

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	Purna Chhetri
Project title	Ecology and sustainable management of <i>Ophiocordyceps sinensis</i> from three alpine regions of Bhutan Himalayas.
RSG reference	16669-1
Reporting period	February 2015-January 2016
Amount of grant	
Your email address	pbchhetri@moaf.gov.bt
Date of this report	23.01.2016

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
Establishment of permanent plots		x		The aim was to established networks of permanent observations plots across the growing belt of <i>O. sinensis</i> , however due to escalation on wages and commodities all projected areas could not be covered with current funding and weather conditions had been very bad which took lot of time and efforts to established plots
Biomass, light traps and larvae population study		x		Captured of moths using light trap could not be conducted due to very bad weather conditions
Installation of micro weather station	x			The estimated cost for the instrument was too low and for cold places it was not practical to install low priced instruments
sample collections (soils, biomass)			x	The sampling of biomass and soils were collected from nine sites from western belt will be elaborated in the final reporting
Monitoring and recording in permanent plots			x	This activity was done, however, 2015 had been very bad year for overall production of <i>O.sinensis</i> in Bhutan.
Genetic and molecular studies	x			This is being done by another agency

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

The success of any works in the higher Himalayas highly dependent on weather conditions and availability of manpower to support the logistic. The only mode of transportation is by foot with support from draft animals. To effectively conduct the work on limited time all the amenities and daily requirements had to be carried along and cannot afford to be stationed in one location, as returned journeys would take most of time.

While implementing the project we have encountered lot of unforeseen and are highlighted below.

- a. The weather conditions did not permit us to leave early for the expedition (actual plan was to start the expedition in mid-May 2015) to the *O. sinensis* growing sites starting from western region, we have been waiting for better weather. By the time the weather turned favourable for our expedition, it coincided with *O. sinensis* collection season and also peak season for other farming activities in which case, it became very difficult to hire local porters

and labourers for our expedition, that is how it became costly in terms of hiring labourers and porters.

- b. Because of bad weather it took several days to make journeys to *O. sinensis* growing areas and so was the establishment of observation plots and collections of samples from the field.
- c. During collection month (June 1st to 30th, permitted by government to collect) all members of the household are engaged in collection of *O. sinensis* activities some way or other. Since our expedition coincided with collection month, it became difficult to convene general stakeholder meetings of collectors relatively on larger groups for awareness on different aspects of *O. sinensis*, so we end up meetings small groups of *O. sinensis* collectors at different collection sites which was time consuming and cumbersome.
- d. It was noticed that *O. sinensis* is growing in a very small niche in a range of 100-150 m above 4200 m asl and scattered over very rugged mountainous terrain. It took lot of time and resources to reach those areas and established research plots.

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

1. Establishment of permanent observation plots and biomass and soil samplings from west and west central region.
2. Awareness on several aspects of *O. sinensis* (impacts of harvesting, impact of grazing, overlapping habitats of snow leopard and blue sheep, post-harvest methods, etc) to the communities and permit holders for collections.
3. Captured of audio visual of the *O. sinensis* habitat, its critical niche, collector's perspective and demonstration of good post harvest practices

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

1. We have given awareness to the collectors whenever we met them on various aspects *O. sinensis*. One such awareness was preservation and minimal human related impacts on *O. sinensis* growing areas. Given the small fragile niche of this species, maintaining minimal human impact will be paramount on its sustainable management and conservation of this species.
2. Awareness on the importance of post harvest practices was imparted to many collectors as we met on collection sites. This has relevancy especially on fetching premium price in the market.
3. The current study also emphasised on participatory research which means that the permanent plots will be looked after by the collectors and in case researchers were unable to monitor the plots, the collectors will be able collect necessary information from the plots.

5. Are there any plans to continue this work?

There are plans to continue this work and some of them are highlighted below.

- a. The holistic ecology of the *O. sinensis* habitat specifically looking at the primary productivity of the realised and potential niche, which will allow estimation of the carrying capacity for ungulates such as blue sheep and domesticated animals (horses and yaks) which are dominant in the *O. sinensis* habitat. The number of blue sheep will be essential to keep the viability of snow leopard population. These overlaps in habitat are not properly understood

scientifically and how such overlaps in habitat be embedded for sustainable management of *O. sinensis*.

