

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	Ugyen Tshering
Project title	The impact of Hydropower dam on the Fish community and its Conservation along Punatshangchu River, Bhutan.
RSG reference	20850-1
Reporting period	Dec 2016 to Dec 2017
Amount of grant	£4999
Your email address	ugyen_00@yahoo.com
Date of this report	22/1/2018

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
<p>1. The studies on impact of fish diversity by the construction of hydropower dams over Punatsangchu River and its habitat preferences</p>				<p>Study area The study area comprised of Punatsangchu, river and its two tributaries (Phochu and Mochu rivers) which are located upstream of the constructed dam. Four sampling stations were selected two below the two constructed dams at Punatsangchu River and one from Phochu and one from Mochu.</p> <p>Methodology At each site a 500 m reach length was selected and each length was split into 25 m segments. A total of two castings were done per each transect point within the circular plot of 10 m to study the fish diversity. For every fish caught, the measurement such as body length, fin length and shape, scale present or absent, jaw position, mouth length, nostril position and body weight was done for identification. The catch per unit effort (CPUE) and fish biomass was recorded and after recording fishes, they were stored in the bucket containing water. At the end of the collection, few unidentified fishes were preserved in 10% formaldehyde and remaining fishes were released back into the system. The fish species were identified using various field guide books, and consulting experts. The unidentified specimens from the field were taken to the College of Natural Resources (CNR), Bhutan, for identification for further identification. Any new species found were catalogued at the University Museum of CNR for the</p>

			<p>reference of students and researchers for the future.</p> <p>The diversity of fish species was estimated using May (1993) in terms of species evenness, using Margalef's D index, Shannon index, Evenness ratio and Simpson's Species diversity, abundance and richness.</p> <p>The habitat use was measured with the purpose to determine which fish species are at the risk due to hydropower project, to identify areas of concern that need to be examined in qualitative field surveys of fish habitat and to identify preliminary restoration strategies (no action, restoration, rehabilitation, mitigation). The velocity flow of water, water depth, temperature of water and the major substratum composition within 10 m radius cast nesting area was examined. In addition to habitat variables, Riparian Vegetation Index (RVI) values was generated for each study reach based on minimum 6 numbers 5 m circular plots on both banks of the river. This value provided information on quality of riparian vegetation between altered and unaltered habitats.</p> <p>Further, the area of special concern was identified, such as reaches that contain the only habitat available for a species, reaches with known or suspected habitat degradation, reaches that are at risk to dam construction impacts, particularly altered inputs of sediment or debris, or reaches with potential barriers to normal movements among habitats. Other conservation threats (natural as well as anthropogenic) were assessed through direct observations at each transect point.</p>
2. To build fundamental information to initiate			The data on density of fish species, habitat preferences, and threats was

<p>conservation activities of fish diversity and its habitat</p>			<p>evaluated to study the impact of the dam on fish community by comparing the data of both downstream and upstream. Data collected was analysed using various statistical tools, formulae, and software (statistical package for social science (SPSS). Then the field guide on the study of fish diversity was published for the future reference and it is expected to help the future researcher to how to go about research in this topic and for the conservation of fishes in their natural habitats.</p>
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

There was less accessible area below the dam site to carryout survey as per the prescribed format. The problem was overcome by going to all the accessible areas to get better survey recordings. The other problem was getting experienced fisherman in the survey area. The problem could be addressed as I have worked in the area for 15 years and was known to most people in the villages. This helped me in getting two experienced fishermen from the villages at my survey site. Getting research approval was time consuming as it involved in catch and release of life animals. This was solved by getting in touch with my friends working at UWICER who deal with issuance of research approval. I was not able to get the equipment to measure the velocity of river but later it was solved by using local available materials like the TT ball and stop watch to measure the velocity of the river flow.

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

Knowledge base

This project aimed to study on impact of fish diversity by the construction of hydropower dams over Punatsangchu River and its habitat preferences. It served as valuable reference for a scientific protection and management of fish diversity. It will serve as the baseline information and assist the conservation planners to consider the role fish play in the conservation approach. It helped to make the students, foresters, locals and policy makers aware of impact of hydro project on fish diversity in Punatsangchu River. If the conservation measures are strengthened, the probability of conserving fish diversity is high under the assumption that the habitat condition will be improved. The habitat is most important factor for the survival of any species and if we are to conserve the species from extinction, knowing the habitat condition and conserving them is critical. This study assessed varies fish species and their habitat requirement in various habitat using different variables. The results of this study are expected to offer better conservation options for management.

