Final Evaluation Report

Your Details	
Full Name	Takudzwa Comfort Madzivanzira
Project Title	Mitigation of socioeconomic impacts associated with crayfish invasion in Lake Kariba
Application ID	32702-1
Date of this Report	14-02-2022

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
Project sensitisation with research team, stakeholders and fishermen				On the first day, we had a meeting with the University of Zimbabwe Lake Kariba Research Station (ULKRS) team to explain the project details as per our proposal. We also visited the Fisheries Department under the Department of Parks and Wildlife, Zimbabwe. On the second day, we met with village leaders and fishermen in the fishing camps asking for permission to conduct our project and experiments during their fishing operations.
Mitigating crayfish impacts (gillnets - crayfish traps experiments)				We successfully conducted the main component of our project which was to demonstrate how crayfish trapping along gillnets prevent crayfish from damaging fish caught.
Demonstrating how to process crayfish for consumption				We successfully demonstrated how to process crayfish for consumption. However, the local people did not want to take part in consuming the crayfish that we processed. The communities still resist using the crayfish for consumption.
Demonstrating how to process crayfish for stock feed				We successfully demonstrated how to process crayfish for livestock feed. This was welcomed by most people in the fishing camps. We fed a few chickens with the feed. The challenge for this objective was the number of crayfish we caught, which were not sufficient in other sites to produce enough feed for further demonstrations.
Crayfish awareness campaigns in schools				Due to the COVID-19 pandemic, the opening of schools in Zimbabwe was delayed, and we were not able to fully achieve this objective. However, we made posters that we delivered to selected schools so that students learn about the invasive crayfish.

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

a). Development of a method that can reduce impacts of crayfish on the artisanal fishery in Lake Kariba
The fishermen expressed deep concern on how their catches are being affected by crayfish in Lake Kariba. Our main objective was to work with the fishermen in curbing the crayfish impacts that they are experiencing. Our experiment was successful as we demonstrated how crayfish impacts on fish can be reduced by placing a baited crayfish trap close to a gillnet. Nets that had no baited traps had fish that were spoiled, whilst there was less or no catch spoilage on nets that were set together with crayfish traps. This method was well received by fishermen.

b). Development of methods to process crayfish for consumption and for stock feed
We demonstrated how to process crayfish for household consumption. Although the communities learnt how to process them, they still were resistant to eat them as they all distanced themselves when it came to eating the processed samples. The main reason why they cannot eat crayfish was because of its appearance as well as religious and cultural beliefs. They however welcomed the idea of using crayfish to feed their domestic animals. We dried the crayfish sampled and grinded them, and we fed chickens.

c). Identifying problems, the challenges that the communities face to participate in the program of catching crayfish
The Department of Fisheries (National Parks) requires each individual to pay permit fee of US $80/crayfish trap. This fee is way too much for the poor fishermen. We noted down this concern which we will include in our recommendations to the department of fisheries so that fishermen be allowed to trap crayfish since it is an invasive species and is doing more harm than benefits in Lake Kariba.

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

Bad weather
Some of the days it rained heavily, and this affected our field operations, and results. We at times had to adjust our times so that we did our field work when the conditions were favourable.

Low crayfish catches at some sites
We just used the few crayfish we caught to demonstrate how to process crayfish for consumption and for food. The important demonstration was that crayfish traps can reduce impacts on their fish caught on gillnets and this method was well received.

Closure of schools extended due to the Covid-19 pandemic
Our trip coincided with the extension of the closing of schools. We had planned to go around schools educating them about crayfish invasions and how they can play a part in conserving natural systems. We therefore designed a poster that we distributed to a few schools in Kariba town so that they display them in their common rooms to deliver the information on crayfish invasions.

Most fishermen were not comfortable with the camera
We explained to them that the photos we took were solely for research and will not be used to incriminate them. We only used our camera where were only allowed to.

