Final Evaluation Report

Your Details	
Full Name	Mac Elikem Nutsuakor
Project Title	Exploring terrestrial molluscan biodiversity in the Atewa Range Forest Reserve: a biodiversity hotspot in Ghana
Application ID	27968-1
Grant Amount	4985.00 £
Email Address	macelikem@gmail.com
Date of this Report	

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
Capacity building for molluscan research in Ghana				Successfully organised first ever training workshop on molluscan biodiversity and research.
Inventory of species richness, diversity and distribution patterns in the ARFR				Approximately 70-90 species of landsnails and slugs with morphospecies from over 2000 specimens were recorded in the area.
Conservation awareness creation				Activity largely restricted by the outbreak of the COVID-19 pandemic.

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

The main unforeseen difficulty was the insurgence of the COVID-19 pandemic. This affected our planned field work and community awareness creation because of the safety protocols that we had to adhere to and the corresponding restrictions to number of people that can assemble at a time. The effect of the pandemic was threefold:

a). Lockdown restrictions caused delays in our field work schedules. This was tackled by increasing the number of research assistants (both field and laboratory for searching and sorting respectively).

b). Conservation awareness creation activities were reduced to the barest minimum by restricting contacts to just few individuals in few communities. Presentations could not be made in community schools since all schools were closed down during and after the peak periods of the COVID-19.

c). With restrictions on international travel and posting of goods (in our case specimens), the team had to resort to the use of some level of "crude" photography of most specimens (especially the microscopic ones) for identification support from mentors as there are currently no identification guides/keys available. The team had to resort to the use of internet most of the time for the transfer of pictures; hitherto, the specimens would have been posted by mail and the mentors would have physical examination for identification of the specimens.

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

a). Arouse the interest in malacology: Over 40 individuals participated in Ghana's 1st Workshop on Molluscan Diversity and Conservation organised in conjunction with Capacity for Sustainable Change – Ghana (CSC – Ghana) and Threatened Species Conservation Alliance (THRESCOAL). Out of this number, six undergraduate students wrote their dissertations with molluscs as the target organism. Three local guides within the Atewa enclave received informal training in snail research.

Figure 1: Participants at the capacity building workshop

b). Provided the first systematic survey of landsnails in the area with a conservative estimate of approximately 70-90 morphospecies of landsnails. The estimate is said to be conservative because of the relatively few areas sampled. High diversities were observed in the Streptaxidae (estimated to be at least 32 species) and Subulinidae (estimated to be at least 26 species). Range restricted species currently known include Red List endangered streptaxids; *Pseudavakubia majus* de Winter & Vastenhout, *Pseudavakubia atewaensis* de Winter & Vastenhout and *Gulella atewana* de Winter, and the subulinid *Ischnoglessula echinophora* Verdcourt. About 20 shelled species, majority of which are undescribed, are only known from the Atewa Range and are thus potentially restricted range endemics. This makes the area one of the most species-diverse areas in West Africa including a number of range restricted species. Further alpha taxonomic work is ongoing so estimates of total and range restricted species diversity are likely to increase considerably.

Figure 2: Pictures of laboratory activities and live snails from the field

c). Contributed towards the assessment and subsequent listing of two species (*Pseudovakubia atewana* and *P. majus*) on the IUCN red list by one of my mentors (Dr. Peter Tattersfield).

https://www.iucnredlist.org/species/163443511/163445797

https://www.iucnredlist.org/species/163444081/163445802

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

We have trained three local people who directly participated with project activities in snail sampling. They were equipped with skills including designing sample plots, specimen sampling, data recording, measuring and identifying specimens. They also had the opportunity to understand the value of this resources which has also contributed to improving their understanding of use and the need for resource protection in general.

5. Are there any plans to continue this work?

Yes, we plan to continue this work after this first experience, in two main ways. First, we will seek to further improve the understanding of the species we have been able to sample and increase efforts to sample, identify and describe the many unknown

species in the study area. Second is to increase the awareness on the need to conserve these species through different media and community engagements. We will also continue to build the capacities of young researchers to undertake research on the species from other geographical areas and contribute to information gathering to boost conservation initiatives on the species.

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

Currently, this work is part of my PhD work and results will be publish in both local and international peer-reviewed journals as well as other periodicals.

Together with my mentors, we have just submitted a short communication entitled "*Atewa Range, Ghana - Species- and Endemic-Rich Upland Evergreen Forests Threatened by Aluminium Ore Extraction*" for publication in the *Tentacle* (Newsletter of the Mollusc Specialist Group of the Species Survival Commission of the IUCN (International Union for the Conservation of Nature).