Diversification of conservation measures

This project is justified to detect various fish diversity which will enable to maintain healthy riverine ecosystem.

Ecology and economy

The impact of anthropogenic activities on the habitat of the fishes was assessed. The information disseminated from the study will be of great conservation importance. Law enforcing agencies, conservation stakeholders and policy makers can act upon the result from the study for the further improvement of habitat and strategies for the conservation of fish. Positive attitude and perception were developed in the local communities towards conservation of the species through awareness campaign. With effort from the government and other agencies to protect and conserve the habitat and positive attitude of the locals to conservation of the fishes, long time survival of the species will be ensured. Hence with the action of conservation, healthy riverine ecosystem is maintained.

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

Large group of people were involved during the entire project period as one of the project objectives is participatory based. My team consists of following people who helped me for the successful completion of this project:

1. Two local people (representatives of village) were involved in the entire time of the project for data collection, transportation of field equipment and to understand the importance of the projects in terms of conservation of fish species and its habitat.
2. Two foresters of Wangdue Forest Division were involved to assist for data collection such as casting, fish identification, plant species identification and filling the data sheet.
3. Dr. D.B. Gurung, Fish expert and Academic Dean of College of Natural Resources, Bhutan helped me in my entire project in identification of fish species and data analysis.
4. Dr. J.A. Johnson (Scientist-D), specialist in Aquatic ecology, stream community ecology, Fresh water Fish biology, and conservation of Wildlife Institute of India was consulted for identification and data analysis related to habitat and fish diversity.
5. Dr. Karma Tenzin, Department of Livestock, Bhutan was my focal person during the awareness campaign.
6. Mr. Dorji Gyeltshen (Forest Officer, Watershed Division, Bhutan) and Mrs. Rebecca Pradhan (Ecologist, RSPN, Bhutan) were being used for plant identification.
7. The Environmental Officer and Environmental wing of Punatsangchu Hydropower Project were involved during the awareness campaign which would help them in

planning for delivering the mitigation work on the conservation of the fish community.

Involvement of local community in awareness campaign took place with the help of local leaders who have huge influence in the community. Local people had achieved basic information about the kind of species found in their locality and fish diversity impact by the development of hydropower projects. Both local leader and local people who were involved in the project were financially benefited as they were provided daily payment as per local rate as wages.

5. Are there any plans to continue this work?

Hydropower generation is one of the most important income generation means of country whereas it has ecologically negative impact on the fish diversity and its habitat. It is obvious that hydropower will help in rise of country's economy and the stakeholders will try to improve and develop hydropower production; hence it is us where we should ecologically state its negative impact on the river ecosystem so that the mitigation is taken care for the conservation of the species. Therefore, it is seen important to have a long-term monitoring in their habitats. Hence, Department of Forest supports the project and assess the impact of Hydropower dam on the Fish community and it's Conservation along Punatsangchu River.

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

To share the results of this study for conservation in the field the following measures are taken:

- a. Publish and report through Royal Society for Protection of Nature, Bhutan.
- b. Make presentation at Indra Gandhi National Forest Academy, India.
- c. Report to Department of Forest and Park Services, Bhutan
- d. Report and present at Wildlife Institute of India
- e. Report to Project Manager of Punatshangchu Hydro project
- f. The presentations were made to Gaselo Higher Secondary school and Wangdue Lower secondary school so that at the very baseline the students are made aware on the impact of Hydropower dam on the Fish community and it's Conservation along Punatsangchu River.
- g. Social Gathering including six villages was done. Villagers residing nearby study area are the most important stakeholders and it is very important that they are aware of the impact of Hydropower dam on the Fish community and it's Conservation.

Further, the results and information will be submitted to Ugyen Wangchuck Institute for Conservation and Environment Research (UWICER), National Biodiversity Centre (NBC) and Department of Forest and Park Services (DoFPS).

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 grant was fully used for a period of 12 months from December 2016 to December, 2017 as same time scale proposed in the project. However, I had to make little adjustment with proposed time scheduled depending on weather condition, capture success and convenience.

