Final Evaluation Report

Your Details	
Full Name	Beatus Mwendwa
Project Title	Assessing population ecology data and threats of Abbott's Duiker using camera-trap survey in Uzungwa-scarp Forest Reserve.
Application ID	33556-1
Date of this Report	August, 2022

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
Evaluate the current population ecology data for endangered Abbott's duiker				Population ecology including the location, population and relative abundance for the forest mammals including Abbott's duiker were presented.
Document forest vegetation cover maps and changes for the past 10 years				Analysis of satellite images and change detection was done. Forest vegetation cover maps for 2010 and 2020 were presented. Map indicating vegetation cover changes and disturbance areas between 2010 and 2020 was presented.
Assess type, frequency and intensity of forest disturbances caused by anthropogenic activities.				Forest survey was conducted in nine transect lines and 11 sample plots. Information on the type and frequency of forest disturbance has been presented.
Capacity building for community members and local leaders				The objective was dropped at this stage following comments and advice from reviewers.
Assess scale and reasons for bush meat hunting				97 people from six villages were reached and participated during UCT survey.
Abbott's duiker population ecology data publication and dissemination				Dissemination was done at village and district meetings and social media. Manuscript writing is underway and now in final stages.

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

OUTCOME I: To assess population ecology data for endangered Abbott's duiker and other threatened forest mammals.

We installed eight unbaited camera traps (two camera traps got lost/stolen in the forest). Out of the six camera traps we established population abundance, distribution and relative density of forest mammals including endangered Abbott's duiker. Sampling duration for camera trapping took 44 days, making camera trapping efforts of 364 trap days distributed between September - November 202.

A total of 141 images were captured, representing forest wildlife behavioural activities in the forest over the trapping period. During this period, a total of 17

mammal species were trapped including primates, antelopes, small carnivores, rodents and humans. Most recorded events were of red duiker (19.5%) followed by small carnivores (10.5%) and primates (6.9%). Endangered Abbots' duiker was recorded in two sites at TM5 (1011) and CT6 (987) and had the capture Rate(R) 3.4 and Relative Abundance Index (RAI) 0.03 (Table 1).

Table 1: *Photo trapping results summary for wild animals in Uzungwa forest reserve indicating events, Capture Rates (R) and Relative Abundance Index (RAI) (N = 87).*

Common name	**Scientific name**	**# of events**	**R (%)**	**RAI**
Mole rat	*Heterocephalus glaber*	3	3.4	0.03
Red Colubus monkeys	*Procolobus gordonorum*	5	5.7	0.06
Red duiker	*Cephalophus harveyi*	17	19.5	0.20
Wild cat	*Felis silvestris*	2	2.3	0.02
Porcupine	*Hystrix africaeaustralis*	9	10.3	0.10
Bushbuck	*Tragelaphus scriptus*	4	4.6	0.05
Abbots'duiker	*Cephalophus spadex*	3	3.4	0.03
Giant shrew	*Rhynchcyon udzungwesis*	3	3.4	0.03
Yellow baboon	*Papio cynocephalus*	6	6.9	0.07
Giant rat	*Cricetomys gambianus*	9	10.3	0.10
Sanje mangabey	*Cercocebus sanjei*	3	3.4	0.03
Honey badger	*Mellivora capensis*	4	4.6	0.05
Banded Mongoose	*Mungos mungo*	2	2.3	0.02
Hyena	*Crocuta crocuta*	5	5.7	0.06
Human being	*Homo sapiens*	2	2.3	0.02
Tree hyrax	*Dendrohyrax validus*	1	1.1	0.01

OUTCOME II: To document Forest disturbance and vegetation cover changes between year 2010 and 2020

The project analysed 2010 and 2020 satellite images (we were not able to get good quality multispectral images for 2019) in order to establish and provide vegetation cover and changes for the two-referenced period. We obtained Multispectral Satellite images from high-resolution WordlView-2 imagery archive.

Pixel based vegetation cover classification were performed in QGIS (version 3.2) using Semi-automatic classification plugin (SCP). Images were clipped, layers were masked and stacked together. Image enhancement using 5-3-2 (RBG) colour composite were applied. This band combination was clearer and different vegetation types were easily separated. Training samples for each class were done by creating region of interest (ROI)from the image. Using maximum likelihood estimation algorithm, three types of vegetation cover namely i. Lower forest ii. Moist montane forest iii. Grassland was developed (Fig.1).

