The Rufford Foundation
Final Report

Congratulations on the completion of your project that was supported by The Rufford 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	Difouo Fopa Ghislain
Project title	Distribution, Habitat and diet composition preferences as conservation issue of three pangolins species in Deng-Deng National Park (DDNP)-Cameroon
RSG reference	26485-1
Reporting period	January 2019- February 2020
Amount of grant	£5000
Your email address	ghislainfopa49@gmail.com
Date of this report	5th February 2020

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
To record and describe the different types of habitat with the likely pangolin's presence of signs;				We have recorded six habitats for pangolin species. The giant and white-bellied pangolin presence was confirmed only in the woodland savannah and the gallery forest and we need to continue the investigation in the forest habitat.
To seasonally collect data from camera traps in order to confirm the pangolin species presence in the various habitats of the park				The number of camera traps we gathered was limited and didn't allow for the biomonitoring of all the habitat simultaneously. During the rainy season, we investigated three of these habitats with 15 camera traps and currently all these habitats are being surveyed with 28 camera traps established in both savannah and forest areas during the dry season. We intend to deploy more cameras in the forest zone during the rainy season to achieve this objective.
To seasonally collect and identify ants and termite species available as food resources for pangolins in the various habitats;				The late purchase of camera traps has delayed the start of the project, so we have collected ant and termites only during the rainy season. We will collect the insects during the dry season to assess the seasonal variation of the food resources
To identify the pangolins diet composition based on stomach and dung content analysis, and compare it to the assemblage of insect prey collected in their potential habitats				The dung of pangolin is known to be particularly rare, and few researchers have already collected it (for example the Temminck's pangolin is known to hide its faeces). Thus, only one white-bellied pangolin dung was collected, it is being analysed and the insect fragment are currently identified. Actually, we can base only on this scat to infer the diet composition. In the similar project we have collected more stomach of the white-bellied pangolin in villages households and we

				intended to apply this approach to collect stomach of pangolin in this park.
To sensitize local people and communities				We have met another RSG grantee with whom we have worked together for the sensitisation in the park with photo of the three species of pangolin. But we still need to organise another awareness campaign.

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

Transaction on the purchase of camera traps (order in USA, deliver and transportation in Cameroon) has cost more than the estimated time. We bought more cameras than the estimated number to be able to cover the whole study areas simultaneously with the additional cameras and gain time. We reduced some costs of education activities to save money for this supplementary material purchase and to involve more assistant because the survey was quite difficult, and many efforts were needed.

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

1. We recorded and described six different habitat types in the Deng-Deng National Park and provided the characteristics of these habitats. The most frequently encountered habitat recorded was the near primary forest which also has the highest average abundance of insects available as food resources for pangolins.

2. A total of 38,872 ant and termite individuals were collected in both forest and savannah habitats comprising 55 ant species and 76 species of termites. The near primary forest has the highest abundance mean (136.5±27.56) of ants available as food resources, the secondary forest has shown a higher abundance mean (108.2±22.59) followed respectively by the woodland savannah (28.6±6.75), forest gallery (14.7±4.10) and the grassland savannah (25.9±11.35). We recorded a lowest abundance of insect available as food resources in swamps (6.1±5.23).

3. We have documented for the first time the presence of the giant pangolin and the white-bellied pangolin in the Deng-Deng National Park. We have shown that it is possible to monitor the giant and the white-bellied pangolin using camera traps set on the living burrow (for the giant pangolin) and termite mounds. We have found that the giant pangolin photographic events mostly occurred in the woodland savannah with no event recorded in the grassland savannah and the forest gallery. There was not photographic event of both black-bellied pangolin in this area. These species being arboreal and living in the canopy of forest, we need to recover the camera-traps set in the forest area before confirming this information.

4. A fecal sample from the white-bellied pangolin collected during the second trip of this project is being analysed and the identification of insect body part found, will be identified to have and information on the insect species consumed by this species.

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

This project helped us to be in touch with local community people and citizens talking about the knowledge of the status and the importance of pangolin conservation, how to protect them in their surrounding forest. As students, we educated the local people involved in our fieldwork and in Deng-Deng, the main villages of the area. We prepared a team of local (future guide; translator) who will facilitate our introduction to local communities to achieve the awareness campaign. Now people from Deng- Deng know the conservation of pangolin is a benefit to them.

5. Are there any plans to continue this work?

28 camera-traps are currently installed in both savannah and forest habitats (six habitats) during the dry season (December 2019 to March 2020) and will be retrieved soon. We will deploy more camera traps in the forest area to evaluate the spatial and seasonal variation of pangolin detection. We will establish the distribution map of the pangolin's species recorded in this park. After the camera trap retrieval, we will continue to sample the ants and termites to gather information on abundance fluctuation of prey available during the dry season. We will assess the trend of pangolin populations (dead/living animals) in both seizures and households of surrounding villages of this park. It will help us to collect more stomach contents and to achieve the fourth objective of this project which is to identify the diet of the white-bellied and giant pangolin. Then, we will publish our result in peer-reviewed journal.

