

Final Evaluation Report

Your Details	
Full Name	Clement Sullibie Saagulo Naabeh formerly Clement Sullibie Saagulo
Project Title	Urban Ecology and Conservation of the West African Dwarf Crocodile in the Kumasi Metropolis, Ghana
Application ID	28192-1
Grant Amount	£5000
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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
Urban population, distribution, and habitat threat status of West African dwarf crocodiles in the Kumasi metropolis, Ghana				A total of 68 encounters were recorded across all the six sites (Kwame Nkrumah University of Science and Technology campus (KNUST), Fumesua Crop Research Institute (FCRI), Christian Village (CV), Parkoso (Park), Complex (Com), and Esuoyeboah (Ey)) in 24 surveys covering a total survey distance of 86.4 km. The encounters per site were KNUST =32, FCRI =3, CV =19, Park =10, Com =3, and Ey=1. Generally, <i>Osteolaemus sp. nov. cf. tetraspis</i> population is dominated by adults and hatchlings (41.176% [n=28]; and 39.706% [n=27] respectively) with juveniles accounting for the lowest representation (19.118% [n=13]). The encounter rates were high in KNUST (2.000±0.540/km), CV (1.188±0.516/km), and Park (0.625±0.144/km), but were low for FCRI (0.188±0.240/km), Com (0.188±0.240/km) and Ey (0.063±0.125/km). Majority of the respondents (270 out of 300) reported the population of West African dwarf crocodile to be declining in the Kumasi metropolitan area. Among the possible causes of crocodile population decline, hunting/killing and urbanization were ranked the top causes of <i>O. sp. nov. cf. tetraspis</i> population decline followed by habitat destruction, human population increase, and pollution. Apart from the KNUST site, the populations in all the other habitats (FCRI, CV, Park, Com, and Ey) were recorded in small patches and the painful story is that these patches have been sold out to people for settlement and business activities and such lands cannot be taken from their owners anymore. So, the only hope for these

				vulnerable individuals is to rescue them and put in safe habitats like KNUST and Abuontem before any complete destruction of those last habitat fragments. A manuscript for a journal article on this objective is currently being developed for publication.
Local perception and trade on West African dwarf crocodiles in the Kumasi metropolis, Ghana				Interviews were conducted for a total of 300 respondents selected using, random, purposive and snowball sampling techniques. Surveys in restaurants and butcheries did not reveal the sale of crocodile meat in the market. This signifies that dwarf crocodile meat is consumed at the subsistence level in the metropolis. This was confirmed by 12% of respondents who revealed their consumption of crocodile meat. Contrary, 15 dwarf crocodile skins were recorded at 50 herbal medicine selling agents in the study area. But by estimation each of the 50 agents sells about two skins a year and this equates to 100 skins per year. 20% of this estimate was confirmed to be coming from the metropolitan area and the remaining 80% coming from outside of the metropolis. Respondents also revealed that the above estimates could likely be higher in future as the demand is on the increase. A manuscript for journal publication is currently being developed for this objective.
Conservation education and stakeholder consultation workshops				Due to the COVID-19 restrictions, our project activity timelines were distorted, and this reduced our originally proposed six school conservation education programmes to two in two schools. Also, our in-person community conservation awareness creation was replaced with one radio-based awareness creation in adherence to Ghana COVID-19 protocols. We however conducted all the three stakeholder consultation workshops.
Monitoring, evaluation, reporting and dissemination of project findings				Progress report was developed and sent to The Rufford Foundation based on which the project team evaluated and made the necessary adjustments to ensure good performance and successful completion of

				the project. Copies of this final evaluation report will be shared with the Wildlife Division of Ghana, Threatened Species Conservation Alliance, Kumasi Metropolitan Assembly, and the Wildlife Department of the Kwame Nkrumah University of Science and Technology as this fulfils our project findings dissemination plan. Short videos are also currently being prepared and will be posted in YouTube when completed.
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

The COVID-19 pandemic massively affected the activities and project timelines due to local lockdowns by the Ghana government. This was tackled by first notifying The Rufford Foundation about the situation. Together with advice from the foundation, we halted the project and adhered to all the COVID-19 protocols until conditions became better and the project was resumed. But since restrictions were only minimised rather than total removal of all restrictions, our in-person community education programmes were replaced with radio-based awareness creation. Also, per schools' COVID-19 regulations, we were only permitted two school education programmes instead of the originally proposed six.