Following are activities in which grant were used:

1. Literature review was done by December 2016.
2. Preliminary survey with forest officials and the local communities was done to understand the ground reality and stakeholder's workshop with the forester to improve on the methodology and additional areas to be covered were discussed on January 2017.
3. Data sheet preparation and one day training to team members on the effective data collection, handling of fishes, preservation was done on February 2017
4. Data was collected from both downstream and upstream to assess impact of hydropower dam construction on fish diversity by pre-monsoon period (March, April, May and June 2017).
5. The awareness was held through workshop (local leader), two schools, social gathering of local people (six villages), and with related officials from Hydropower project through various means like audio-visual, postures and distribution of Boucher in the study area in July and August 2017).
6. Data was collected from both downstream and upstream to assess the impact of hydropower dam construction on fish diversity in post monsoon period (September, October and November 2017).
7. Data analysis, report writing and submission of final report to Rufford Foundation on December 2017 and January, 2018).

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
Field equipment's - Measuring tape, vernier calliper, GPS, altimeter, binocular, digital camera, compass, pocket calculator, stopwatch tents	701	712	-11	All the material was purchased from the online shopping of India: www.flipcart.com and www.amazon.com
Travel cost and communication	344	355	+11	Vehicle hiring charge was higher in remote villages due to high maintenance costs, mobiles and internet.
Standard field kits/stationaries (Printer paper, field notebook, field guide book, lead pencils, plastic bag, ruler)	112	201	89	Two field guide book for identifying tree species were purchased.
Education and Awareness	1922	1900	-22	The refreshment was provided during the entire awareness program and workshop with the forest official, conservationist during the discussion of finding and further improvement or protection program to be doing in the area.
Budgets for printing Poster, Broachers and Pictorial	99	102	+3	Posters were used during local visit in the community and during presentation aside slide presentation.
Budget for salaries/wages	1860	1729	-131	The wages to the team member were calculated based on the as monthly salaries.
Total	4997	4999	-61	

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

1. Studying the distribution and diversity of different types of fishes in western, Bhutan.
2. Identifying the impact of hydropower dam on the fish community and its conservation.

3. Identifying the factors affecting the habitats of fish.
4. Community based conservation with involvement of local people, students and related stake holders.

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?

With an aim to publicise RF to conservationists, students, local community, focal research institution and organizations, I have used the Rufford Foundation logo while making presentations to:

- Royal Society for Protection of Nature, Bhutan.
- Indra Gandhi National Forest Academy, India.
- Department of Forest and Park Services, Bhutan
- Wildlife Institute of India
- Project Manager of Punatsangchu Hydro project.
- The presentation were given to schools namely Gaselo Higher Secondary school and Wangdue Lower secondary school so that at the very baseline the students are made aware on the impact of hydropower dam on the fish community and its conservation along Punatshangchu River.
- Social Gathering including six villages was done. Villagers residing nearby study area are the most important stakeholders and it is very important that they are aware the impact of hydropower dam on the fish community and its conservation.

Further, the results and information will be submitted to Ugyen Wangchuck Institute for Conservation and Environment Research (UWICER), National Biodiversity Centre (NBC) and Department of Forest and Park Services (DoFPS).

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

The team consists of following:

Two local people (representatives of village) were involve in the entire time period of the project for data collection, transportation of field equipment and to understand the importance of the projects in terms of conservation of fish species and its habitat.

Two forester of Wangdue Forest Division were involved to assist for data collection such as casting, fish identification, plant species identification and filling the data sheet.

Dr. D.B. Gurung, Fish expert and Academic Dean of College of Natural Resources, Bhutan helped me in my entire project in identification of fish species and data analysis.

Dr. J.A. Johnson (Scientist-D), specialization in Aquatic ecology, stream community ecology, Fresh water Fish biology and conservation of Wild life Institute of India being the fish expertise of India and done the similar studies in India helped me in fish identification, and data analysis related to habitat and fish diversity.

Dr. Karma Tenzin, Department of Livestock, Bhutan was my focal person during the awareness campaign.

Mr. Dorji Gyeltshen (Forest Officer, Watershed Division, Bhutan) and Mrs. Rebecca Pradhan (Ecologist, RSPN, Bhutan) being well experience in plant identification helped me in identification of plant species.

The Environmental Officer and Environmental wing of Punatsangchu Hydropower Project were involved during the awareness campaign.

12. Any other comments?

With a heartfelt appreciation, I would like to thank your esteemed RF for providing kind financial grant, without which I could not have been able to carry out the impact of dam on the fish community.

To keep the good knowledge and experiences gained from this project alive, and to progress the fish conservation work in near future, I look forward to a similar financial support from your esteemed foundation. So with deep reverence, I would like to request your esteemed foundation to look into the consideration to reopen and continue granting support to Bhutan with some formalities. The continuation grant from your esteemed foundation would make vast contribution in nature conservation projects.



Left: Showing use of cast netting to collect the samples. Right: Data enumeration at field.