

Final Evaluation Report

Your Details	
Full Name	Koggani Dickson Koggani
Project Title	Understanding the cause of decline of near threatened Puku antelope: Using DNA metabarcoding to assess the impact of competitive exclusion by livestock in Kilombero Valley, Tanzania
Application ID	27784-1
Grant Amount	£4,961
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Date of this Report	07/09/2020

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
Updating an estimate of Puku abundance at the study area (Ngapemba conservation area)				An estimate of puku abundance was partially achieved i.e. the remaining small portion was difficult to access due river barrier (crossing the river was a challenge to the field team) and some areas become waterlogged during wet season.
Characterise vegetation community composition at the study area				Vegetation at the study area was partially assessed and characterised mainly due to reasons mentioned above. However, from the transects conducted the vegetation community composition we visualised using non-multidimension scale. Also, we conducted several analyses (PERMANOVA, ANOSIM and SIMPER) to test if there is significant difference in the vegetation composition as well to what extent does each vegetation community contribute.
Characterise, assess, and compare diet of puku and cattle at the study area				Diet, and the degree of dietary overlap between cattle and puku were fully characterised and assessed using DNA metabarcoding. We found that puku diet was consistent across study site (both areas experiencing and the ones not experiencing cattle encroachment) suggesting that food competition with cattle does not occurring possibly not a significant factor to explain puku displacement from areas encroached by cattle. However, surprisingly agricultural crops (i.e. maize and rice) were found to be highly abundant in puku diets suggesting puku do forage on farmlands particularly during dry season and this could give rise to conflicts (crop raid) with the local

				community as well as being exposed to poachers while foraging on farmlands.
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

- i. River barrier and waterlogged areas; one of the project activities aimed at estimating puku abundance across the whole study area in relation to cattle distribution. Conversely, some of portions of the study area were not possible to be reached by the field team due to challenge in crossing the river but also during wet season where most of the places accessed during dry season became waterlogged hence hindered field team to conduct a complete survey. As a result, more efforts were directed to rest portion of the study area where accessibility were still possible.
- ii. COVID-19 outbreak. The COVID-19 outbreak was the major unforeseen difficult for this project as the incidence came while we were in the main analysis phase (DNA metabarcoding). Despite of a significant hinderance to our effort to finish the project as per allocated time frame, all the government and health officials and university directives and protocols with regard to COVID-19 prevention were fully adhered while carrying on project activities during the outbreak. As a result, the analysis work took much time than anticipated which affected the next steps (i.e. report write up and submission). As said above, the only safe way to tackle this challenge was to fully adhere government, health officials and university directives and protocols which prolonged the finishing time as anticipated before.

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

The project has successfully

- i. Updated an estimate of puku abundance and characterised vegetation composition at the study area.
- ii. Characterised, and determined degree of dietary overlap between puku and cattle at the study area.
- iii. Contributed knowledge upon better understanding of puku ecology more particularly its feeding ecology with the use of DNA metabarcoding technique.

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

Local community were part and parcel of the project. The village game scouts who are part of the community involved in the project were trained on the data collection tools to be used for this project (i.e. for estimating animal abundance as well as faecal sample collection). Also, the local community member participated in the project were sensitised about the importance of the wildlife around their areas and the importance of them to conserve due to some economic benefits it derive

to them i.e. there is a hunting company operating at the area hence most of its staff, particularly rangers, are from the village but also the company helped to build some of the community social services like water provision. And more importantly, some local community members (game scouts and driver) got temporary employment as a result of the project being conducted around their areas.

5. Are there any plans to continue this work?

Absolutely, there is a plan to continue this work and expand to cover the other small remaining portion of puku population in Lake Rukwa (Rukwa Game Reserve). It has been observed that human activities keep on impacting puku population severely not only in Kilombero Valley but also in Rukwa Game Reserve (Waltert et al., 2009) where another small portion of puku population is present. However, it is shocking that the Kilombero has already lost 97% of its puku population (TAWIRI 2019). Habitat loss through human activities keep on threatening the most remaining population of puku in Ngapemba conservation area. Despite some effort being made to save this near threatened species, some important questions like how the change in land use is impacted puku population and its habitat, what will be the fate of Kilombero puku population given trend of habitat loss, remain poorly understood and the answers are critical for the sustenance and survival of the Kilombero Valley puku population and its entire ecosystem which is critical for the wellbeing of local community around. As noted above, the completed study found agricultural crops (i.e. maize and rice) being highly abundant in puku diet suggesting puku do forage on farmlands hence thoroughly investigation is of highly immediate conservation and management importance. The next project will gear itself upon investigating puku's movements with the aid of camera traps as well as survey to monitor its population status, quantitatively assessment of the spatio-temporal in puku habitat quality and quantity (habitat suitability) as well as and assessment of knowledge, attitude, and awareness of the local community on puku conservation and the importance of protecting the entire ecosystem which they do depends on for several ecosystem services.