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

This project highly involved the local communities. Their participation in this project was remarkable. They assisted in the setting of traps (end of day) as well as retrieval in the morning. They assisted in recording the quantity of fish that were affected and participated in calculating the monetary loses associated with the damage by crayfish. They also assisted in identifying crayfish hotspots.

With this project of setting traps alongside gillnets, we provided a solution that fishermen can use which can have three positive results overall:

- A significant reduction in catch spoilage associated with crayfish, as crayfish go into the baited crayfish traps and not to the gillnets.
- Utilisation of crayfish mainly for feeding domestic animals (mostly poultry), as people are not yet ready to consume crayfish.
- Overall, continued localised trapping reduces the abundances of crayfish. When crayfish numbers are low, catch spoilage is reduced.
- Potential to form crayfish cooperatives where they submit their crayfish catch for sell in Kariba town restaurants and hotels.

5. Are there any plans to continue this work?

We only conducted this study in Basin 5 of Lake Kariba which is close to Kariba town as we had technical support from ULKRS. We wish to continue to Basin 2 and 3 where high impacts of crayfish are being recorded. In continuing this work, we also want to advocate for permit waivers for the fishermen to be allowed set a certain number of traps alongside their gillnets. This will be through engaging the Department of Fisheries and the Zambezi River Authority who manage the lake.

We also would like to include crayfish in poultry feed formulation that can be locally used to rear chickens for those communities that cannot afford to purchase commercial feed. This will achieve two things:

- Formulation of a cheap feed using almost-free raw materials.
- Overall reduction in the abundances of crayfish. When crayfish numbers are low, catch spoilage is reduced.

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

I aim to publish this work in social sciences peer-reviewed journals. Already, some of the information from this project has contributed to a scientific manuscript that is almost ready for submission to a high impact journal and the contribution of The Rufford Foundation will be acknowledged. This project generated a vital method that can be applicable to other invaded systems in Africa. This will help in controlling

the abundances of these invasive crayfish species and reducing the associated socioeconomic impacts on livelihoods. If I manage to attend conferences, I will personally make a poster to present my findings.

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

The next important step is to engage the Department of Parks to present the results we got from this survey. The problem that the fishermen are experiencing is the crayfish which is affecting their catch. For fishermen to be able to trap the crayfish, they are required to possess a permit which costs $80/trap. We want this fee to be scrapped off for artisanal fishermen, so they participate in trapping crayfish to reduce their numbers in Lake Kariba. In reducing their numbers in the lake, they are not only protecting their fishery, but a wide range of biodiversity in the lake some of which is threatened e.g., the Kariba bream. Allowing fishermen to trap crayfish will potentially create a cooperative where they will submit their crayfish catch for sell in Kariba town, therefore adding to their daily income. Venturing into crayfish business will ultimately reduce pressure on the already threatened artisanal fishery.

The next step also is to do proximate analysis of crayfish to describe its nutrient status for inclusion in feed formulations. Crayfish is a potential cheap protein source which is being thrown away by fishermen.

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?

We produced a poster that we distributed to every office and school that we visited in Kariba town. We mentioned always that the research was funded by Rufford Foundation, and we briefly explained about how the foundation has been supporting projects in Africa.

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

Dr. Takudzwa C Madzivanzira
Dr. Takudzwa C Madzivanzira is a postdoctoral research fellow based at the University of Mpumalanga in South Africa. He was the project manager for this project. He was responsible for coordinating all fieldwork activities and general administration work.

Mrs Adroit T Chakandinakira-Furudzai
Mrs Furudzai is an aquatic ecologist under the Zimbabwe Parks & Wildlife Management Authority. She handled all the admin work for us to be allowed to conduct our field work in Lake Kariba. She assisted in identifying the fishing camps as well as field work.

Miss Grace Nyahanana
Miss Nyahanana is a Food Science technologist based in Harare Polytechnic College. She previously worked on developing crayfish cooking methods in Lake

Kariba. Her role in this project was to assist in fieldwork and mainly to demonstrate how to process crayfish for consumption.