- b. What we have found out is that there are over 15 medicinal plants growing in *O. sinensis* growing areas and are being harvested, which could impact the overall sustainability of *O. sinensis*, as the roots of those medicinal are also the food for larvae of moths on which *O. sinensis* grows. The impacts of such harvesting regimes are still unknown and may be very critical in sustaining the *O. sinensis* in the long run.
- c. The overall landscape level interactions between different entity and their impact on each other will be very important to prescribe the sustainable management of this species.
- d. The literature from elsewhere showed over hundred host moths were identified and named as possible host of *O. sinensis* and similar species, however in Bhutan, we have identified only two such moth species whose larvae are important for production of *O. sinensis*, so drive for identification of possible host and their food sources had to be secured and conserved.

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

The results will be published in scientific journal and also education materials are being developed as guidelines for collectors /harvesters.

As mentioned earlier an audio-visual material was captured during our expedition with Rufford support and this material will be aired once it is edited properly. Due to high cost of edition of materials, the production is still pending, and I would like to seek support of Rufford for production (edition) of this useful and very important aspect of our research. The final production will have subtitles in English and spoken language in the documentary will be in Dzongkha as our targets are the collectors and general public of Bhutan.

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 Rufford grant was almost entirely used up during the establishment of permanent sample plots in western region effectively from May 2015 (purchase of materials) to July 2015. The grant was enough to cover cost of establishing 20 permanent sample plots in five locations in the western region of the country and also awareness and advocacy on the species to the collectors. As mentioned earlier, the critical point for us was to reach the *O. sinensis* growing areas, which are very small pockets, scattered over very rugged mountainous terrain; most of our time was consumed to reach those areas and in establishing permanent sample plots. Moreover, the local weather conditions played very important role, all our movements depended on unpredictable mountain weather conditions and most of it was very bad during the expedition period.

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
1. Al pegs for marking the permanent plots	300.00	258.76	41.25	We could get the materials at lower cost than previously estimated
2.Porters for carrying research materials	1000.00	1073.61	-73.59	Hiring charged increased due to revision on national wage rates and also conflicts with <i>O. sinensis</i> collection timing and other farm activities
3. Hiring of labours	650.00	742.53	-92.51	Hiring charged increased due to revision on national wage rates and also conflicts with <i>O. sinensis</i> collection timing and other farm activities
4.Field gears (tents, ruck sacks, cooking gas boots)	800.00	750.03	49.99	We could get the materials at lower cost than previously estimated
5.Other materials (poly bags, shovel, spades, soil augers)	650.00	570.56	79.46	We could get the materials at lower cost than previously estimated
6. consultation meetings with stakeholders	600.00	642.88	-42.87	Became costlier because of small group meetings at different locations
7.Temperature and moisture meter (Hiring of camera man)	650.00	540.02	110.00	Forgone this because the instruments were expensive and installation impossible with the present estimates instead used for hiring of camera man for audio visual production.
8. Food items	150.00	214.29	-64.29	The food prices had gone up and also we had added more food items suitable for hiring mountains and medical kits
9.Development of guidelines and printing	200.00	210.01	-10.00	Guidelines for harvesters is under process and Audio visual is in making
Total	5000.00	5002.68	-2.57	

Exchange rate= £= Nu 93.33 at the time of received of grant

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

1. The next step would be to publish the scientific paper on our present data and also edition and production of audio-visual materials for general public. It will be highly useful as awareness materials for collectors.
2. Establishments of some more observation's plots in central region.
3. Understanding of critical ecology of *O. sinensis* habitats, looking at overlapping niches of snow leopard, blue sheep, yaks and recently introduced horse grazing during collection month. And also impact of medicinal plant collections on *O. sinensis*. These are immediate task at hand.
4. For long term, the observations on permanent plots along with climate variables would be very important.
5. As of now, we know only two moth species whose larvae are infested with *O. sinensis*, further research on moth and insects of the region seems paramount.
6. The harvesting (picking from ground) , the post harvest techniques are still weak amongst the collectors , strengthening of these variables can significantly bring in more income with no additional cost to the collectors.

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

As of now the data collected from the Rufford were not published officially and will certainly use Rufford foundation logo especially on audio visual documentary. The RSGF got lot of publicity during the course of my work, indicated by a greater number of researchers are applying for Rufford grant for floral and faunal species conservation in Bhutan.

11. Any other comments?

Some of the data from the laboratory are still being processed; we will provide the complete scientific report in matter of few months, latest by end of March 2016.

I would like to seek further grant to complete my uncompleted task.

Finally, I would like to thank Rufford Foundation for your kind contribution towards species conservation on our planet.