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

Preliminary results (puku abundance estimates) were shared to Tanzania Wildlife Research Institute during preparation of their 2018 Selous – Mikumi Aerial census report, and an oral presentation during Rufford Small Grant Conference which was held in Zanzibar in February 2020. Full project results will be shared with the Tanzania Wildlife Management via Kilombero District wildlife conservation officers and Kilombero Valley Ramsar manager, The Kilombero North Safari Company as well as the Tanzania Wildlife Research Institute. To make sure project results reaches broader audiences, a project manuscript is underway to be submitted to peer reviewed journal for scientific publication, offering conference presentation (e.g. Rufford Small Grant Conference to be done in Rwanda later this year and in Mozambique, Student Conference in Conservation Science to be held in Cambridge – UK, New York – USA, Brisbane – Australia and in Tihany – Hungary) as well as results sharing results via social media.

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

The project grant was used within 14 months contrary to anticipated 12 months period. Due to COVID-19 pandemic outbreak we experienced a delay particularly on the analysis of the diet samples as explained above.

8. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Data analysis	3265	4255	+990	
Subsistence payment for local team	339	339		
Field vehicle hiring	640	640		
Fuel for field vehicle	717	717		
TOTAL	4961	5951	+990	

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

The next important steps are to share the project results to the stakeholders but also a continuation for of this work more particularly by developing grant proposal that will seek to:

- i. Complete the survey of puku distribution in areas which were not covered and monitoring the population status via surveys.
- ii. Investigate puku's movement since a completed study found agricultural crop highly abundant in its diet (which suggest it does forage on farmlands) to ascertain the hypothesis.
- iii. Quantitatively assess the spatiotemporal changes in puku habitat quantity and quality (habitat suitability) over a 20-year period.
- iv. Quantify the effect of land use changes on puku abundance and habitat quality and quantity (suitability) over a 20-year period.
- v. Assess knowledge, attitude, and awareness of the local community on puku conservation and the importance of protecting the biodiversity/environment.

10. 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?

Yes, the Rufford Foundation logo was and will be used in every material produced in relation to this project and of course most of people appreciated and praised the work done by The Rufford Foundation by providing research grants to especially we early career conservationist and they hope the foundation will keep it up.

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

Prof. Barbara Mable

Main project supervisor and provide assistance on the genetic diet analysis section.

Dr. Thomas Morrison

Co-project supervisor and advisor on issues regarding how animals and plants populations responds and adapt to environmental variations and disturbances.

Mrs. Elizabeth Kilibride

Senior lab technician, supervised lab work.

Mr. Anthony Pesambili

Research assistant.

Mr. Yuda and Mzee Msungu

Village game scouts/armed rangers who provided security while in the field

Mr. Benedict Danda

Field driver

Miss. Rachel Gray

Project partner and provided assistance in the analysis of metabarcoding data.

Mr. Koggani D. Koggani

Project leader and principal investigator

12. Any other comments?

I would like to present my heartfelt gratitude thanks to the Rufford Foundation for providing me with the funds which made this project successful. I sincerely thanks all my team member for their great work towards this project and anyone who participated in one way or another, once again thank you all.



Mr Koggani while in the field collecting data



Our dry season field vehicle



Our wet season field vehicle



Herd of female puku at the study area



Puku's fresh faecal pellets



Mr. Koggani labelling DNA faecal samples to be shipped for sequencing



Mr. Koggani preparing DNA faecal samples for polymerase chain reaction (PCR)



Fully labelled DNA faecal samples ready to be transported for sequencing



Mr. Koggani giving presentation on the project as well as its preliminary results during Rufford Small Grant Conference in Zanzibar (Feb 2020)



Fig 10. Certificate of attendance at the Rufford Small Grant Conference in Zanzibar, Feb 2020.