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	Jeszianlenn L. Plaza
Project title	Feeding niche analysis on sympatric stream anurans on Taguibo River Watershed Forest Reserve, Northeastern Mindanao, Philippines
RSG reference	21083-1
Reporting period	May 2017–May 2018
Amount of grant	£5000
Your email address	jeszianlenn.plaza@g.msuiit.edu.ph
Date of this report	April 24, 2018

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 prey selectivity, feeding niche breadth, and overlap of anurans using stomach content analysis (SCA).			■	Data gathering in a period of 6 months, generated important basic ecological data about sympatric stream anurans. Prey selectivity, diet specialisation, and food niche breadth and overlap between species were determined.
Infer trophic level and interactions of anurans through Carbon and Nitrogen stable isotope analysis (SIA).			■	The use of SIA, delineated the three anurans as predators, but *O. laevis* is a specialist on spiders, while the other two species are insectivorous carnivores but appeared to show preferential insect groups (Odonata, Formicidae, and Vespidae) as prey.
Associate anuran prey selectivity to morphology and spatial (microhabitat) use.		■		We were able to associate anuran prey selectivity to morphology, i.e. mouth width, but association of prey selectivity to microhabitat was not accomplished.

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

The major difficulties were encountered during this project are two-fold— safety and security and misconceptions about field biologists as bio-prospectors. In Butuan City, historical and currently known conflict areas are barangay Pianing and Anticala. Local insurgencies is a continuing challenge to fieldwork in many parts of Mindanao, and NPA (New People's Army) still operates in Caraga Region, and their presence in our sites of interest (Pianing and Anticala) is pervasive. Within our sampling period, there were several encounters between AFP and NPAs; we'd hear gunshots back in our base camp (both in Pianing and Anticala). The most intense encounter was during September 2017, when families were evacuated from the two most remote communities in Anticala (one of which is our entry point) because of military operations conducted by the AFP directed towards the New People's Army. Due to the challenges about safety and security, the two sites of interest within the Taguibo Watershed — Pianing was sampled for 5 months (from May–September) and Anticala was sampled for 4 months (April, June–August).

Another major challenge to the team, as experienced by field biologists in the Philippines— both local and foreign is the misconception that field biologists are bio-

prospectors (Brown et al., 2002). Explaining that our fieldwork team are not bio-prospectors was a challenge, especially in Anticala. Due to its history as a conflict site, few to no researchers have accessed the area, this could be one of the reason why locals has limited knowledge to the type of work field biologists do in general. But we were able to address this barrier after explaining that gathering of data and frog specimens is purely for academic research and education purposes only. Photos from previous fieldwork was presented and this helps them understand the fieldwork setup. It was also emphasised to the tribal council that the team will need and rely on their knowledge about the area. The tribal council of Anticala was particularly helpful, and provided people that knows the site best to become part of the fieldwork team. This was a great help because we had very efficient local guides and porters.

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

In general, this project provided baseline ecological data (e.g. occurrence, trophic ecology) on stream anurans in Taguibo Watershed and is divided into three major outcomes. Through field sampling, use of stomach content analysis (dissection of stomach and stomach flushing), and stable isotope analysis we learned that:

(1) Anuran species composition in riparian communities between sites of different elevation is not similar. A total of eight species was documented in the watershed—four species (*Limnonectes magnus, Pulchrana grandocula, Megophrys stejnegeri, and Occidozyga laevis*) are recorded in low elevation; and seven species (*L. magnus, Ansonia muelleri, P. grandocula, Leptobrachium lumadorum, M. stejnegeri, Sanguirana mearnsi, and Staurois natator*) are in mid-elevation site;

(2) Insect prey categories (e.g. Hymenoptera: Formicidae, Coleoptera) are the most important prey types. There is contraction and expansion of niche breadth values, but overall niche breadth is narrow suggesting diet specialisation of sympatric stream anurans in insect prey types. Niche overlap between pairs of species ranges from 0 (no overlap) to 1(complete overlap) across months; and

(3) Mean $\delta^{13}C$ and $\delta^{13}N$ values from stable isotope analysis on sympatric stream anurans indicated that the frog *Occidozyga laevis* showed the most depleted $\delta^{13}C$ and most enriched $\delta^{13}N$ value s as it assimilated mostly predatory species of spiders (Araneae). The two other species of anurans *Limnonectes magnus* and *Pulchrana grandocula*, showed comparable $\delta^{13}C$ and $\delta^{13}N$ mean values indicating very similar diets but SIAR Bayesian simulation showed a much broader diet of ants, dragonflies and wasps for *L. magnus* than *P. grandocula* which assimilated dragonflies mainly.

