

Final Project Evaluation Report

We ask all grant recipients to complete a project evaluation that helps us to gauge the success of your project. This must be sent in **MS Word and not PDF 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 – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Complete the form in English and be as concise as you can. Note that the information may be edited before posting on our website.

Please email this report to jane@rufford.org.

Your Details	
Full Name	Margoth Elizabeth Acuña Tarazona
Project Title	Diversity, endemism and conservation of orchids and ferns in the Peruvian Montane Forest
Application ID	18872-1
Grant Amount	£5000
Email Address	mareli.laura@gmail.com
Date of this Report	November 3rd 2017

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
Analysis of patterns of biodiversity of epiphytic and terrestrial orchids and ferns.				The project was planned for a total of 4 years. The grant from RSG was used to develop the first phase, which focused on during fieldwork for data collection. We established 72 plots (100 m ²) in a gradient of elevation (2000 to 3450 m asl) At each plot, we recorded epiphytic and terrestrial orchids and ferns. We have identified approximately 128 fern species and 56 orchid species. We are still in the process of identification. We plan to complete analysis of patterns of biodiversity of these groups in 2018.
Analyses of abundance and distribution that will contribute to the definition of species conservation status and identification of those groups or species more vulnerable to climate change.				The analysis of abundance require the identification of all species or morpho-species. Once I have completed the identification in 2018 I will be able to assess the patterns of abundance and distribution of orchids and ferns along the gradient of elevation.
Establishment of permanent plots and the baseline for long term monitoring to assess the dynamics in communities assemblies.				We established in total 72 permanent plots (originally I had planned to establish only 30 plots). I registered plot coordinates and marked a corner of the plots with numbered metal tags.
Production of a list of orchid and fern species of the natural protected area "Bosque de Protección Alto Mayo" (BPAM).				We are identifying the specimens collected and plan to produce the complete list of ferns in 2018 and a preliminary list of orchids in 2018.
Production of field guides to identify orchids and ferns species.				We are identifying the specimens collected and plan to produce the field guide for ferns in 2018. Most of

				the orchid specimens were in a vegetative state and we require flowers for proper identification. We plan to collect fertile samples and identify them in 2018 and prepare the orchid's guide in 2019.
Training of techniques for orchid and fern identification and sampling for herbaria will enhance the skills of park rangers and volunteers.				I organised a workshop about orchids and ferns morphology, diversity and importance, in which 26 park rangers and three volunteers participated. We produced a short guide of morphology of orchids and ferns to carry out the workshop and we gave it to the park rangers (see information attached)
Dissemination of research results will increase knowledge in public schools, the university and the BPAM administration.				I organised a workshop about orchids and ferns morphology, diversity and importance for 20 primary school students and 33 students in the high school "Paraíso de Alto Mayo Moyobamba, I.E. N° 00918" in the town Paraíso. We produced a cartel of orchids and ferns morphology, diversity and importance (see information attached). The poster was given to the school. Also we gave orchid and ferns guide to the students. We plan to disseminate the results of the research in 2018 by producing a report for the BPAM administration and I also plan to give a conference at the University of San Martin.

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

The intense rains produced by El Niño Costero 2017 during the months of February - March - April delayed the sampling period. Therefore, it took longer sampling periods (20 days) in the months after these events (field trips were also in May, June, July, September).

For the taxonomic identification of orchids, flowers are necessary. The majority of orchids registered in the montane forest were vegetative. We collected the vegetative individuals, marked them with codes and planted them in the local guide's house in order to produce flowers for identification. Because I have to travel

back to Lima to process the samples at the herbarium I organised with one of the field guides the collection of the orchid flowers. I plan to visit his house and the forest during the rainy season in March 2018.

I talked with the leaders of the towns in the study area to carry out the workshops in their schools. However due to the social problems with the administration of the Bosque de Protección Alto Mayo (BPAM) and mistrust toward biologists due to bad experiences in the past, the leaders refused to carry out the workshops. Instead I coordinated carried out the workshops in other towns, and the administration chose the town of Paraiso for this purpose.

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

a). The data is currently being used to complete a PhD research thesis. The final thesis is expected to be submitted by the end of August 2019.

b). The data has and will provide important baseline information of orchids and ferns for the protected area BPAM. Only five fern species have been reported in the master plan of the BPAM (INRENA 2008) and I have registered approximately 100 species of ferns. We have described a new species of tree fern (*Cyathea leoniae*) and the manuscript with the description has been submitted to the peer review journal Phytotaxa.

c). I have carried out a very extensive sampling (72 plots) in different habitats that will produce very valuable data for the studied groups and the region. The data will allow me to assess among others, species at higher risk, the role of sink and source populations in the patterns of biodiversity of these groups and the role of shrub patches at the paramo for the diversity of ferns and epiphytes. I consider that all of these outcomes will represent an important contribution towards the knowledge of ferns and orchids ecology and will serve to support the conservation of these important groups.