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

The Rufford Foundation Grant was used for about 18 months against the proposed 12 months. We had to re-structure our project timeline due to the insurgence of COVID-19 and its resulting restriction in movements from one part of the country to the other. There were also more rains in the area than expected and which caused undue delays in our field expeditions.

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
Renting minibus and fuel for field training	110	110		
Printing and photocopying of training manuals	40	72	+32	
Cost of food for workshop participants	100	150	+50	Number of expected participants doubled and since we wanted to arouse the interest in malacology, we accepted all applicants thereby increasing the

				project cost
Expendables (litter sacks, Ziploc bags, CryoTubes Vials, Ethanol)	280	305	+25	5 more litters of ethanol was needed to preserve live specimens collected from the field
Equipment (GPS, Magnifier, dissection kit, corded stereoscope)	830	830		
Camping (Tent, headlamp)	255	250	-5	
Cost of hiring 4x4 vehicle for field data collection	800	900	+100	
Fuel cost for data collection	160	213	+53	
DSA for team members for field data collection	960	960		
DSA for community members to supports in creating pathways in dense vegetation in the forest during fieldwork	480	500	+20	
DSA for laboratory assistants to support in drying and sorting of litter samples for microscopic snails	360	400	+40	Owing to large number of specimens collected, lab assistants had to spend more days than expected to sort the litter.
Cost of printing project T-shirts	300	300		
Cost of hiring vehicle for conservation outreach programs	60	30	+30	
Cost of hiring projector + fuelling power generator	50	0	-50	We could not undertake this activity because of the COVID-19 restrictions
Cost of refreshment for stakeholder seminars	200	100	-100	
Total	**4985**	**5120**	**+135**	

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

Like most tropical areas, Atewa's malacofauna is poorly explored and much of the range has not been surveyed at all. Additionally, land snails have restricted ranges, are rare and difficult to detect in the forest. The following are considered to be the most important next steps:

1. To continue with the processing of the data, publish its results and to keep sharing information at various for a.

2. To deliver project information to various stakeholders to be included in subsequent biodiversity resource reports of the area.
3. Thorough assessment of the field ecology needs of land snails in order to design appropriate conservation interventions. Field surveys should also encompass other forest reserved areas within high forest zones of Ghana.
4. Potentially describe the undescribed species of landsnails and the dozens of slugs.
5. Designing the identification guide for the land snail fauna of ARFR using the results of the project and picture bank.
6. To apply for a second RSGF to continue with research on the conservation and ecology of land snails.

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, on all presentations, seminars, t-shirts and name tags during workshop.

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

Mac Elikem Nutsuakor - team leader and led the development of the project ideas, implementation plan, training materials and co-delivery of the training to participants, and field data collection. He was responsible for project reporting.

Benjamin Ossom - was the field coordinator and was responsible for arranging field visits, securing permits and support services during data collection.

Victor Agyei - was in charge of procuring logistics, venues for workshops and seminars and taking photographs during project implementation

Iris Nikwei Kutorkor, Micheal Ochem and **Patience Duku** – Provided support in field data collection, drying and sorting litter for macro and microscopic snails at the laboratory.

Anita Fofo Agyare, Betty Owusu-Ansah, Caleb Donkor, Gabriel Odoom, Jennifer Essen, and **Julius Zebtor** – undergraduate volunteers who supported the project team on the field and the laboratory.

Dominic Duodu, Dominic, Samuel Afum and **Kwadzo Amofa** – local guides who helped in creating pathways in difficult undergrowth areas in the forest and also supported in the direct search of snails from the forest floor

Drs A. J de Winter and **Peter Tattersfield** – Provided expert advice on sampling protocols and species identifications.

12. Any other comments?

The project team expresses profound gratitude to Rufford Foundation for the support in undertaking this first systematic survey of the terrestrial snails in the Atewa Range forest reserve and for that matter the first of its kind in Ghana. Even though there is a long way to go in uncovering the real extent, of molluscan biodiversity in Ghana, we believe this was a good starting point.

Figure 3: After a hard day's snail-hunting expedition in Atewa

Figure 4: Anthropogenic activities that poses potential threat to the survival of landsnail: A) Exploration routes created towards bauxite mining; B) Illegally harvested timber; C) Fuelwood exploitation and D) Illegal farming