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	Dr Joyeeta Singh (Chakraborty)
Project title	Assessing abundance and ecology of pollinator -insects in high-altitude ecosystems of Himalaya: a case-study from Kedarnath Wildlife Sanctuary.
RSG reference	24854-1
Reporting period	November 2019
Amount of grant	£4581
Your email address	joyeeta.u@gmail.com
Date of this report	20.01.2020

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
To document abundance and distribution of pollinator insects across critical habitats of high-altitude (~3000 m and beyond) Himalayan ecosystems				Records/data regarding taxonomic identity and IUCN threat status of certain observed alpine pollinator insects (especially flies, bumblebees and some flower beetles) in the region were markedly insufficient which delayed/ hampered the current study to some extent.
To understand the interaction pattern of the pollinator insects with host flowering-plants at various alpine habitats				
To conduct relevant educational outreach programs among local community and tourists				

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

A major unforeseen difficulty faced was that the project lagged behind the proposed timeframe (thus requiring an extension of another 6 months) due to the following reasons: -

a) Unexpected delay in getting a work permit from state forest department delayed the initial project activity schedule.
b) Unfavourable weather conditions severely impeded field data collection during the growing season of 2018. The gap filling in data collection was complemented during the 2019 growing season by imposing intensive sampling effort.
c) Difficulty arose in taxonomic identification of dipterans and few other types of insect pollinator specimens. The problem was mostly resolved by consulting with various expert taxonomists, exploring various freely available online insect databases/archives and visiting multiple insect collection museums/laboratories.

I am sincerely thankful to RF for allowing me the extension period required to achieve the proposed objectives successfully.

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

a) Baseline data as well as new interesting insights were obtained on abundance and distribution of pollinator insects across critical habitats (e.g. temperate forests/tree-line ecotone; alpine scrub; alpine meadows; rock crevices; boulders and scree slopes) of high-altitude (~3000 m and beyond) Himalayan ecosystems. The data (being processed to be published) will prove to be very useful for future monitoring and assessment of threat/conservation status of insect pollinators in the region. Pollinator insect species composition, relative abundance and dominance differed across seasons (summer versus monsoon) as well as lower (e.g. forests and treeline ecotone) to higher (e.g. alpine meadows and boulder scree slopes) altitudinal habitats.

b) Pattern of interaction with host plants (in terms of interaction strength, symmetry/skewness etc.) differed markedly across summer and monsoon seasons. No endangered host plant was recorded in the studied habitat plots. However, the possibility of occurrence of such plants in core forest region or inaccessible mountain slopes cannot be ignored since alpine herbs in the region are often patchily distributed. No specialist plant-pollinator interaction was observed, yet relative preference for one or two specific host plant species was observed in high altitude meadows and boulder scree slopes during the monsoon. Additionally, data on climatic factors were collected to understand if such factors are affecting the pollinator insect species assemblage and their interaction pattern with host plants in various habitats.

c) Outreach programmes were conducted in four villages adjacent to Kedarnath wildlife sanctuary, which improved local peoples' awareness on the importance of pollinator insects in agriculture and clarified relevant negative perceptions/myths by using effective promotional materials. Present project activity popularised citizen science enthused local people/tourists to voluntarily participate in pollinator photography contest and thereby enhanced possibility of their involvement in long term conservation of alpine pollinator insects. Pollinator photography contest also facilitated larger coverage of information on native butterfly and other pollinator insects' distribution range, habitats and host plants.

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

Local communities were involved in the project in following ways: -

a) One-to-one interviews as well as group discussions were conducted with selected local people (encompassing all possible socio-economic, cultural and educational background, age group and gender) to understand their level of awareness and perception regarding importance of pollinator insects, relevant threats/problems and probable conservation solutions. All respondents were encouraged for participation with adequate gifts.

b) Local youths, stakeholders, students, women and tourists were involved in outreach programmes by showing relevant videos, distributing informative pamphlets and explaining the contents. Quiz and sit and draw contests were conducted among the school students. Local women were provided with useful information pertaining to relevant livelihood options, associated network links and local/online market contacts.
c) Local people and tourists enthusiastically participated in 'spot your pollinator' photography contest and some of them won cash prizes for their excellent inputs.
d) Few local youths were recruited as volunteers or paid field assistants.
e) Local homestays/hotels, eateries and transport service were paid in cash for providing with lodging facilities, food and transport required for project activities.

5. Are there any plans to continue this work?

Yes, our preliminary observations raised several relevant questions/concerns (as discussed in Question 9) which could not be addressed in the given time and fund limits of the current project. I would like to continue with relevant in-depth future research for strengthening conservation of alpine insect pollinators, their habitats and host plants at high altitude Himalayan region.

