

Final Evaluation Report

Your Details							
Full Name	Zinsou Cosme Koudenoukpo						
Project Title	Assessing and addressing the quality of the Pendjari River in Benin, using aquatic macroinvertebrates, monitoring and Environmental Education Programs						
Application ID	31111-1						
Grant Amount	£5,998						
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Date of this Report	November, 2021						



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
Macroinvertebrate's checklist in the Pendjari River				A total of 240 macroinvertebrates samples were collected (six samples x 10 sites x four sampling campaigns). The macrofauna inventory based on 240 samples enabled the identification of 22017 individuals belonging to 77 taxa (will be presented in the paper currently being written). Etheria elliptica (Mollusca: bivalvia) is the most abundant species at all stations. It is nevertheless the species most exploited by the riparian populations for commercial purposes.
Environmental characteristics of the surveyed sites				52 measurements of environmental parameters were analysed, including nutrients and pesticides (Endosulfan and Lindane). Out of the 10 sites surveyed, organic pollution and the presence of pesticides in the water were noted at six sites, all of which were located downstream of the river. The upper sites of the river are ecologically stable with high oxygen values, transparency and absence of organic pollution.
Environmental education activities towards local communities and decision-makers				A total of 84 people participated in three sessions of three environmental education activities were organised; two of which were aimed at cotton growers' associations in three communes bordering the river catchment area, and one activity aimed at students in the largest secondary school in the study area.
Writing articles and technical information documents				I wrote a first draft of the manuscript, and it is submitted to others co-authors prior to submission. This activity is still going on



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

No unforeseen difficulties arose during this project. However, during the first expedition of this project (2 days) we found that the abundance and spread of hippos was greater than expected, which prevented us from effectively surveying many of the planned macroinvertebrate sites (riverbanks, shallower stations). We therefore had to adjust our survey planning by concentrating data collection on deeper stations (>7m) to avoid crossing hippos.

Moreover, we planned to conduct fieldwork in September 2020, after initial field visit in August. However, due to unprecedent floods we were stranded during fieldwork and could not reach our sampling sites. Because of this unforeseen problem we lost three months in timescale.

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

- Macroinvertebrate's checklist of Pendjari River

The population is largely dominated by insects with 84.01% of the total richness. Other groups followed in varying proportions, namely molluscs, crustaceans and annelids. The Coleoptera order was abundant in individuals and the Etheridae was the most abundant family. The study showed a seasonal variation in the abundance of taxa during the rainy season with a high density.

Statistical tests clearly show that temperature, nutrients, and pesticides affect the distribution of organisms. Then, bio typological structure shows a stable population upstream compared to the downstream stations which are disturbed with a low diversity of species and a total absence of pollution-sensitive organisms such as ETP taxa (Ephemeroptera-Tricoptera-Plecoptera). Downstream of the river, where agricultural activities are more intense, we noticed organic pollution of the stations, non-tolerable values of pesticides with a proliferation of Oligochaeta, Chironomidae and Simulidae (resistant taxa).

- Environmental education for conservation of the river and its ecosystem services This project has shown local people the importance of conserving the Pendjari River, on which the survival of several endangered species depends.

Public and park people get basic information on macroinvertebrates. Thirty-two people, including local communities, park authorities, and 52 students participated in the environmental education sessions, to develop their self-awareness and to inform their parents about the dangers of using fertilisers and pesticides.

4. What do you consider to be the most significant achievement of this work?

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

Local communities were engaged during our field surveys by informal talks and discussions.



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

We also discussed our work with the staff of the all-cotton farmers association and school students. The main benefit of these communities has been the increasing of awareness and knowledge referred to conservation of local biodiversity. The communities have also benefitted with better agricultural practices, informed about impact of unregulated sand dredging and how to protect the surrounding soil and ecosystems services.

6. Are there any plans to continue this work?

There are still lots to do and explore in context of protection of Pendjari Biosphere Reserve. So, my next research trip is to:

- Complete the sampling for providing a more comprehensive list of the benthic macrofauna, promoting community-based protection strategies of the key habitats showing highest diversity of aquatic organisms.
- Continuous awareness-raising meetings with additional other groups for more impact.
- More importantly, it will also be necessary to promote a value chain around the exploitation of local oysters (*Etheria elliptica*) for a better involvement of women in the river sustainability should be.