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

1. This study has recorded for the first time an urban population, distribution and threat status of West African dwarf crocodile and this is first of its kind in Ghana. The population status was estimated using the encounter rates and population structures following the guidelines defined in Shirley et al., (2009) and Smolensky (2015). I calculated the population structure as the relative proportions of the number of encounters per life stage per site and the encounter rates were calculated as the number of crocodile encounters per km (Shirley et al., 2009; Smolensky, 2015). We also modelled the environmental determinants of the population and distribution patterns of West African dwarf crocodile. Threats were also quantified based on the scope, severity, and magnitude of each possible threat (Battisti, 2008). This serves as a solid baseline information for long-term monitoring and the development of management strategies for the species

2. This project has initiated the development of targeted urban management plan for West African dwarf crocodile which will also benefit all crocodiles in urban landscapes in Ghana and elsewhere. The plan will be completed in the second phase of the project with the full involvement of all the relevant stakeholders.

3. Our work from this project has also resulted in two scientific manuscripts, one under review and the other under development. Both will be published in top international journals. Such articles will benefit the larger scientific community as they will serve as guides to other conservationist and researchers who will do similar works in other places.

4. We have also created conservation awareness through school education (300 students), radio-based awareness and stakeholder workshops. We have also formed one community volunteer group comprising of six members who will serve as the immediate contact whilst the project team is away. With this, crocodile cases can easily be reported, and rescue services can also be immediately organised when the need arises.

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

Stakeholder consultation was a key component of this project where community authorities representing the voice of the public were deeply involved in all meetings and in the initiation of the management plan of the species. Farmers who fringe the habitats of the species were also involved in all consultations and needs-based assessments were made where the farmers stand to benefit from all the future habitat restoration activities in the second phase of the project. A community volunteer group was formed, and the volunteers' capacity was built in crocodile surveys, crocodile capture and release, and awareness creation. These members were given allowances whenever they were engaged in project activities and this supported their finances. Also, during project activities, we abided by our local economy development policy where all project items available in the local communities were purchased from the respective communities. Three BSc students were also involved in all crocodile ecological research and social surveys activities. They were offered training and skills in sampling techniques, interviews, and data analyses and interpretation.

5. Are there any plans to continue this work?

This project concluded by emphasising that out of the six sites surveyed, the population observed in the Kwame Nkrumah University of Science and Technology (KNUST) campus is a sustainable population and should, therefore, be given great conservation importance. We therefore recommended that KNUST is a potential urban refuge for this species and an envisaged urban tourism centre; hence habitat restoration and urban management programmes in this area should be immediately initiated and upscaled. But such programmes should go hand-in-hand with further research including repeated seasonal population, continuous stakeholder meetings and awareness creation, and habitat health assessment of the species. Also, we recently discovered a new potential dwarf crocodile hotspot/refuge (Abuontem) located in the suburb of the metropolis where significant populations of the West African dwarf crocodile were recorded. The good news about this habitat is that the species is traditionally protected but the challenge is habitat encroachment and destruction. This site requires effective

awareness, restoration and strong collaborative management strategies for the long-term survival of the species. So, we intend to continue this work to the second phase where we will rollout restoration of the degraded portions of both Abuontem and KNUST habitats as these habitats are currently being threatened with encroachment and habitat loss. To ensure that these habitats are fully capable of being developed as urban crocodile hotspots and ecotourism centres, we will comprehensively conduct habitat health assessments entailing diet resource availability, nest habitat availability, and hatching success of nesting mothers. When this is done, we can then confidently rescue all the isolated vulnerable individuals of the species across the urban centres of Ghana and release them into these habitats for their long-term survival. Long-term public support for conserving this species relies on how positively they change their behaviour and attitudes towards the species and such behavioural change stands upon constant and continuous public awareness creation and education; hence we will continue all our awareness creation programmes in the second phase of the project. Students and pupils serve as indispensable ambassadors of nature conservation: hence, we will form conservation clubs in schools in our second phase of this project.

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

We have two manuscripts from this project, one under review and the other under development. These articles will be published in international scientific journals to benefit the general public and the larger scientific community. We will provide The Rufford Foundation with a final project evaluation report which will be published on their website to benefit other conservationists who intend to conduct similar projects. We will share this final report with all the stakeholders and their affiliates who were involved in all our stakeholder consultations. Short videos are currently being edited to be posted on YouTube for online awareness creation.

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

The grant was used for the period 1st August 2019 to 10th December 2020. This is about 5 months extra to the originally proposed 12 months of project duration. This unforeseen circumstance occurred as a result of the COVID-19 pandemic and its restrictions.