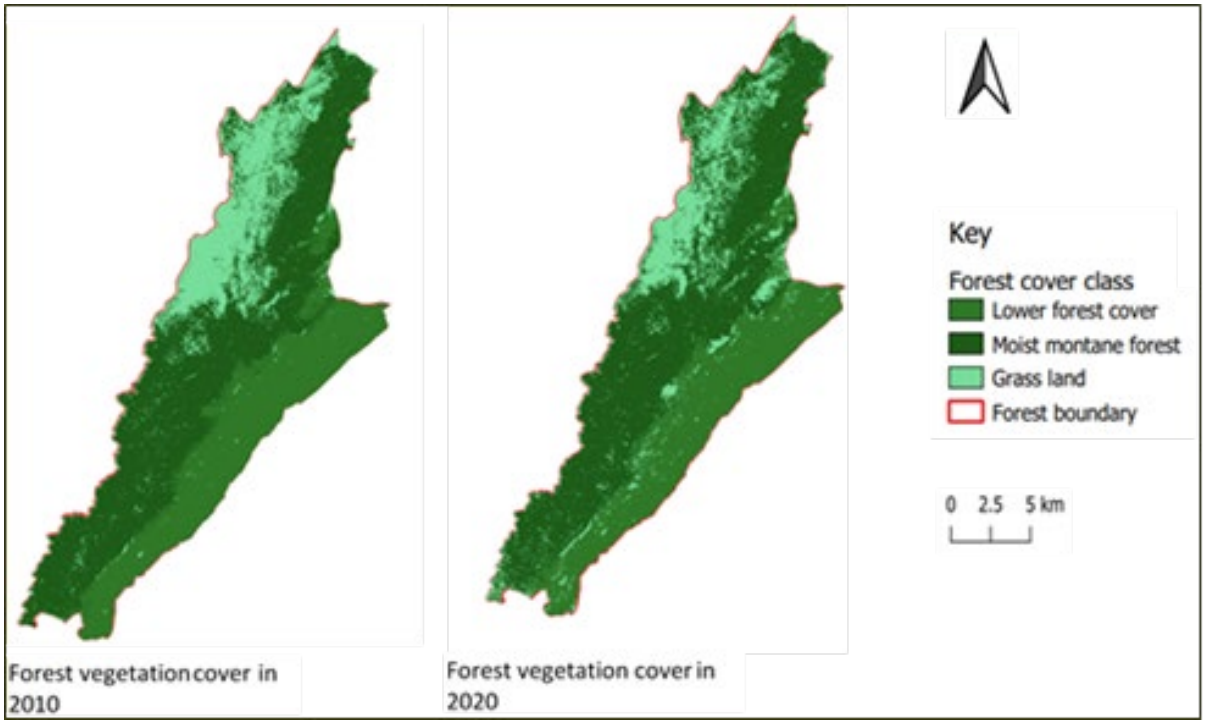

***Figure 1**: Uzungwa scarp forest vegetation cover maps for 2010 and 2020 showing lower forest cove, moist montane forest cover and Grass land.*

Vegetation cover change detection between 2010 and 2020 were performed through Postprocessing Land Cover Change Workflow in SCP plugin. Virtual band for 2010 and 2020 were set as reference and new class bands respectively. A comparison algorithm was run to produce map and statistics indicating areas converted from/to lower forest, moist montane forest and grassland (Fig 2 and Table 2).

Based on the satellite imagery analysis and on ground survey, we found that 3.03 km2 (0.9%) of lower forest vegetation and 25.6 km2 (7.7%) of moist montane forest were converted to grass land between 2010 to 2020 as indicated in a detailed area conversion matrix in Table 2.

