

The Rufford Small Grants 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. The Final Report must be sent in **word format** and not PDF format or any other format. 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. Please note that the information may be edited for clarity. 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	Francesco Rovero
Project title	Boosting local capacity for ecological monitoring: long-term, integrated research and conservation programme in the Udzungwa Mountains, Tanzania
RSG reference	
Reporting period	2012-2013
Amount of grant	£24,912
Your email address	francesco.rovero@muse.it
Date of this report	May 28, 2014

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
Consolidate the ranger-based monitoring programme and hand-over to the park the primate monitoring programme		Partially achieved		After extensive trials, it appeared very clearly that the deployment of rangers to conduct monitoring was not necessarily supported by TANAPA, the main reason being shortage of staff, and secondarily an inherent, persisting under-prioritisation of ecological monitoring over anti-poaching and other ranger duties. However, with dedicated staff, as applies to the primate monitoring, the programme continued successfully with 11 years of data now accumulated. The park-wide monitoring appeared more difficult to sustain relatively to the primate monitoring, for the reasons above that resulted in less allocation of support to this programme than assumed.
Use the ecological monitoring activities as case-study for training and replication at local, national and regional levels			Fully achieved	In August 2013 a training workshop for forest park ecologists was conducted (see dedicated report) and this laid the basis for ensuing standardisation of monitoring across the parks.
Adopt multi-disciplinary approaches to determine whether and how habitat fragmentation and human disturbance affect population abundance, genetic variation and physiological status of the Udzungwa red colobus			Fully achieved	The objectives of the research project were fully met with the exception that one forest could not be sampled (see below). Yet, a previously unmatched data set was obtained. All research involved extensive training by local technicians.
Public and scientific dissemination of project approach and results			Fully achieved	We are in the process of writing up scientific papers. One has been published, three are submitted and three are near submission. Two posters and one oral presentation have been presented to scientific conferences. The report on the

				training workshop for park ecologists has also been widely diffused.
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

This project allowed to consolidate over 10 years of involvement by the applicant in capacity building to enhance and standardise monitoring of biodiversity in the Udzungwa Mountains National Park. The potential of such programme has now been fully achieved and key lessons learnt assessed. The first project objective, i.e. consolidating the park-wide and ranger-based programme, was partially (75%) achieved mainly because the resources by TANAPA required to sustain, after project completion, a scientifically sound programme did not appear adequate. In addition, the spatial scale chosen for monitoring (i.e. the entire park) may be too large for long-term implementation by TANAPA. The continued shortage of rangers, their primarily allocation to other activities than monitoring (mainly anti-poaching), the continue staff rotation across parks, and the oscillating dedication of park ecologists to this task (themselves being often shifted across parks) make a park-wide system functioning in autonomy a challenging task. Yet, the project could assess that when the staff is fully dedicated, and hence instead of rangers local field technicians are involved, and when the spatial scale is reduced (less transects and limited to areas which are reachable and routinely accessed by the park staff), then the monitoring effort can indeed be sustainable.

The difficulty was tackled by selecting on a more limited, but representative set of transects to be used in place of the original design, and substituting the use of rangers with trained and dedicated field technicians. This model, under the project support, appeared to work, with a limited but sound data-set been collected; hence, current efforts by TANAPA under the continued support of the Udzungwa Ecological Monitoring Centre are dedicated to continue this programme and monitor its effectiveness.

Indeed the second objective (i.e. consolidation of the primate monitoring programme) was successfully achieved with no constraints given its relatively simpler configuration and the dedicated staff, and the primate monitoring continues to be the longest dataset on any biodiversity component in the area.

The integrated research project on the endemic and endangered Udzungwa red colobus was successfully conducted with the exception that we were unable to sample in the fifth forest (Ndundulu forest) because of logistic and time schedule limitations. However, we were able to successfully conduct the project in the other four forests and incorporate all integrating approaches.

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

1. Consolidating biodiversity monitoring in the Udzungwa Mountains National Park

The park now implements the primate monitoring programme in Mwanihana forest and the large mammal monitoring from ranger posts and across selected areas of the park. Capacities of field technicians and park ecologists to collect, enter data and make summaries have been built. This in turn implies that conservation-relevant data on status and trends of large mammals are available to detect changes and monitor park's effectiveness. The primate monitoring, in particular, has been the most successful and through a study near submission we have analysed 11 years of data for both Mwanihana and Uzungwa scarp (southern and unprotected forest). Results show population stability

in the park, while a dramatic decline in the relative abundance of primates has occurred in the southern forest. The implications for conservation are clear and unambiguous, especially given the well-known role of indicators of forest health of these primates: Udzungwa forests needs to be protected effectively to maintain forest integrity and viable populations.

2. Udzungwa as a model for standardizing monitoring across forest parks

The training workshop proposed the Udzungwa model for replication across all forest parks in the country (see dedicated report). This represents a pre-requisite for gathering standardised biodiversity data across Tanzanian forest parks. Follow up of ongoing and new monitoring efforts and additional capacity building, with commitment from TANAPA, will be necessary to ensure effectiveness of this programme.

3. Integrated approach to the study of threatened species

The integrated multi-disciplinary approaches (ecological, physiological and genetic) used during this study have expanded the monitoring and conservation programme already established and consolidated our knowledge about threatened Udzungwa primates. First, we determined the abundance of the Udzungwa red colobus, an excellent indicator of ecosystem integrity, in four different forest blocks, their variation within and between such different forest types, their health status and the genetic diversity between populations residing in close and distant forest blocks. Our results provide the basis for scientifically-sound recommendations on conservation actions which will ensure long-term conservation for the endemic and endangered Udzungwa red colobus monkey. The outcome includes seven publications as detailed in Appendix.