This study has clearly delineated the three anurans as predators, but *O. laevis* is a specialist on spiders, while the other two species are insectivorous carnivore but appeared to show preferential insect groups (Odonata, Formicidae, and Vespidae) as prey. This project addressed an important knowledge gap about the ecology of Philippine anurans, especially species that are found in an amphibian-rich region like Northeastern Mindanao (Sanguila et al. 2016).

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

The local communities of the two localities— Anticala and Pianing were benefitted economically, although short-term, this project provided income to locals hired as porters and guides, during the entire period of fieldwork and sampling on the mentioned areas. Also, data generated from this project could be used as basis to strengthen the proposed eco-tourism projects by the local government unit and government organisations (i.e. Department of Environment Natural Resource-Caraga) to develop barangay Anticala and Pianing as key areas for eco-tourism in Butuan City.

5. Are there any plans to continue this work?

Yes; this project generated important ecological data about stream anurans and complement our current understanding of the ecology of Philippine amphibians. Thus, continuing what this project has started and further augment our knowledge and understanding of ecology of Philippine amphibian is important and needed. We intend to do further studies to understand better the ecology of Philippine amphibians. We plan to return to these sites (Anticala and Pianing, or adjacent localities within the watershed) to do at least 1 year of data gathering, focusing on watershed ecosystems targeting different anuran communities (e.g. stream, arboreal, ground) and its interacting species—its predators (snakes, etc.), prey (insects and arthropods) and basal sources, and use stable isotope analysis to infer and characterize relationships and between interacting species in watershed ecosystems of north-eastern Mindanao.

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

Data generated from this project will be shared to key stakeholders and will be presented on scientific and academic platforms. Preliminary data of this project in poster form was shared to the local communities and regional office of the Department of Environment and Natural Resources; and was presented in one international conference— the 3rd Southeast Asian Gateway Evolution (SAGE) Meeting from 27th August to 1st September 2017 at Bogor, Indonesia. Also, this study will be presented in a national scientific conference— 36th Association of Systematic Biologists of the Philippines-Symposium and Annual Meeting (ASBP-SAM) which will be held this May 2018. Data about the basic ecology of anurans found in Taguibo Watershed will be used as part of two scientific publications currently in preparation: distribution and occurrence of stream anurans across months and trophic data using stomach content and stable isotope analysis. The outputs in the form of scientific articles will be shared for free to relevant stakeholders (e.g. academe, water district, and government environment office, etc.). A simplified version of the papers will be shared to the local communities at barangay Pianing and Anticala thru the barangay office, as well as the office of the city mayor.

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

This project is scheduled for 1year, with fieldwork and data gathering scheduled from April to September 2017. The bulk of funds from the Rufford Small Grant (RSG) was allocated for all fieldwork and data sampling related expenses. The succeeding months (October onwards) is scheduled for data analysis and interpretation and writing of manuscript for master's thesis (accomplished December 2017) and draft of scientific articles (on going).

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
Chemicals (Lidocaine, Ethanol, etc.)	300	596.29	-269.29	Greater volume of chemicals were needed during fieldwork than initially anticipated.
Camera with accessories and tripod	565	361.64	203.36	Less expensive dslr camera model was purchased.
Field notebook, herp data sheet	15	15	0	
Jennings Pocket scale	32	59.56	-27.56	Pesola digital scale was purchased instead of Jennings.
Camp materials, gears, and equipment	150	882	-732.00	Materials used for specimen prep and collection is lodged under this section; international shipping for equipment purchases (GPS, etc.) is also lodged under this section.
First aid, medicines	100	100	0	
Stable Isotope Analysis Fee	463	468.75	-5.75	There is a slight increase of price from the date of inquiry to the actual date of SIA.
Specimen prep and collection, non-consumables	177	0		Reallocated; expenses under this section were lodged to camp materials, gears, and equipment
Specimen prep and	513	0		Reallocated; expenses under