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

I have been/will be sharing project outcomes and preliminary observations in the following ways: -

a) Delivered a speed talk 'Towards understanding local community perception on native pollinator insects in high altitude settlements of Kedarnath wildlife sanctuary in Uttarakhand Himalaya' at The Rufford India Conference 2019.
b) Delivered an oral presentation on 'Abundance and ecology of pollinator insects in high-altitude ecosystems of Himalaya' at The Rufford India Conference 2018.
c) Outreach programmes/workshops were conducted to share the project findings with local people. Local youths, stakeholders, students, women and tourists were shown relevant videos, informative pamphlets etc. followed by adequate explanation, Q & A session and interactive meetings. Present project activity popularised citizen science and enthused local people/tourists to voluntarily participate in pollinator photography contest.
d) Project findings were informally shared during several meetings and discussions with local NGOs, government officers, research personnel, taxonomists/entomologists and other individuals.
e) In addition, the RSG sanctioned current project has been mentioned in my ResearchGate and ORCID accounts.
f) The final report will be sent to State Forest Department and several organisations and individuals involved in conservation activities in the region as well as other parts of the world.

g) In addition, I have plans to disseminate the project findings among scientific community through publication of popular articles/research articles in peer-reviewed journals. The results will also be presented in other local and international seminars and conferences.

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 Foundation grant has been used over a period of 18 months, although the anticipated length of the project was 1 year.

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
Portable Solar Battery/ Power Bank	35	35		
Insect collection materials (swipe nets, pan trap bowls/trays, collection vials, preservation chemicals, identification books)	116	116		
Rucksack	35	35		
Field shoes	104	104		
Sleeping bags and tent	128	128		
GPS, Binoculars and Magnifying Glasses	360	360		
Camera for field photography with macro lens	580	580		
Data Storage Devices	81	81		
Field Assistants	528	652	+124	Due to extension in field work for 2019 growing season, expenses related to travel, fuel and field assistants' payment exceeded than budgeted amount which was therefore reappropriated from food and accommodation budget.
Travel Expenses + Fuel	650	706	+56	
Food and Accommodation	1392	1160	-232	
Expenses for Outreach Programs	233	285	+52	
Contingency (office stationery and others)	129	129		

Communication (telephone/internet/postage)	50	50		
Report and publication	160	160		
Total	**4581**	**4581**		

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

Baseline data on alpine pollinator insect species composition and their host plants as well as habitat preference has been procured through the current project, which are under process of publication in reputed scientific journals. Hence, in-depth future research can be conducted to assess threats (to the pollinator insects as well as host plants of alpine meadows) from habitat degradation, anthropogenic disturbances due to increasing tourism and particularly from the impacts of changing climate as well as consequent feedback response/adaptation. Such study will in turn point towards the success of KWLS as a protected area and ascertain further requirement of long-term monitoring/ other additional conservation measures. In addition, more elaborate research should be focused on taxonomic identity and functional ecology of late season bumblebees, dipteran pollinators and other less abundant/rare groups. Systematic training can be organised focusing on capacity building of local community for alpine pollinator conservation along with documentation of relevant traditional ecological knowledge and sustainable livelihood practices. Furthermore, capacity building of local stakeholders and forest officials for promotion of ecotourism would indirectly benefit conservation of alpine habitats.

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?

Rufford Foundation logo has been used in pollinator photography contest cards and other outreach promotional materials, reports to be submitted to State (Uttarakahnd, India) Forest Department as well as Rufford India Conference presentation. The RSG sanctioned current project has been mentioned in my ResearchGate and ORCID accounts. The foundation will be acknowledged in all future publication generated from this project.

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

Name	Role	Nature of involvement
Dr. Joyeeta Singh Chakraborty	Team leader	Planning and execution of project (inclusive of field work to desk job of data processing/ analysis and report preparation) Co-ordination, management and supervision of teamwork
Dr. S Bagchi	Mentor	Consultant in planning of project proposal

		Co-author for future publications
Dr. Sudhir Singh	Collaborator	Taxonomic identification support for pollinator insects Co-author for publications
Dr. V. P. Uniyal	Collaborator	Taxonomic identification support for pollinator insects Co-author for publications
Dr. Rashmi Nautiyal and Mr. Manendra Kaneria	Team members	Project proposal review, planning of budget and purchase of field items at initial phase Taxonomic identification support for insects Co-author for publications from the project
Mr. Manish Bisht and Mr. Vikram Singh Rawat	Field Assistants	Field data collection Public outreach facilitation
Mr. Karan Singh	Volunteer	Taxonomic identification support for host plants
Mr. Kuldeep Dingwal and Mr. V.D. Jamloki	Volunteers	Public outreach facilitation Winners of pollinator photography contest
Ms. Beena Kurmi	Volunteer	Data entry

12. Any other comments?

Attending Rufford India Conferences enriched my knowledge and idea on current trends and practices in biodiversity conservation as well as helped me to develop a wonderful network with peers across the country. Working under the prestigious Rufford Grants Programme has been an exciting experience which provided me with immense professional and personal growth and satisfaction. Finally, I would like to acknowledge the local community for their enthusiastic cooperation which favoured smooth functioning of the project at all stages.