Final Evaluation Report

Your Details	
Full Name	Antonio Diego Alejandro Juárez-Sánchez
Project Title	Can predation pressure control invasive armored catfish (Pterygoplichthys spp.) populations in northern Guatemala?
Application ID	30263-1
Date of this Report	18-Aug-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
Identify the main native predators for the invasive ACF				Occupancy data has been collected from potential native predators for the armored catfish. Yielding 320 predatory fish samples, 195 crocodile observations, 445 fishing bird observations and 443 Neotropical river otter scat collection. The analysis of diet samples is being processed now. We have been conducting further fieldwork in 2022 and we are to doing the laboratory work between 2022 and 2023. Crocodiles and fishing bird captures have proven difficult due to restricted time in the field that is consumed with the rest of sampling activities on the project.
Assessing the importance of predation as a driver of ACF populations in northern Guatemala				In 2021 we were able to sample 29 sampling points collecting 311 samples of the armoured catfish, from which we will estimating some population parameters and relate them to the functional diversity of native predators. In 2022 with funding from other donors we were able to go back to the field and expand our sampling area. Now we are entering into the laboratory and office stage of this component of the research.

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

a) We have collated enough samples to develop a diet study for the most abundant fish and mammalian river fish predators. This will be use not just to identify the main predators of the invasive armoured catfish but also it can be used as a baseline in a monitoring programme to measure the impacts along time of the presence of the invasive species in the system.

b) We were able to collect samples of river otter diet and distribution to continue with the monitoring programme that we have set up since 2009-2010 and has a 5-year interval (2090-2010, 2015, 2021). This monitoring programme was interrupted in 2020 due to the movement restrictions placed by the Guatemalan Government during the COVID-19 outbreak. Thanks to the

Rufford Foundation funding, we have been able to collect samples of other river fish predators setting a baseline for a monitoring program as explained previously.

c) We have collected data on the invasive armoured catfish, its native competitors, and native predators at 29 sampling points. We will use this data to evaluate predation importance over the control of invasive species populations.

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

We were expecting to conduct the sampling in 2020 but due to the COVID-19 outbreak, the fieldwork was moved to 2021 when the disease was known better and prevention strategies were in place. By the end of 2021, all the field personnel had their vaccines and none of us were infected.

Large predatory fish were proven to be difficult to capture during our sampling sessions and diet data was scarce. We were able to contact and build a partnership with local fishing tournament organisers. They allow us to collect diet data of the specimens that were turned in during the tournament. This allows us to gather the necessary samples to study the big fish diet.

Captures of crocodiles and fishing birds were limited due to the necessary time to fulfill the other data collection of this project. We did some observational data when birds were seen feeding trying to identify the species of the prey and estimating the time required to handle the prey before completely consuming it. Furthermore, we expect to develop the second stage of this project where we can dedicate longer time to the captures of this species in other to evaluate their diet.

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

During this portion of the research in the area, the involvement of local communities was limited since the aims addressed in this part did not require it. We informed local authorities that we will be sampling in the river nearby the villages. This way people will not get surprised to see outsiders around their territories. We did not experience any conflict with any locals and all the interactions were friendly. We did get help from the authorities at the National Council of Protected Areas to contact local authorities and key people. We were able to contact and establish a partnership with fishing tournament organisers to collect samples from the fish that were being turned in at the judges' table. We had conversations with local authorities and curios, local people, to hum we explained our research and talk about the river animals and the importance of predators in general.

5. Are there any plans to continue this work?

Yes, we are planning to continue the research with river predators in the region. In the line of the same project, we still need to do laboratory work, data analysis, and

publication writing. The Neotropical river otter data will be included in the monitoring program that we have settled up since 2009 and we plan to continue it further. We are building a partnership with organisers of fishing tournaments in the hopes of combining the tournaments with research and data gathering. We expect to develop the second stage of this project where we can dedicate more time evaluating the diet of crocodilians and fishing birds. Furthermore, we are writing proposals to study the local people's perceptions and interactions with river predators.

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

I plan to make my research available to the scientific community through scientific publications using only open access journals. Open access is especially important for a country like Guatemala, where national public or private investment in ecology and conservation research is low, and access to literature is limited. In collaboration with Fabiola Corona, another Rufford grantee, we wrote a general public newspaper article in the weekly magazine Domingo, which is printed by the largest newspaper in Guatemala, Prensa Libre. The article is about otters of the world and otters in Guatemala, what we know about them, and their threats. We plan to continue with this and share the results of my research in short articles aimed at the general public or work with reporters at local newspapers so that they can write them.

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

The immediate next step is to conclude the laboratory and office work of the project. Beyond this, I plan to continue my research with trophic ecology in the region evaluating how trophic interactions change in the system throw time and space in northern Guatemala in relation with the presence of invasive prey. The diet study of crocodilians and fishing birds is one of the priorities in the research group for the next years. I am also interested on looking at the interactions and perceptions of local people and native river predators. This can guide us to identify threats and opportunities for conservation. All the biological samples collected in this project are being deposit in the Natural History Museum of the Centro Universitario de Zacapa (CUNZAC) form the national Universidad de San Carlos de Guatemala. The next step is to organise and curate this collection.

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?

Yes, I participated as a presenter in The Rufford Foundation Conference, El Salvador 30 October to 1 November 2021. During this conference, partial results were presented and the Rufford Foundation logo was used.

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

Dr. Christina Romagosa is a research assistant professor in the Wildlife Ecology and Conservation Department at the University of Florida. She has experience

researching invasive species trade and the associated ecological impacts. In addition to mentoring graduate students, she is also involved in mentoring and advising minority undergrad students from under-represented groups in natural resources through research and internship programs. She is my Ph.D. advisor and co-project leader. Her lab is being used as a processing place for some of the diet and stable isotope samples that we gathered.

Dr. Michelle Bustamante is a research professor at the Centro Universitario de Zacapa (CUNZA) from the Universidad de San Carlos de Guatemala (USAC) where she researches bird ecology and trophic interactions. She coordinated the bird sampling and trained the personnel. Her lab is being used as a processing place for some of the diet samples that we gathered.

Ph.D. Candidate **Manuel Lepe** is a research assistant professor at USAC where he researches parasitology in aquatic environments. He also has experience in wildlife health research and handling wildlife. He coordinated and trained the personnel to collect tissue samples from the animals captured during this project. His lab is being used as a processing place for some of the tissue samples that will be sent for DNA analyses in the parallel project of digestive tract parasites in both the predators and the invasive ACF.

M.Sc. **Bessie Oliva-Hernández** is a professor at USAC where she teaches environmental chemistry. Her research focuses on evaluating pollutants in aquatic systems ranging from arsenic, pesticides, heavy metals, and nutrients. She coordinated and trained the personnel to collect water samples for water quality analysis. All the water samples were processed in her laboratory, using other funding apart from the Rufford grant.

10. Any other comments?

We don't have any further comments at this moment besides thanking The Rufford Foundation for their support for the development of this project and understanding all the setbacks and delays that were associated with the execution of the project.