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

Through different environmental education, part of our findings was shared with key stakeholder. This will be continued through:

- Publication: currently, I'm working on a manuscript, which is expected to be published in 2022 in peer-reviewed international journal and shared in international conferences.
- Social media, through blog and the CAPE BIO NGO website will contain the achieved results of this project (the website is being maintained and be available in December 2021).
- Rural animation with local partners such as cotton farmers associations and local population living around the park.

8. 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 15 months from August 2020 – November 2021. The actual length of the project was greater than the anticipated. Part of the field research and environmental education with stakeholders (cotton farmer and school students,



local communities and park people) was postponed to July and August 2021 due to end of year exams and agricultural calendar. The field work was completed by September 2021

9. Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in \pounds 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
Field Equipment	1262	1262		
Field Work	2308	2336	+28	Social distancing measures due to COVID 19 Pandemic increased the local travel amount.
Laboratory work	1638	1622	-16	We obtained some reductions due to the long-standing collaboration between the NGO CAPEBIO and the analysis laboratory.
Field based training and educational program	790	842	+52	To increase the impact, we have extended the awareness raising to the students at the largest secondary school of the area.
TOTAL	5998	6062	+64	Given the importance of the study, the difference (+64) was covered by the NGO CAPEBIO after a management board session.

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

We think for the future:

- Firstly, we plan to complete sampling campaigns to produce a more comprehensive list of macroinvertebrates from the river for future modelling plans. Thus, we plan to use eDNA approach to achieve this goal and minimise misidentification. It will allow better construction of future models for ecosystem preservation.
- Secondly, to continue education sessions to other stakeholder groups exerting pressure on the river. Extend awareness-raising sessions to fishermen for a



rational exploitation of aquatic resources. In addition, we are thinking of forming monitoring green groups in each school around the reserve that will have extracurricular activities for the preservation of the reserve's ecosystem services.

• Finally, implement a strategy for the sustainable management of wild oyster stocks and the promotion of value chains of the exploitation of the species. This will allow the population to better benefit from the river; thus, they will be more interested in its preservation.

11. 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 logo was used in posters (below), brochures and banners used for different promotional and awareness campaign. The Rufford Foundation will also be thanked in all other upcoming publications.



1st Rufford Small Grant



Assessing and addressing the quality of the Pendjari River in Benin, using aquatic macroinvertebrates, monitoring and Environmental Education Programs

Activity: Environmental education activities towards local communities and decision-makers

Benin, 2020 - 2021

Together let's save our rivers!



Assessing and addressing the quality of the Pendjari River in Benin, using aquatic macroinvertebrates, monitoring and Environmental Education Programs

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

Dr. Luc Janssens de Bisthoven: helped to design the posters used in the environmental education sessions. We received training on how to make awareness posters through one of the activities of the CEBioS programme (https://cebios.naturalsciences.be/), of which he is the coordinator.

Dr. Luc Akpona: working with African Park, he organised permits, accommodation, and provided local contacts for field work (drivers, field guides).

Dr. Prudenciene Agboho: she participated to sampling and provided additional expertise for freshwater micro-mollusc's identification.

Dr. Appolinaire Goussanou: he provided expertise for freshwater Crustacean's identification.

Msc. Alexandrine Agbangbatin and Msc. Medard Agbessi: helped during field work and environmental education activities.

Dr Thierry Agblonon: participated in all field expeditions. Provided in situ-water quality measurement equipment (Secchi disk depth, Temperature, DO, pH, etc.)

Msc. Nado Ewegbe: helped to get in touch with the cotton growers' associations easily.

13. Any other comments?

During execution of this project, we were struck by the painful death of Professor Yves KENGNE (https://afwa-hq.org/index.php/fr/publicite-fr/item/1209-deces-profkengne). He is one of the referees who believed and recommended this project. Rest in peace dear Professor!

I am truly grateful to The Rufford Foundation, UK for funding this project. We look forward receiving furthermore support in future.

We also thank all the teachers who gave advice and helped us at different levels for the good execution of activities.





Sampling and measuring of environmental parameters.



Laboratory activities (organisms' identification and dosage of pesticides).





Environmental education with cotton farmers.



Environmental education with School groups (mainly children of farmers).