Mr. Shelton Motsi
Mr. Motsi is an Animal Scientist who runs an aquaculture farm in the Midlands region of Zimbabwe. His role in this project was to demonstrate how crayfish can be utilised to make stock feeds. He also assisted in field work.

Miss Tariro Mabiza
Miss Mabiza is an aquatic ecologist-based Aquaculture Innovations. Her role was to assist in fieldwork, as well as to assist in preparing crayfish for consumption.

The ULKRS team

Mr. Zenzo Khali
He facilitated all field work and introduced us to the fishermen. He also assisted the field work.

Mr. Tendai Chinamaringa
He facilitated all field work and introduced us to the fishermen. He also assisted the field work.

Mr. Faison Muleya
The boat captain. He drove us to all the sampling sites and fishing camps in Lake Kariba.

Students
Students immeasurably contributed to this project. These are doing their internship at the ULKRS, which is part of their curriculum. They prepared equipment to be used in the field on daily basis. In the field, they assisted in various tasks that were assigned to them. They took turns to go with us into the field. The list of students is below:

Tobias Mushore
A 3rd year BSc student at Midlands State University studying Biology.

Tanyaradzwa Mutemachani
A 3rd year student at the University of Zimbabwe studying Biological Sciences.

Tadiwanashe Nyongo
A 3rd year BSc student at the University of Zimbabwe studying Biological Sciences.

Nyasha Mataure
A 3rd year BSc student at the University of Zimbabwe studying Biological Sciences.

Faith Chikangaidze
A 3rd year BSc student at the University of Zimbabwe studying Biological Sciences.

Tinotenda Masiko

A 3rd year BSc student at Chinhoyi University of Technology studying Freshwater and Fishery Science.

10. Any other comments?

The grant that we got was enough to cover for all our expenses. Some costs that we had not budgeted for, we managed to balance out with some expenses where we spent less than we budgeted for. I was happy to use my personal finances to cover some of the unforeseen costs. Students that we worked with appreciated being involved in this project. They acknowledged that it was the first time getting into the lake and working with crayfish as financial constrains are affecting operations at ULKRS. This project contributed to their manpower development component of their curriculum, and they will include the details of this trip in their end of internship report which will be examined by academic boards at their respective universities.

Mitigation of socioeconomic impacts associated with crayfish invasion in Lake Kariba

By Dr. Takudzwa C Madzivanzira

Photo summary

Part of the research team preparing equipment to use for field work

Grace Nyahanana explaining to Nyasha Mataure (student on internship) the sampling procedures