No evidence of the black-bellied pangolin was recorded during this project. Whilst anthropogenic activities were widespread in this park (hydroelectric dam flooding, petroleum pipeline, road construction). We will further assess their impact on the habitat fragmentation and loss to prevent the extirpation of pangolin in this park.

Campaign awareness and education will be organised including the petroleum compagnies and hydroelectric dam personals. Recommendation will be provided.

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

We are currently preparing manuscripts to be published in a peer reviewed journal primarily, the communities of ants available as food resources for giant pangolin in comparison with the dung component. The second one will be on termite's importance as food for pangolins and another will be on the characteristics of habitats of the detection of both giant and white-bellied pangolin. The PhD thesis will be defended publicly at the University of Yaoundé 1.

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 Rufford Small Grant covered the expenses of this proposal during a 1-year period, starting in February 2019 and ending in February 2020. This did not match perfectly with the anticipated length of the project 12 months, reason why cameras are still in the field. But the number of camera-traps available now will allow future projects to be easily implemented in the deadline.

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
Unforeseen cost	£249	£249		Complete the expenses for other materials We purchased one External Hard Disk in order to save data from camera-traps; Visa Card to facilitate transactions in purchasing the field material Trend of the pound compared to the local currency
Transportation (ticket travel costs) from Yaoundé to Belabo – Deng-Deng- Yaoundé for 3 persons during 6 trips	£455	£501	+£46	Bad road quality has increased the transportation cost
Accommodation of three persons for 8 nights	£214	£214		
Food of 7 persons for 132 days of field works	£774	£774		
Per diems for 4 potters and 1 Guide, 1 ranger and 2 assistant for 132 days of field works	£1082	£1082		We needed the help of another porter and another field assistant
27 bottles of 95° Alcohol for specimen's conservation	£30	£30		

10 packets of tubes (4 ml) for conservation of insects	£151	£151		
Auger + bowl + gloves	£38	£38		
Sleeping bag		£30	+£30	
Digital camera	£75		-£75	External provider
Memory cards	£51	£100		
Batteries for Camera traps, Digital camera, GPS and head torches	£84	£84		
Tents	£183		-£183	External provider
Camera traps	£1463	£1850	+£387	We purchased more camera traps than the number that was estimated
Garmin Handled GPS	£151		-£151	
TOTAL	**£5000**	**£5103**	**+103**	Notes to budget: The currency used in Cameroon is XAF (CFA franc). The exchange rate is 1 GPB= 755 XAF, please note that the exchange rate fluctuates constantly.

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

- Obtain other funds used to prior remove the camera in the field and assess the seasonal variation in the forest area.
- Monitor the coordinates where pangolin was detected to collect more faeces and be in touch with the DDNP eco guards patrol services and household to collect the stomach content from the dead seized pangolins.
- Establish the list of ant and termites on which the giant and white-bellied pangolin feed on with their associated habitat.
- Publish these results in the peer-reviewed journals.

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

We have not yet used the logo of Rufford Foundation apart of the report produced but the Rufford Foundation name as a funder of our research has been mentioned in the film launched in Cameroon named SCALES.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

DIFOUO FOPA Ghislain, Project leader and principal investigator

SIMO TALLA Franklin, PhD Candidate University of Yaoundé I (Research assistant). Assist the principal investigator to prepare the protocol and implement it in the field assist in camera-trap installation,

FOKOU Oscar Ramon, Master Student University of Yaoundé I (Research assistant). Help to collect ant and termites in the field and analysis of the white-bellied pangolin faeces in the laboratory as well as insect identification.

OBOULO Elyse, Ministry of Forest and Wildlife (Eco guard). Government representative; Protect the team from dangerous animal during the field work.

