

## Final Project Evaluation Report

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Your Details	
<b>Full Name</b>	Vishnupriya Sankararaman
<b>Project Title</b>	Amphibian diversity in agro-forests
<b>Application ID</b>	24516-1
<b>Grant Amount</b>	£5000
<b>Email Address</b>	vus85@psu.edu
<b>Date of this Report</b>	2019.02.18

**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
Amphibian Occupancy Surveys				We conducted amphibian surveys in 60 stream segments across tea and coffee plantations between May and August 2018. It was not possible to obtain forest department permits to survey streams inside the protected area in the limited time period. However, we added additional surveys for amphibians at a distance of 10 m from each stream. Although this was not there in the original proposal, it gave us the opportunity to explore the terrestrial amphibian community as well.
Social Surveys				We spent the first 2 weeks of the project networking and speaking with plantation companies and landowners for permits to conduct research on their property. It became evident that managers were not immediately comfortable about allowing a research study particularly at night. The reservations seemed to be partly for our safety and partly because they were unsure of what repercussions the results of the study would have on their company's reputation. It took a couple of weeks of engagement, meetings and discussions to convince them of the safety and importance of the work. This being the case, we felt that it was too early to try out social surveys which requires trust to obtain correct answers.
Data Analysis				We ran multi-species occupancy models to determine the influence of land use and habitat on species richness and occurrence.
Outreach				We individually met with 11 company managers and private land owners to

				talk about the relevance of our project to them. We also created posters and reports for every plantation company and landowner to make them aware of the amphibian diversity in their properties.
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**2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.**

The monsoon of 2018 was the heaviest that the Western Ghats had seen in many years. The extreme rainfall events led to landslides and floods that killed nearly 400 people and left over 700,000 people homeless in the state of Kerala. This being the case we could not complete all the amphibian surveys that we had begun. We had started with 80 sites across tea and coffee plantations but were only able to complete 61 of them due to this unforeseen climatic event.

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

Through the surveys we recorded five critically endangered, four endangered and three data deficient species - six of which had higher occurrence in coffee than in tea plantations. However, a total of 10 species from our study are not even listed in the IUCN Red List. We believe therefore that the IUCN status of many of these do not reflect the ground reality of their distributions and population trends. For instance, *Pseudophilautus wynaadensis* was one of the most commonly occurring species across all tea plantations and yet it is listed as endangered. On the other hand, we found only two individuals of *Ghatixalus magnus* at a single stream segment across all study sites and this species is not listed at all. Our study has huge implications on the conservation of many species, particularly those that are data deficient or not listed and may require categorisation very soon.

The study has also enhanced our understanding of the ecological drivers of amphibian diversity across agro-plantation types in the Western Ghats. We found that species richness of stream-side amphibians was significantly higher in coffee than in tea plantations. Conversely, the species richness at a 10 m distance from the stream were very similar across the two plantation types. Nevertheless, coffee had a significant positive influence on the occurrence of 16 species while tea only positively affected five species.

Clearly, the modification of terrestrial habitats in these hotspots directly affects the freshwater network within them – the core breeding habitat for amphibians. Canopy grown mixed-vegetation plantations like coffee are more likely to preserve a more complex assemblage of amphibians than mono-cultured plantations like tea. These results are likely to be true for any part of the Western Ghats and our results can be used while sanctioning any land use modifications in the future.

**4. Briefly describe the involvement of local communities and how they have benefited from the project.**

Over the 3 months of field work, we hired and trained six members from the native tribal community of the Anamalai region to help collect field data. They were taught to identify the different species of amphibians both visually and acoustically and were also taught to take readings from field equipment such as GPS, water testing kits and ambient noise meters. We plan to continue using this team in future field projects in the region.

We also met with and spoke to eleven of the individual planters and managers of the plantation companies. We shared photographs and spoke to them about our project, amphibians, freshwater ecosystems and the importance of conserving them.

**5. Are there any plans to continue this work?**

We intend to continue collecting more ecological and socio-economic data and expand the scientific understanding from the region to implement robust conservation measures.

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

We have created posters of amphibians both in English and in the local language (Tamil) and sent it to the plantation owners for their outreach use. We hope this will engage the local people in taking active interest in some of these rare, endemic and beautiful diversity of their landscape.

We are also working on a manuscript from the research we have conducted. Once we complete some more modelling on the data, we will publish this work in an international peer-reviewed journal.

The study will also be presented at an international conference within the next few months. We are in the process of applying for talks and posters to different ecological and conservation-based conferences.

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

The grant was primarily used between April and August of 2018. This stayed close to the original plan for the study since all of the budget was focussed on planning and conducting the field components of the study.

**8. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.**

Item	Budgeted Amount	Actual Amount	Difference	Comments
Food	£1200	£603	597	My local field assistants preferred to eat at their homes instead of joining the main team for meals.
Field Accommodation	£700	£500	200	We were able to sublet another researcher's house for a lower price for most of the field duration.
Local Travel	£650	£1450	-800	Our field vehicle broke down twice during the surveys. The cost of fixing it and having to rent a local jeep for almost 3 weeks of the survey increased the amount spent.
Travel to field site	£100	£128	-28	
Salaries	£1850	£1837	13	
Equipment	£500	£482	18	
<b>Total</b>	<b>£5000</b>	<b>£5000</b>		

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

The study has shown that more drastically modified habitats like tea plantations directly affect the streams flowing through them and therefore preserve a lower diversity of amphibians. One solution that has been practiced the world over is the restoration of riparian buffers along affected streams. While Valparai has had some restoration efforts over the past couple of decades, they have not really focused on freshwater systems.

We feel that the next important step is to plan a riparian restoration strategy in these private lands. However, such a measure could have negative impacts on the economy of the region. It has to therefore be designed to mitigate such impacts on the stakeholders. We plan to do this by collecting socio-economic data from the landowners and managers and then develop an economic optimisation model. This would incorporate both the ecological and socio-economic data to spatially identify restoration sites with maximum biodiversity benefits and minimum economic losses.

**10. 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 used the logo in all the posters and reports submitted to the private companies and landowners. We also used the logo in PowerPoint presentations about the project at Penn State University. We will continue to use it in all outreach material or presentations that come up in the future regarding this work.

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

**Vishnupriya Sankararaman** is the principal investigator of the project. She was responsible for study design, data collection, analysis, science communication and outreach.

**Dr. David Miller** was the main advisor on the project. He helped design the study, data analysis and interpretation and provided guidance and feedback on all the steps of the project.

**Shashank Dalvi** helped with the field data collection, took all the photographs of amphibians on this project and helped design our media and outreach activities.

**Sagar Nambiar** is an undergraduate in Environmental Science from St. Joseph's College, Bangalore. He was the field technician on the project and helped collect and enter all of the field data on amphibian diversity.

