

Final Project Evaluation Report

Your Details	
Full Name	Pramod Kumar Yadav
Project Title	Assessing Ecological Threats for Caterpillar Fungus (<i>Ophiocordyceps sinensis</i>) in the Askot Landscape, Western Himalaya, India
Application ID	23358-2
Grant Amount	£5000
Email Address	pramod.yadav31@gmail.com
Date of this Report	25 September, 2018

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
To monitor vegetation composition in caterpillar fungus' habitat				Due to heavy monsoon and highly remoteness many targeted sampling sites were not accessible to conduct study in the available time duration and resources. However, in the coming season project team will again try to investigate in the remaining areas of the Askot landscape to fulfil project objectives.
To assess the ecological threats for caterpillar fungus in natural habitat				The project team has documented harvesters' various activities such as presence of livestock, slashed trees for fuel wood, non-biodegradable garbage, open defecation etc in the alpine meadows which generate huge ecological threats in the landscape. The team has also documented perception of harvesters and made field observation that how anthropogenic activities have brought various ecological challenges for indigenous flora and fauna.
To measure environmental and edaphic parameters in caterpillar fungus' habitat				The project team has collected soil samples from the field and lab analysis will be done in the near future. Although, to make any scientific conclusions about caterpillar fungus habitat more samples would be required. In the coming period, the team will continue to collect more samples and analyse them to fulfil project objectives.

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

The project sites fall in the rugged and largely inaccessible alpine meadows of the western Himalaya where biological surveys are quite difficult task. Field surveys for caterpillar fungus habitat was conducted in the monsoon season (May to July) and

during this period the sites become landslide and flash flood prone areas. Project site is also very prone to human-wildlife conflict and no medical facilities are available over there. During the project assignment, the team took every measure to try to avoid these difficulties and were always careful in their conduct. During various explorations, the team members were always carrying first aid; winter cloths and rain coats for protecting themselves from climatic challenges. Local field assistants and volunteers were also engaged with the project activities to guide the team through possible difficulties.

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

The project team had conducted investigations in Askot landscape of the western Himalaya to document floral diversity, anthropogenic pressure as well as sampling of soil to understand edaphic factors of caterpillar fungus habitat. The project has following major outcomes.

A). Inventory of vegetation composition associated with caterpillar fungus

For the estimation of associated vegetation composition with caterpillar fungus, quadrat surveys were conducted in the alpine meadows of the landscape. The team has documented more than 48 plant species which commonly belong to the *Anaphalis*, *Anemone*, *Aster*, *Delphinium*, *Fritillaria*, *Juniperus*, *Primula*, *Potentilla*, *Rhododendron* genera. During the field investigation in the Askot landscape, the team has recorded the following species among others: *Primulamacrophylla stuartii*, *Fritillaria roylei*, *Aconogonum molle*, *Androsace zambalensis*, *Anemone polyanthes*, *Bistorta macrophylla*, *Carex sp.*, *Thermopsis barbata*, *Euphorbia stracheyi*, *Arisaema jacquemontii*, *Juncus thomsonii*, *Juniperus indica*, *Potentilla atrosanguinea*, *Meconopsis aculeate*, *Nardostachys grandiflora*, *Cortusa brother*, *Neopicrorhiza scrophulariiflora*, *Oxygraphis polypetala*, *Potentilla cuneata*, *Potentilla fulgens*, *Primula macrophylla*, *Rheum australe*, *Rhododendron anthopogon*, *Rumex acetosa*, and *Saxifraga sp.* and *Lilium oxypetalum*.