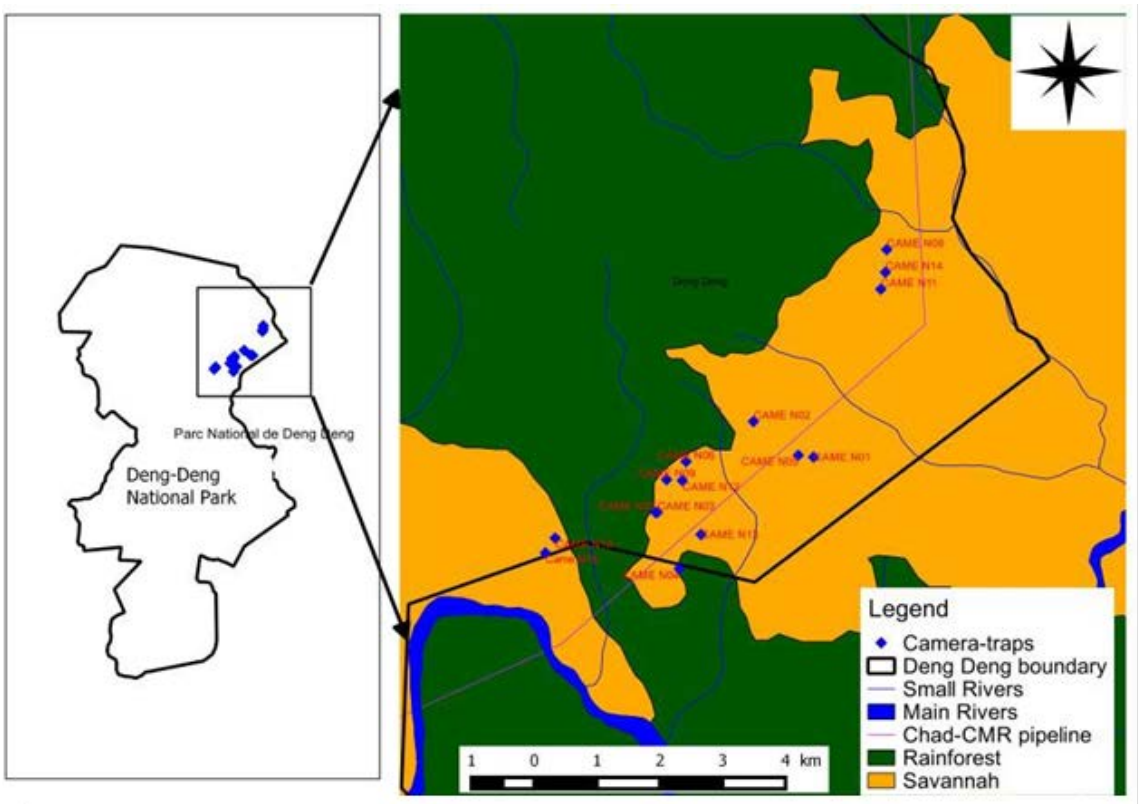
NDOCTA Molar Stephane (local guide). Field biomonitoring local guide help to create track in the forest and the savannah to enable the team to pass.

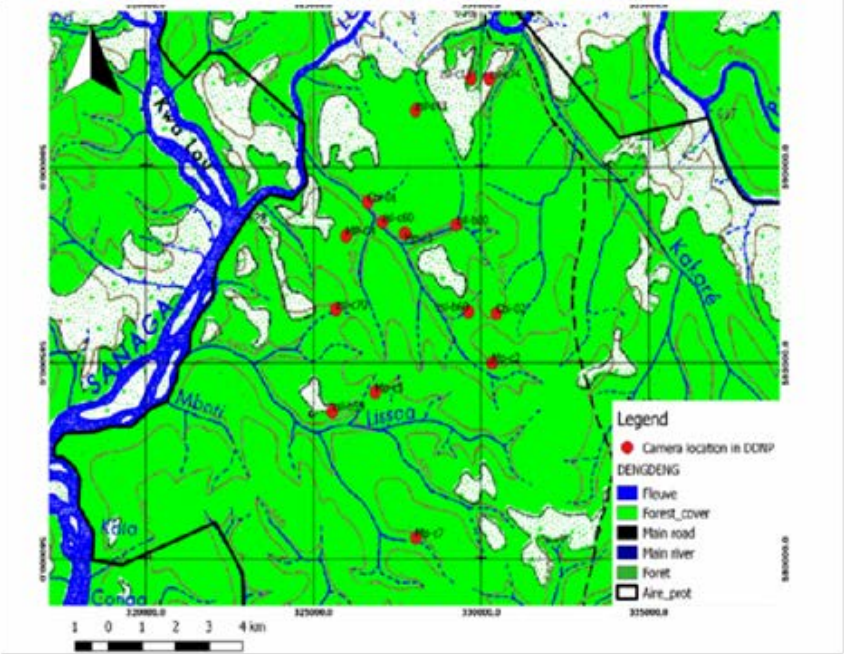
ABBA Jackson; BOUBA Claude Aristide; WAMAN Floribert and Elizé (porters) Carry the field materials and food for all the team.

12. Any other comments?

We acknowledge the Rufford Foundation for their financial support to this research through the Rufford Small Grant. We greatly thank our referees DR David OLSON and supervisor Professor Sévilor KEKEUNOU for their support. And a special expression of gratitude to DR Kevin NJABO for his guidance and for helping us to purchase and transport some field equipment from the US. And the field team members and all the population of Deng-Deng village.

Appendix I: Previous and current location of camera-traps in both forest and savannah zone of Deng-Deng National Park.





Appendix II: Surveyed team in the Deng-Deng National Park.

Left: Northern boundary of the Deng-Deng National Park. Right: Field team near Lom-pangar hydroelectric dam.


Left: Principal investigator and the assistant. Right: Field team trek in the DDNP savannah zone.


Appendix III: Some materials, field and laboratory activities carry out in both Deng-Deng National Park and in the laboratory.

Left: 30 purchased cameras and 3 packets of batteries. Right: Principal investigator setting a camera.

Two field assistants collecting insects in both forest and savannah habitats of the Deng-Deng National Park.

Material uses in the laboratory.

Appendix IV: Threats to wildlife and pangolins observed in the Deng-Deng National Park.

Left: Principal investigator and a local guide discovered a road created in the Deng-Deng National Park near two previous camera trap locations. Right: Flooding of 3 previous cameras location in the northern part of Deng-Deng National Park.

Human activity in the Deng-Deng National Park.