collection, consumables				this section were lodged to camp materials, gears, and equipment
Kestrel pocket weather meter	265	121.29	143.71	A less expensive model was purchased instead of Kestrel 5200.
Garmin GPS	221	230	-9.00	GPS bag was also purchased.
SD cards, marking pens	15	15	0	
Food (field team of 5)	450	832	-382.00	Field team consist of more than 5, including porters, resulting to an increased food expenses.
Manpower (research assistant, porters and guides)	1000	700.62	299.38	Negotiated daily wage for porters and local guides is lesser than the proposed amount.
Transportation	484	367.85	-116.15	Actual fuel price and transport services were lesser than initially proposed.
Permitting	50	50	0	
Contingency 4%	200	200	0	
Total	5000	5000		*GBP to PHP at 64.00

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

It is important that findings of this project be appreciated by the public, especially locals of Anticala and Pianing, to achieve this, all simplified and scientific outputs will be shared free and accessible (e.g., upload on platforms like researchgate) to relevant stakeholders. And all voucher specimens will be deposited on a local university with facilities for an online-referenced natural history collection, making data generated from this project accessible to relevant stakeholders (e.g. academics, local government unit, etc.). Access to and providing science-based information will be very helpful in the management and conservation of Taguibo watershed— important for its ecosystem services. This is appropriate and timely, because the government has plans to develop these localities as key areas for eco-tourism in Butuan City. Results of this project emphasises the need to conduct more thorough ecological surveys and sampling on unsurveyed sites (e.g. Anticala). Follow-up and thorough ecological surveys and sampling of at least 1 year (or more) to acquire new ecological data, assess the quality of different habitats, and possible threats to amphibian communities in watershed ecosystems (e.g. Taguibo watershed, or other watersheds in Caraga) is an excellent step to increase and complement our current understanding about the ecology of Philippine amphibians.

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 Foundation logo was displayed and acknowledged in all outputs presented at meetings with relevant stakeholders and scientific conferences. As the funding organisation of this project, The Rufford Foundation will be acknowledged in all outputs (scientific articles, presentations, policy briefs, etc.) related to this project.

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

The team includes selected locals of barangay Anticala and Pianing, one research assistant, and adviser and external adviser from MSU-IIT and FSUU. Local residents of barangay Anticala and Pianing served as local guides and porters are the following: Godo Patinte, Calixto Alucero, Jovanie Edim, Gabi Sagay, Jun Sagay, Diego Sagay, Reynald Pita, Sherwin Pita, Erwin Dano, Junrey Igom, Luther Dano, Joselito Dondriano, Justin Dumadag, JR Beray, Besben Catalan, Reynold Beray, Gabi Catalan, Rolly Dano, James Mabasle, Kevin Guy-ab, Jason Limbahon, Rolly Capangpangan, Raymond Beray, and Jovencio Catalan Jr.; Janrick Inchoco as a research assistant assisted on collection of data during fieldwork; and Drs Ephrime B. Metillo (MSU-IIT) and Marites B. Sanguila (FSUU) as advisers provided appropriate guidance to formulate the questions and conceptual framework of this project.

12. Any other comments?

The goal of this project would not be achieved without the support from the Rufford Foundation. Funds from the grant was used directly on fieldwork and sampling for a period of 6 months and other related expenses. The data generated from this project is a first attempt to characterise feeding ecology of anurans common in riparian communities. And this provides important ecological information on local populations of Philippine anurans, such as, species composition between elevation, and occurrence across months. Furthermore, dietary composition data from stomach content analysis challenge the prevailing knowledge that common species— *Limnonectes magnus* and *Pulchrana grandocula* are generalists, when in fact they are specialist predators with a preference to insect prey types— these data are significant to our understanding of the ecology of Philippine amphibians. Because of the generous support of the Rufford Foundation, important inference about feeding preferences of anurans based on temporal data was generated from this project. In addition, our fieldwork team is the first group of to access the montane habitats of Anticala. The locals' (e.g. porters, guides, tribal council, etc.) experience with our fieldwork team provided them adequate background on the nature of work of field biologists and researchers and help address barriers and misconceptions about field biologists. We hope that the locals of Anticala and Pianing will have an increased appreciation of the biodiversity and importance of Taguibo watershed through the data shared from this project. The points mentioned here were achieved because of the generous support from the Rufford Foundation through the Rufford Small Grant.