The Rufford Foundation
Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Yasmin Quintana Morales
Project title	Ecological Impact of the Invasive Armoured Catfish (Loricariidae) on Fish Assemblages and Implications for Conservation in North Guatemala
RSG reference	26506-1
Reporting period	February 2019-February 2020
Amount of grant	£ 5,000
Your email address	yquintana@tamu.edu
Date of this report	February 26, 2020

1. Please 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
Determine patterns of the catfish invasion in two large tributaries, San Pedro and La Pasion rivers, under different management categories in the upper Usumacinta.				Fish were collected from San Pedro and La Pasion rivers along a longitudinal gradient. The community data will allow us to understand the patterns of armoured catfish invasion and identify locations that are being more affected. A paper looking at the invasion patterns is being prepared and we expect to have the final version by the end of 2020.
Define the first baseline of ecological knowledge of the fish assemblages in the upper Usumacinta in Guatemala.				Data to explore patterns of diversity is available for the San Pedro and La Pasion rivers, including habitat characteristics from sampling locations. To our knowledge, this is the first study to identify the ecological characteristics that drive fish assemblages in the upper Usumacinta. This information will be published as one of the chapters of my PhD dissertation.
Identify imperilled fish species and community patterns associated with the catfish invasion.				We are identifying indicator and rare species for both rivers. With stable isotope analysis, we will explore niche overlap among the invasive armoured catfish and native species that can be under risk due to the intensity of the invasion. The final assessment will be published at the end of 2020.
Improve understanding of the environmental and spatial factors affecting the fish assemblage, including the influence of catfish invasion.				Water quality parameters and habitat characteristics were collected at each sampling location along a longitudinal gradient. These environmental factors and the geographical position of each location will be correlated with the community data to identify their influence in diversity patterns.
Collect fish specimens to be archived in				Multiple samples of different fish species were collected from both

museums and tissue samples of fishes and basal production sources for stable isotope analysis to estimate the effect of catfish invasion on food webs.				rivers and they are now been archived in two ichthyological collections at the Universidad de San Carlos de Guatemala and Texas A&M University. Tissue samples from 47 species were collected for stable isotope analysis. The tissue samples are currently under process for further analysis.

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

We experienced some logistic difficulties such as vehicles failure, problems with boat engines, and lack of fishermen available to work several days in a row. However, as we were conscious that these types of problems are common when doing field work in Guatemala, we had enough time and also had a backup plan for emergencies.

We always were in contact with local authorities and local leaders in case help was required.

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

a) This is the first study that will look at the ecological impacts of the invasive armoured catfish on fish assemblages. This information will be relevant for fish conservation, not only in Guatemala but in many tropical ecosystems experiencing the same conservation concerns regarding this invasion.

b) Our study will provide data of fish diversity patterns in the upper Usumacinta River which can be a guideline for conservation strategies. This data will indicate the importance of local conservation, environmental factors relevant for fish conservation, and rare species that may require some attention. This is the first time that fish are surveyed systematically using complementary fishing gears to include the entire fish community in the analysis.

c) The fish tissue and the fish food basal sources collected will allow us to evaluate the impact of the armoured catfish at a trophic level. This will allow us to determine if the armoured catfish has a niche overlap with native species and if the catfish abundance influence the sizes of trophic niches of native fishes at multiple trophic levels.

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

Government agencies and NGOs in charge of the conservation and management of aquatic ecosystems allowed me to present my project and explain the framework

of the research. In some cases, they provide assistance and logistic support. The Autoridad para el Manejo y Desarrollo Sostenible de la Cuenca del Lago Peten Itza, provided laboratory space and equipment to process water samples. The NGO Asociacion Balam and the biological station Las Guacamayas provided logistic support to conduct part of the sampling in San Pedro River.

The national university, Universidad de San Carlos de Guatemala, organised a seminar to present this project to students and the faculty. Several students from biology attended the seminar and some reached out to get more involved in the project and participate in the fieldwork. Two students collected data for their BSc theses through this project. One of the students is analysing the diets of armored catfishes and other student is looking at the plastic ingestions by some fish species.

When doing fieldwork, we were able to contact the organisers of a fishing tournament in one of the sampling locations. They offered to provide samples of the stomach, and tissues from snook collected by fishermen during the tournament. During the tournament, we were able to explain to the public about the armored catfish project.

We also had the opportunity to talk to local fishermen and get their perspectives about the armored catfish invasion. Some fishermen worked with us during the fieldwork for several days, which was useful for information exchange.

5. Are there any plans to continue this work?

The data is being analysed as part of my PhD dissertation and final products are expected to be published between 2020 and 2021.

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

I am presenting progress of this research to different audiences. I am running a website where I will be posting some updates from the project (https://yasquintana.weebly.com/current-research.html). Also, I have presented partial results through seminars, short talks and posters in different conferences. I expect to continue presenting this work in conferences to get feedback from experienced scientist.

Each chapter of my dissertation will be published in an international peer review journal. Finally, I expect to give a final presentation in Guatemala.

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

The funding was used from April to July 2020. The project is expected to be completed by November 2021.

8. Budget: Please 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.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Fishermen day	418	1427	+1009	
Accommodations	1000	2379	+1379	
Food	800	2300	+1500	I had to cover more days than expected in the sampling areas.
Fuel	1000	1200	+200	More fuel used than estimated. The difference was covered by another grant.
Boat rental	1782	2500	+718	
Sub Total	**5000**	**9806**	**+4806**	
Equipment and materials		5400	+1900	More equipment and materials were required for the sampling. This was cover by other funding sources.
Travel cost		615		
Car rental		1500	+757	Cover by other funding sources for the entire field trip.
TOTALS	**5000**	**17321**	**+12321**	

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

Complete the analysis and publish the results. The published results will be available for the public and can be used by researchers from different countries with the same type of invasion.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

The Rufford logo was used in the presentations I gave at seminars and conferences. I will acknowledge The Rufford Foundation in any future publications, including talks and posters.

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

Dr. Kirk Winemiller is my Ph.D. supervisor. Dr. Winemiller helped me to design the project and he is currently helping me with analysis and results interpretations.

Dr. Christian Barrientos gave advises to design the project from the beginning given his expertise in the area.

MSc. Diego Elias helped with species identification.

MSc. Diego Juarez has experience working in the area, and he helped with the survey in La Pasion River.

BS. Cesar Fuentes helped with the logistics of the project, fieldwork and the deposit of fish collections.

I had the assistance of several people in the field and the laboratory, who helped during the survey and fish tissue storage. The following list includes the name of fishermen and students who helped: Julio Cucul, Alfonso Pop, Carlos Cuz, Mauricio Tec, Jeovany Tut, Nico Webber, Marco Ventura, Marlon Cordova, Luis Escobar, Julio Escobar, Lucia Lopez, Francis Santos.

12. Any other comments?

I want to highlight the importance of The Rufford Foundation to the advancement of science and conservation in developing countries. This project is one of few efforts for the conservation of the aquatic resources of Guatemala, therefore, the Rufford Foundation contribution for the project is extremely valuable and will help us to provide sound scientific information for the managers to take actions in the case of the armoured catfish invasion and the conservation of fish diversity.