMM)	350	0	350	The Malagasy student was not available.
Principal investigator: accommodation and food in Fort Dauphin around £10 per day (around 3 days per month: 42 days)	420	1140	-720	The costs were higher than expected and in some months I had to stay more time in town for logistic reasons.
Malagasy MSc student: accommodation and food in	90	0	90	The Malagasy student was not available.

Fort Dauphin around £10 per day (around 9 days)				
Anaesthetics, capture equipment, and capture team for four animals: £20X15 animalsX2 (capture and re-capture)	600	750	-150	
VHF collars and backpacks (TW-3, Biotrack Ltd.) per 15 animals: £160X15	2400	1800	600	I decided to buy 12 collars instead of 15 to increase the feasibility of the project. In fact, I realized that doing behavioural observations on 20 animals would have been too time consuming. I bought VHF collars (RI-2D) and backpacks (Ri-2C) from Holohil System Ltd.
One RA-23K VHF Antenna (Telonics Inc.) for radio-tracking receiver	170	215	-45	
One radio-tracking receiver (TR-4K, Telonics Inc.)	580	665	-85	
Malagasy MSc student: dissertation costs	170	0	170	The Malagasy student was not available.
Logistic costs for presentations in schools	120	180	-40	
Binocular (Nikon Monarch 8x42)	260	200	60	
Waterproof notebooks (40 Rite in the rain spiral notebooks)	120	68	52	
Head-lamps (2 Petzl duo LED)	190	70	120	I found a deal a different model with focal light and three intensities. The light works much better than the Petzl since the animals frequently move at 40 m high at night.
Handheld GPS (GPSMAP 64st; Garmin)	390	190	200	
Accelerometers and temperature tags (Axy-2;	0	2560	-2560	In addition to the funds cited in the proposal, I obtained an

Tecnosmart srl): £320X8				additional fund of around £3100 from Mohamed Bin Zayed Species Conservation. I included accelerometers in 8 VHF collars to have a higher resolution on the temporal niche partitioning and energy expenditure. The accelerometers have temperature tags which I would use to investigate the possibility of heterothermy in the study species.
Research permission fees	170	170	0	
TOTAL	8720	**11838**	-3118	

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

Firstly, it is vital that research will continue in the area for long time. It was important to build a new research station to give more job opportunities to local people and we hope it will help decreasing their impact on the forest. It is important to continue doing research in the area if we want to raise awareness on the importance of the forest. Thus, we are looking for local managers to manage the research station and facilitate the research from all the universities and not only from Oxford Brookes University.

Second, it is important to continue the study on *Avahi meridionalis* and *Lepilemur fleuretae* since these two species require further studies over a long time. Also, it is important to plan other studies on the lemurs present at Ampasy (*Hapalemur meridionalis, Eulemur collaris, Microcebus tanosy, Cheirogaleus major, Daubentonia madagascariensis*) since the biology of these species is almost unknown in the mountain and lowland rainforest.

10. Did you use the RSGF logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?

I used the RSGF logo during the presentation I delivered to American students at the Libanona ecological centre, in Fort Dauphin. I will certainly use the logo again after the end of the study for presentations and posters.