During field investigation, the project team has observed that caterpillar fungus habitat of the Askot landscape is also potential habitat for many MAPs species such as *Aconitum heterophyllum* (Atis), *Nardostachys jatamansi* (Jatamansi), *Aconitum balfourii* (Meetha vis), *Dactylorhiza hatagirea* (Hathajari), *Podophyllum hexandrum* (Ban kakri) and *Paris polyphylla* (Satwa). These species are highly exploited from the landscape to fulfil demand of pharmaceutical industries.

b). Documentation of anthropogenic pressures in alpine meadows

During field work the team had documented environmental threats like over grazing, lopping of trees for firewood, non-degradable garbage in the vicinity of harvesters' camps and open defecation in alpine pastures, which have a deleterious effect on caterpillar fungus and its habitats which support many threatened and endangered species including the snow leopard. Anthropogenic activities are also threatening to those MAPs species which sparse population in few areas and in high demand, e.g., *Aconitum heterophyllum*, *Dactylorhiza hatagirea*, *Arnebia benthamii*, *Nardostachys grandiflora* and *Pleurospermum angelicoides*.

During field investigations, the team found that alpine pastures were heavily grazed by goats, sheep, cows, mules and horses of the harvesters which eventually leads habitat degradation of many rare endangered species of the landscape. Direct degradation of habitat is caused by caterpillar fungus harvesters through widespread digging of alpine meadow turf and consequent grassland degradation particularly due to uprooted turfs and extensive cutting of alpine plants for fuel. Dumping of large amount of non-degradable trash, abundant harvesters' tents and open defecation in alpine pasture is contaminating water sources of the landscape which is used a source of drinking water by the downstream inhabitants.

c). Identified major ecologic threats in caterpillar fungus habitat

During collection period, major ecological threats like over grazing, chopping of trees for firewood, increased human population in alpine pastures have a negative impact on caterpillar fungus and the environment. Ground-dwelling birds, charismatic megafauna and vegetation composition are affected by anthropogenic activities. Moreover, degradable and non-degradable garbage in the surrounding of the base camps of harvesters is causing one of the measure ecological problems in the landscape. Currently, there is no management practice to mitigate or reduce generated garbage during stay of harvesters in the meadows, which have negative effect on the pristine quality of the habitat. There is a need for extensive outreach and educational programmes to develop local capacity for sustainable harvesting and spread awareness about the environmental causes among the stakeholders. However, the team has found that the communities seemed open to these ideas but were very less aware of them, which were causing the pollution and ecological threats as observed by the surveying team at the harvesting sites.

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

In this assignment, endogenous people were not directly involved or got benefited. Nonetheless, during field investigation local community supported to the team in data collection exercises as well as shared their valuable knowledge, experiences and opinion regarding ecological threats in caterpillar fungus habitat of the Askot landscape.

5. Are there any plans to continue this work?

The project team believe that there is an urgent need to conduct outreach programmes among harvesters of caterpillar fungus to educate and sensitise about huge anthropogenic pressure and its phenomenon in the alpine meadows which has been created by them during harvesting season. Overall goal of the assignment will be to change attitude of harvesters for conservation, sustainable harvesting and maintain eco-friendly living during the period of stay in the alpine meadows for collection of caterpillar fungus. This proposed project would be a great initiative in order to address identified environmental threats in the meadows during completed RSG- I&II and CLP projects.

On the other hand, the project team has also plan continuing investigations to in remaining part of the Askot landscape as well as neighbouring Nanda Devi Biosphere Reserve of the western Himalaya to assess ecological threats for caterpillar fungus's habitat and come up with a comprehensive framework to take mitigation and measure. To take up these assignments, project team will apply for funds to Conservation Leadership Programme and British Ecological Society as well as explore for funding opportunities from other potential agencies.

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

The findings of the project are being complied and basic analysis has been done to know trends of the result. Although, more data sets are required to draft a scientific paper for reputed journal. However, the team has drafted popular articles to highlight issues associated anthropogenic pressure in caterpillar fungus habitat as well sustainable harvesting of the species. Moreover, the project team will apply for RSG Booster Grant to publish current as well as previous project (RSG and CLP) findings through a handbook in vernacular language and English for stakeholders to address identified ecological threats in the alpine meadows. The project outcomes will be also disseminated among wider stakeholders through national and international 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 used over a period of one year from October 2017 to September 2018. Since this was the second round of our RSG, the activities were more organised and streamlined.