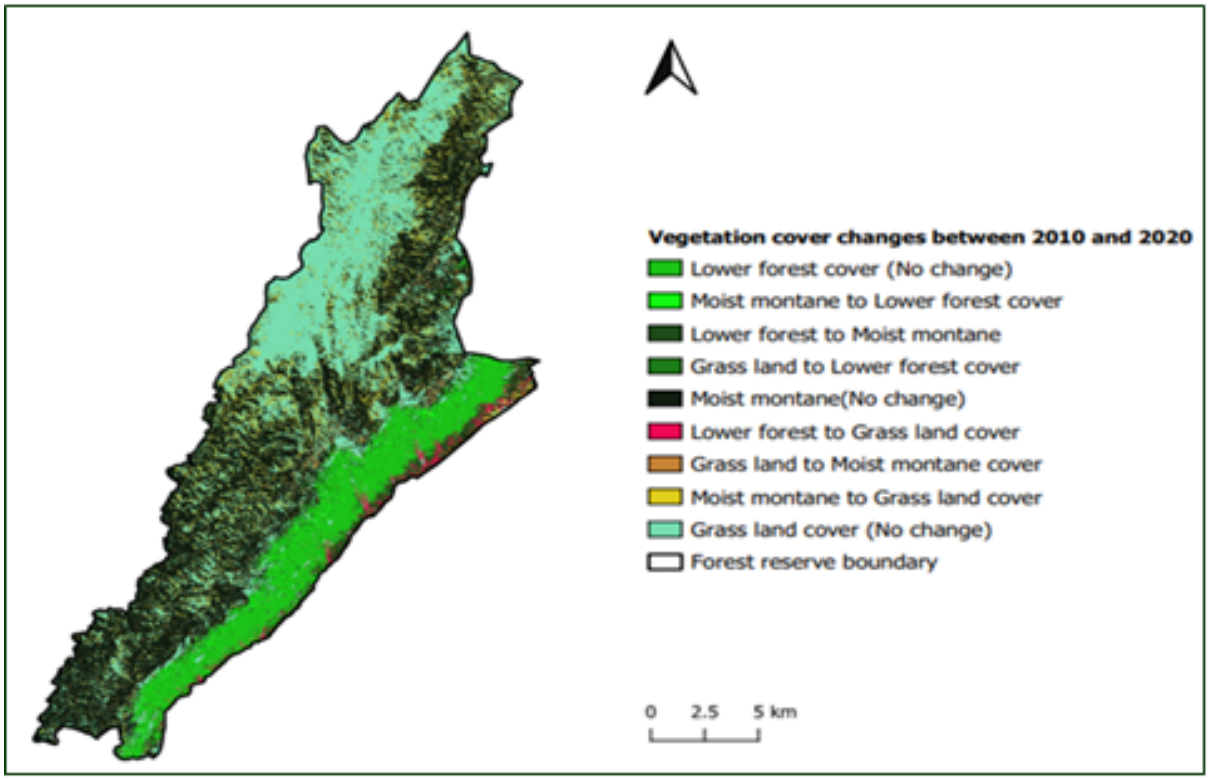

Figure 2: *Vegetation cover change map of year 2010 and 2020 between Lower Forest cover, Moist montane forest and Grass land in Uzungwa-scarp forest reserve.*

Table 2*: Forest Vegetation Cover Change Matrix indicating area conversion between 1. Lower forest cover 2. Moist montane forest cover 3. Grass land vegetation cover between year 2010 and 2020 in Uzungwa-scarp forest reserve*

Year 2020 New cover			
2010 Reference cover	Lower forest	Moist montane	Grass land
Lower forest cover	41.13	7.25	3.07
Moist montane forest	6.48	134.43	25.64
Grass land	5.03	6.13	103.07
Total area (Km²)	**52.65**	**147.8**	**131. 77**

Most deforested and disturbed areas (red colour) were found to confine in the southeast close to the forest boundary as well as in northern south region. Hunting and animal traps were the most prevalent disturbance (35%) mostly recorded in moderate elevation. Other disturbance activities included tree cutting (22%), fire incidences (14%) and encroachment (5%).

OUTCOME III: To find out the Scale and Reasons for Bushmeat hunting

Using Unmatched Count Technique (UCT), Observation during forest survey and interviews with village officials, the project determined scale and reasons for bushmeat hunting. 97 members from six villages participated during this survey. We found 39 % of the households are currently involved in bushmeat hunting particularly in the villages eastern and south-eastern of the forest reserve (Fig 3).