In particular, we found that: (1) although Udzungwa red colobus monkeys have revealed to be dependent and more abundant at lowland and medium elevation forests, where human disturbance is highest, they show considerable resilience to moderate forest disturbance. However, due to agricultural intensification, forest degradation is rapidly increasing in the lowlands and, consequently, detrimental effects on primates need to be prevented through increased protection measures; (2) physiological measurements of stress (assessed through fecal glucocorticoid levels) were not detected in highly disturbed forests, indicating that our target species is not negatively influenced by a moderate level of human activity, as confirmed by ecological models. However, if human disturbance persists and increases further, it could lead either to acclimatization or to chronic stress, which might limit the future viability of these populations; (3) genetic analyses suggest that one of the farthest forests (Udzungwa Scarp) present the highest genetic differentiation and a lack of gene flow with the other red colobus populations, indicating a longer isolation. Moreover, human disturbance density (fire), forest canopy cover, and distance to road play the greatest roles in structuring genetic differentiation.

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

The project implementation was integrated with the activities coordinated by the Udzungwa Ecological Monitoring Centre, which conducts an environmental education programme in primary and secondary schools in 14 villages adjacent the park. The staff working in the schools is regularly updated with the results of research projects such as this. Hence the project contributed indirectly to raise local awareness on the importance of forest conservation. In addition, field activities involved extensive involvement by local villagers (no less than 100 people) in the various tasks from carrying equipment to assisting at camps and data collection.

5. Are there any plans to continue this work?

The critical tasks ahead that spanned from the project are the following:

- Consolidate to full sustainability the successful, locally-based monitoring approach determined through the project of park-wide monitoring through use field technicians and focus to areas of least logistic and resource demand; this will use the primate monitoring programme in Mwanihana forest as the model.
- Follow-up through a second training workshop the standardised monitoring programme in forest parks that was established by this project. Key efforts needed are checking the layout of transects designed at the first workshop, verify the quality of the first set of data collected, check the data analysis-data reporting flow, provide any additional training that may be needed and ensure that this programme is fully endorsed by the Ecological Monitoring Department of TANAPA HQs.
- Complete the research project by sampling the fifth forest and integrate the results in the ongoing analysis. The need for this data set is justified both by the importance of the forest itself and because a sample of at least five forests would allow proper hypothesis-testing for the comprehensive, comparative analysis.

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

Besides the seven scientific publications made or in preparation/submitted (see Appendix), the scientific results will be disseminated at international, regional and national meetings and conferences. The project results are also diffused through the web and the vast network of partners that Trento Science Museum (now 'MUSE') has established in the region.

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

The grant was used over 2012-2013. We anticipated that the project would have been implemented over two years.

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
Personnel	10,890	10,590	-300	Slight variation in the amount for temporary field assistants
Travel and subsistence	6,660	7,400	740	Increase in price of diesel and spare parts for vehicles
Training and monitoring costs	3,900	4,400	500	Increase in the costs for organising the TANAPA workshop
Equipment and office costs	1,650	1,150	-500	The desk-top computer was donated by a UEMC partner
Project administration	1,812	1,372	-440	
Total	24,912	24,912	0	

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

Please see under point 5. In addition, I generally believe the long-term presence in the area has been instrumental to achieve the results through this project, and in turn the continued presence in the medium-term will be an asset for achieving the future tasks listed above. The Udzungwa Ecological Monitoring Centre is currently under an agreement with TANAPA until 2016, and subsequently a plan of progressive handing-over of the Centre management will be set. Within this time frame, it will be critical to ensure that important programmes such as this are fully consolidated and sustainable.

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

Yes, I did. It was used in poster presentations, scientific and public talks and the attached report on training of park ecologists.

Appended documents:

- Report of training workshop for TANAPA ecologists, held in August 2013
- Pdf. of paper: Araldi A, Barelli C, Hodges K, Rovero F (2014). Density estimation of the endangered Udzungwa red colobus (*Procolobus gordonorum*) and other arboreal primates in the Udzungwa Mountains using systematic distance sampling. *International Journal of Primatology*. DOI: 10.1007/s10764-014-9772-6.
- Selection of photographs

List of scientific papers in preparation/submitted:

Barelli C, Rovero F, Hodges K, Araldi A, Heistermann M (submitted). Stress hormone measurements in the endemic and endangered Udzungwa red colobus of Tanzania.

Barelli C, Mundry R, Araldi A, Hodges K, Rocchini D, Rovero F (submitted). Modelling primate abundance in complex landscapes: case study from the Udzungwa Mountains of Tanzania.

Rovero F., Mtui A., Kitegile A., Jacob P., Araldi A., and Tenan S. (submitted) Achieving rigor with data constraints in monitoring programs: an application to assess trends in primate abundance.

Ruiz-Lopez MJ, Barelli C, Rovero F, Hodges K, Roos C, Peterman WE, Ting N (in prep.). A landscape genetics approach demonstrates the effects of human disturbance on a primate indicator species in an East African biodiversity hotspot.

Barelli C, Rovero F, Gillespie T (in prep.). Gastrointestinal parasitism in the endemic Udzungwa red colobus monkeys.

Barelli C, Albanese D, Hauffe CH, De Filippo C (in prep.). Characterization of the gut micro biome in Udzungwa red colobus monkeys.