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
Field Assistant (Per diem for two research assistants, (140 working days * 2 person * 3 GBP per person)	840	950	+110	The team had spent more days in the field as it was planned. Moreover, due to remote and tough terrain more field assisted were employed
Travel (Public transport/ local taxis will be used for the project activities in	1,000	1100	+100	The team has visited various remote part of the landscape by the hired taxi where no public transport was available

remote areas)				
Food and accommodation (during field works and travel for project activities)	1,300	1450	+150	The team had spent more days in the field as it was planned. Moreover, Volunteers were also engaged for the field work
Digital data loggers for temperature, humidity rainfall and slope measurement	1,000	1090	+90	Digital data loggers were bit costly during procurements.
Chemical analysis for edaphic parameters	450	0	0	No fund was available spent for this activity. Therefore, more funds will be raised to complete analysis of collected soil samples.
Contingency (office stationery and others)	50	50	0	
Communication (telephone/internet/post age)	160	160	0	
Report printing and dissemination	100	0	0	Preparation of a comprehensive report on the project outcomes is under process. Remaining amount will be spent for report printing and dissemination project finding among stakeholders.
Other on-the-site field supplies (unforeseeable)	100	100	0	
Total	5000	4900	100	Reaming £100 will be spent for report preparation and printing to disseminate among stakeholders.

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

For next stage, project team will apply for RSG Booster Grant to develop a comprehensive handbook and outreach programme to change attitude of harvesters as well as bring awareness among other stakeholders on various issues associated with caterpillar fungus' trade and habitat. After conducting outreach programmes and provided handbooks to Van Panchayat (Village Forest Council), school and public libraries for the local stakeholders; the team believes that the people of the region will become more aware of the ecological threats in the alpine meadows and sustainability issues associated with the caterpillar fungus. One of the measurable outcomes from next proposed initiative would be changing the attitude of local people for biodiversity conservation in the ecologically fragile landscape of the Himalaya.

Through outreach programme, local stakeholders will be encouraged to take initiatives through community participation to make ditches for biodegradable waste and defecation in the alpine meadows as well as bring back non-biodegradable waste from harvesting sites to home. The project team also believe

that after successful implementation of the project, the harvester will shift towards sustainable harvesting of the species and management.

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?

The project team has used the RSG logo in following conference and workshop during talks as well as published articles to highlight issues associated with caterpillar fungus.

1. Presentation in conference of Society of Conservation Biology in India.
2. Presentation during Kinship Conservation Workshop in India.
3. The Ghost Moth and Death of an Ecosystem published by the *Current Conservation*.
4. Yartsagunbu: transforming people's livelihoods in the western Himalaya published by the *Oryx - The International Journal of Conservation*.

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

Rajdeep Singh

Rajdeep prepared identification key to identify vegetation of alpine meadows in Askot landscape. He also contributed in indemnification of the photographed plants from the study area.

Muzamil Ahmad Mir

Muzamil was involved in field investigation to assess vegetation composition and ecological threats in caterpillar fungus habitat.

12. Acknowledgements

The project team is grateful to the Rufford Foundation for providing funds to conduct this study. We are thankful to Uttarakhand Forest Department for giving us permissions to conduct this study and every possible help by the officials as well as the field staffs during field investigation. We convey our gratitude to those people (Subhajit Saha, Rizwan Khan, Rahul Sharma and Ravi) who supported us voluntarily and field assistants because without their support this project would not be completed within the timeframe.

Annexure: From the field



Harvesters are searching for caterpillar fungus in the Askot landscape



Harvesters are holding evening meeting and enjoying cricket game in the meadow after a daylong tiring collection session of caterpillar fungus



Abundant shelters of harvesters and garbage in caterpillar fungus habitat



Remnant of harvesters' tents and garbage in post harvesting period



A glimpse of traditional house from the Askot landscape



Project team on the way for the field investigation