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
Transportation	£1160	£1000	-£160	Due to the COVID 19 restrictions, some of our transportation activities were limited and we could not use all the money allocated.
Daily Subsistence Allowance for field assistance and team members	£1104	£1364	+£260	We recruited field assistances and since the COVID-19 lockdowns increased food and accommodation prices, we spent extra £260 in addition to the allocated funds.
Cost of education and educational materials	£2205	£2005	-£200	Due to the COVID 19 restrictions we could only conduct 2 out of the six originally proposed school education programs: hence, we did not use all of the funds allocated.
Cost of stakeholder workshops	£375	£475	+100	Cost of food and meeting space increased at the time of the project: hence, we spent £100 extra in addition to the funds allocated to this task.
Cost of crocodile survey equipment	£156	£156		
TOTAL	£5000	£5000		The exchange rate at the time of the grant was £1 = GHS 6.72

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

Awareness creation is still a crucial aspect for the long-term survival of this species in the Kumasi metropolis as we are talking about a city with over 2 million inhabitants. Also, the long-term survival of this species in the urban ecosystems requires urgent targeted conservation management plan developed based on our already established baseline information with detailed stakeholder involvement. Hence, in the second phase of the

project, we will continue the stakeholder meetings and complete the development of the needed management strategies for this species. Also, our surveys revealed that one site (KNUST) out of the six survey sites and a newly discovered site (Abuontem) harbour significant sustainable populations of the species and offer a high potential of serving as urban dwarf crocodile refuges and ecotourism centres. However, these habitats are severely undergoing degradation due to encroachment pressures. Fortunately, our already initiated stakeholder consultations and preliminary work at the new habitat have resulted to a collective interest in the restoration of the degraded portions of these habitats. So, it is crucial to rollout a restoration process involving tree planting in all the degraded portions of these two habitats. Also, our project findings indicate that all the habitats surveyed except KNUST and Abuontem campus are having unsustainable population (no signs of breeding, relatively high threat status and bias population structures) and this means that such individuals need to be rescued and released into healthy habitats for their long-term survival. So, we will conduct habitat quality assessment involving diet availability assessment, breeding habitat quality assessment, and hatching success in KNUST and Abuontem in the second phase. Now that we have the baseline urban ecological data of the species, it is very relevant to us to intend to conduct repeated dry and wet seasons ecological surveys so that we can monitor the long-term population trends and threats of the species.

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?

The Rufford logo was used on the conservation t-shirts which were them distributed in schools and communities. Rufford is also acknowledged as the primary donor in all our publications that will result from this project.

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

Name	Role
Clement Sullibie Saagulo Naabeh	Principal Investigator (PI)
Emmanuel Amoah	Played lead role in the crocodile surveys and the design and implementation of the conservation education programs
Akwasi Anokye	Led the stakeholder workshops and social surveys which entailed market surveys, household surveys, hunters' interviews and key informant interviews.
Gideon Appiah	Field assistant: helped in field data collection, data organisation and analyses
John Fuhensi	Driver from the Threatened Species Conservation Alliance (THRESCOAL) who drove our team during all project activities that required vehicular navigation.

Nana Efua	Field assistant: she helped in field data collection, data organisation and analyses
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12. Any other comments?

We are very grateful to The Rufford Foundation for providing tremendous financial support for this work. Even in the era of global COVID tremor which affected the timeline of this project, the foundation offered our team the necessary understanding to halt project activities until the normalisation of the situation in Ghana and this allowed our project to last longer than the 12 months original timeframe. It was such a great learning experience, and we hope to learn more in the second phase of this project. Without the collective efforts of our team, this project will have come nowhere near completion and I say thank you to Emmanuel Amoah, Akwesi Anokye, Gideon Appiah, John Fuhensi, and Nana Efua who variedly played crucial roles during all the project activities. We extend our gratitude to all the stakeholders (Ghana Wildlife Division, Kumasi Metropolitan Assembly, Threatened Species Conservation Alliance, Department of Wildlife and Range Management of the Kwame Nkrumah University of Science and Technology, and all the traditional authorities), farmers, households, hunters, and all the people who were involved in this project for their massive support and ideas. God bless you all and let us continue to work together with one conservation voice and goal.

Ecological and Threat Survey Photos



Left: Evidence of hunting. Right: Photo of species (adult).



Habitat encroachment (Agriculture). Right: Cutting survey transect.

School Education Photos



Classroom education.



Left: Group photo after school education. Right: Donating project t-shirts to the headmistress.

Meat and Herbal Medicine Market Survey Photos



Interview at the butchery.



Left: Dwarf crocodile skins at the herbal market. Right: Interview at the herbal market.

Social Survey Photos



Left: Interview with a male household head. Right: Interview with a female household head.