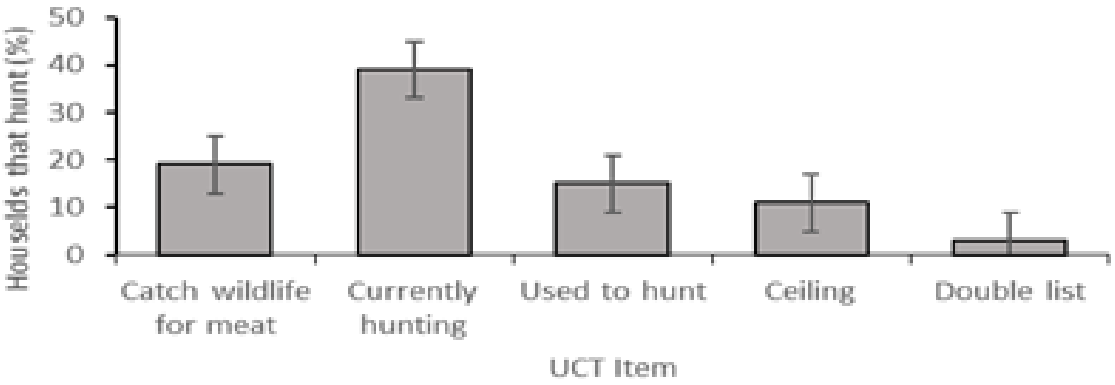

Figure 3: *Triangulated estimates of household participation in bushmeat hunting in Uzungwa scarp forest reserve with 95% confidence interval (Control N= 41, Treatment N=45)*

As indicated in table 3 below, the main reason for bushmeat hunting reported by both retired and current hunters was source of household income. Other reasons reported included source of household food (15%) and protecting agricultural crops in the household farms (5%). Another interesting reason reported was the use of bushmeat as an honour and cultural appreciation reported by 4% of the respondents. Another interesting reason reported was the use of bushmeat as an honour and cultural appreciation reported by 4% of the respondents.

Table 3: *Reasons given for hunting and consuming bushmeat among both retired and current hunters*

Hunting reasons	Participant's response (%)
Protecting crops	7 (5)
Household food	19(15)
Source of cash (income)	27(25)
Honour and cultural appreciation	7(4)
Taste and luxurious preference	5 (3)

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

i. Difficult terrain

Most of the forest area are mountainous with very difficult roads. It was not easy to go through with a car. We had to use motorcycles and walk quite a long distance than planned.

ii. Inaccessible sample plots

During forest vegetation survey, we were not able to access two sample plots. Based on the plot layout design, the sample plots were found in cliffs and steep gorges which the team were unable to reach.

iii. Project timeline interruption

The project leader was assigned other duties outside the country with his employer for 3 months from September to December 2021. This interrupted the project implementation timeline and resulted into a delay in project reporting and completion.

iv. Inflation

Some items particularly fuel had a higher price than planned. We had to adjust budget to overcome this challenge

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

Local communities were involved at various stages during implementation of the project.

i. 11 members from village governments were involved as local assistants during camera trap survey (four members) and forest vegetation survey (seven members).

ii. 97 community members from six villages adjacent forest reserve during bushmeat hunting survey (UCT) to provide their opinions on the scale and reasons.

iii. 85 participated during village dissemination meetings. These community members benefited with knowledge and information about threatened forest mammals and degradation of forest reserve during dissemination of the project findings.

5. Are there any plans to continue this work?

At this stage we have explored some information of population of the Abbots duiker, state of the forest disturbances and affected areas and community perceptions on the scale and reasons for bushmeat hunting. Project team plans to continue with this work by: -

i. Continue with forest survey in other remaining parts of the forest reserve.

ii. Conduct UCT survey to other four villages which were not reached at the first stage.

iii. Design and conduct capacity building programme to raise community awareness against bushmeat hunting and conservation of forest biodiversity.

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

This will be done through village/district dissemination meetings, social media, host organisation website(www.gicd.or.tz) and through publications of the findings in a reputable journal.

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

Capacity building for local leaders and raising forest community awareness against bushmeat hunting and threats posed to forest mammals are the most important areas to invest as the next step to strengthen protection of threatened forest mammals and conserve forest biodiversity.

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?

The Rufford Foundation logo was used during dissemination meetings and workshops and hence the Foundation received publicity during our project work.

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

Beatus Mwendwa – Project leader

Musa Nyumba – Forest surveyor

Helena Isaya – Wildlife Officer

Happy Reuben – Social economic survey

Shafi Hassan – Survey assistant

Hamad Rashid – Survey assistant

10. Any other comments?

On behalf of the project team and forest communities, we extend our thanks and appreciation to The Rufford Foundation for supporting this project.