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

We employed local people that helped me to successfully complete this project. We hired villagers to help us transport the camping equipment, field materials and food to the evaluation area within the forest. During the field trips we exchange impressions and knowledge about the ferns and orchids in general. I had a local guide, Roner Espinal who played a central role in the development of the project, he help me to establish the plots, to evaluate the orchids and ferns, to locate and access the larger trees to evaluate epiphytes. I worked continuously with Mr Roner, who learned to recognise the species of ferns and orchids and the sampling techniques of epiphytic and terrestrial plants. In the workshops for the park ranges and volunteers they increase their knowledge about the importance of the studied groups.

5. Are there any plans to continue this work?

My plan is to continue visiting the study area to collect the orchids that have not been registered in flower, and determine species real richness. We have identified new species and new records for Peru. We plan to publish them on indexed articles. This project has had considerable attention by Bosque de Protección Alto Mayo's administration and the resulting information will be included in the next Master Plan (2019-2023).

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

When we complete the identification of orchid and fern species, we will produce field guides to identify orchid and ferns species to facilitate future management, populations monitoring and ecotourism. We will distribute the guides to administration BPAM and they will distribute them to rangers and towns.

As it is part of my PhD thesis, we plan to produce three scientific publications with the following tentative titles: "Effects of shrub patches on the diversity of terrestrial orchids and epiphytes in a Peruvian Paramo", "Epiphytic versus terrestrial plants: diversity and conservation of orchid and ferns communities in the Peruvian Andes", and "The role of sink and source populations in orchid and ferns diversity across an altitudinal gradient". I plan to participate in at least one scientific congress to disseminate the results. It is my intention also to produce a report to communicate results to the local authorities of towns Jorge Chavez and Afluente.

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 used over a period of 12 months. I received another grant from the American Orchid Society (AOS), which allowed me to continue the fieldwork for seven more months. With the funding from the AOS we will design and print the field guides for orchids.

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
2 x Transportation for fieldwork by bus and taxi (Lima-Rioja-	200	1500	-1300	Intensive rains that fell in Peruvian northern between February and April 2017 delayed us. Then we

Bosque Protección Alto Mayo round trip) (two people)				make more trips than scheduled. The bus tickets increased. Due to the intense fieldwork, sometimes more than two people travelled to the study area.
Food for fieldwork (camping, £5/person/day)	3100	2500	600	food prices are lower in the towns of the study area compared to the city of Lima
Local field assistant salary £ 7 x 160 days	1120	1500	-380	We carried out more fieldwork than originally planned
Rent of pack animals to transport equipment to the camp sites	580	700	-120	We hired people from the town to transport the equipment, because the animals could only arrive to the mid elevation in the mountain
Total	5000	6200	-1200	We covered the difference with the funding from the American Orchid Society.

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

- Produce the guide for identification of orchids and ferns of studio area.
- Complete my PhD thesis by August 2019.
- Submit another two scientific papers to international journals.
- Continue my orchid and fern research in Bosque Protección Alto Mayo. I would like to visit other mountains placed in high altitude between San Martin and Amazonas. I would like to explore elfin forest and paramos because they are vulnerable habitats to human activities, particularly sensitive to climate change, are unexplored areas and conserve high diversity of orchids and ferns.

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?

Yes. The logo was used in a short guide and cartel of orchid and fern I made for the workshop for rangers and students. Also, the Rufford Foundation was acknowledged in one publication which is in revision in Phytotaxa (Acuña-Tarazona et al. in review). The field guide will include the logo from The Rufford Foundation and all the resulting publications will include the RSG in the acknowledgements.

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

Dr Tarin Toledo Aceves. Research professor at INECOL A.C. (Mexico). She is my supervisor and provide strong scientific support and expertise in this project.

Dr Klaus Mehltreter. Research professor at INECOL A.C. (Mexico). He is my supervisor and provide strong scientific support and expertise to this project.

Dr Alejandro Flores-Palacios. Research professor at Centro de Investigación en Biodiversidad y Conservación and Universidad Autónoma del Estado de Morelos (Mexico). His contribution to this project is in relation to statistical and experimental design planning.

Dr Vinicio de J. Sosa Fernández. Research professor at INECOL A.C. (Mexico). His contribution to this project is in relation to statistical and experimental design planning.

Dr Michael Kessler. University of Zurich (Switzerland). His contribution to this project is in relation to statistical and experimental design planning, and he is an expert on ferns ecology.

Dr Blanca León. University of Texas at Austin (USA). Her contribution to this project is in relation to identification of ferns species of family Polypodiaceae.

Bach. Elluz Huaman Melo. Research associate at the Natural History Museum (Peru). Her contribution to this project is in relation to identification of ferns species of family Cyatheaceae.

Bach. Franco Mellado Nolis. Research associate at the Natural History Museum (Peru). His contribution to this project is in relation to identification of ferns species of the genus Elaphoglossum.

Mg. Delsy Trujillo. Research associate at the Natural History Museum (Peru). His contribution to this project is in relation to identification of orchid species.

12. Any other comments?

I would like to thank the Rufford Foundation for the financial support. Without their contribution this project would not have been possible. Also, I would like to thank my supervisors Dr Tarin Toledo Aceves and Dr Klaus Mehlreter for their support and Mr. Roner Espinal for his invaluable help during the fieldwork.