Charara Fishing camp

Dr. Takudzwa Madzivanzira explaining to the fishermen about the project

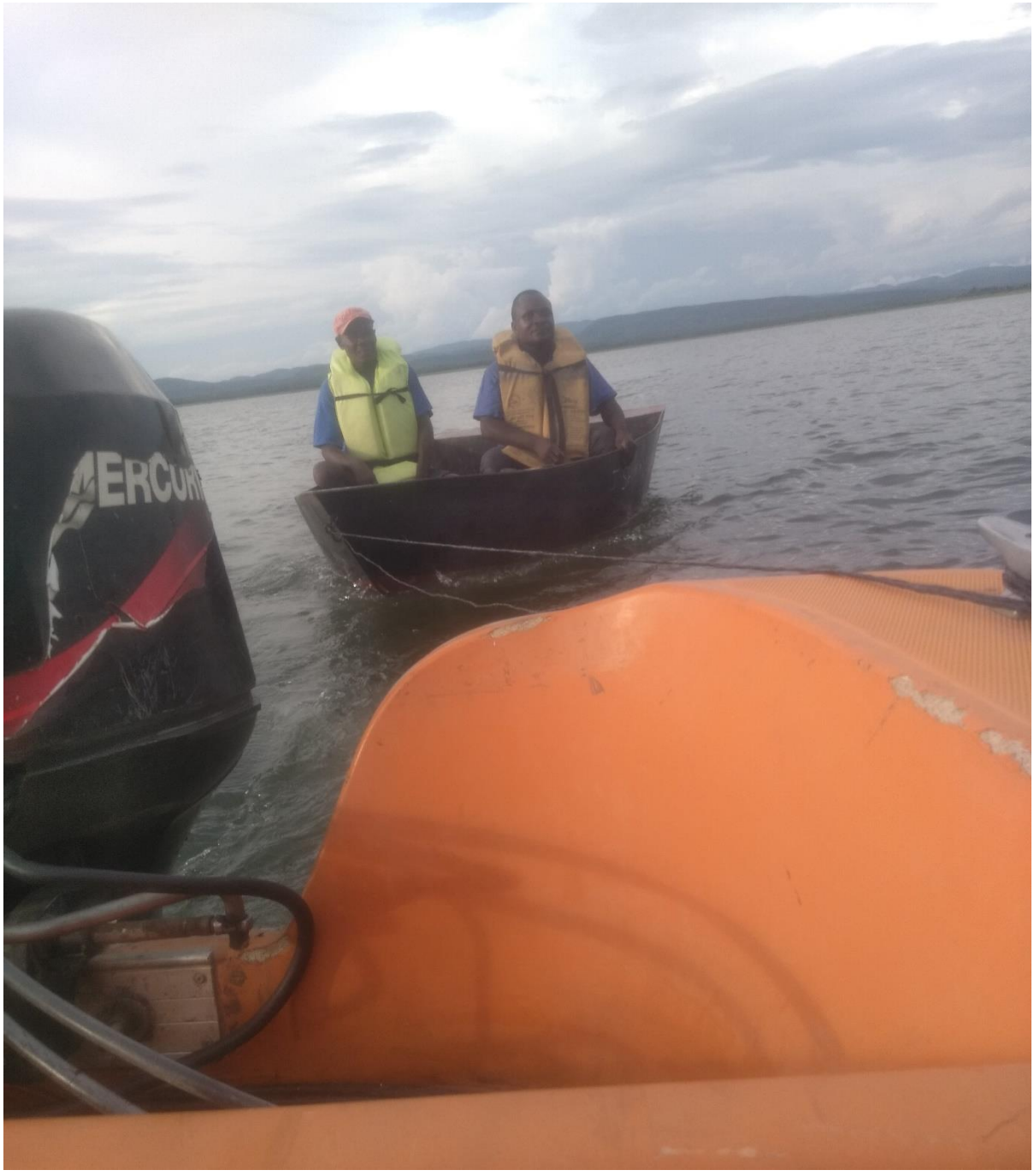
Nyaodza fishing camp

Nyaodza Fishing camp

Gache-Gache fishing camp

Fisherman drying his catch

Fishermen showing where he sets his nets



Fishermen who assisted in the research being towed by our boat

Tendai Chinamaringa (ULKRS) explaining to the fisherman about our project in Lake Kariba

Fisherman assisting the deployment of baited traps

Our boat towing fishermen boats who assisted in deploying crayfish traps

Crayfish trapped on the fishermen net

Crayfish entangled on the net

Fishermen removing crayfish entangled on a net

Fish damaged by crayfish

Fish damaged by crayfish

Fish damaged by crayfish

Fish damaged by crayfish

Crayfish caught from baited traps

Crayfish caught from baited traps

Crayfish removed from a gillnet

Crayfish removed from gillnet

Potential protein source for livestock feed being discarded by fishermen

Grace Nyahanana holding a trap with crayfish

Crayfish in a baited opera crayfish trap

Grace taking out crayfish from a crayfish trap to prepare for consumption while children watch

Part of the prepared meal (cooked mealie meal, leaf vegetables, crayfish and fish

Fried crayfish steaks

Fried crayfish steaks ready to be eaten

Mr. Muleya happy to share his crayfish steaks