

THE RUFFORD FOUNDATION

Interim Report (2018–2019)

**Project Title: Assessing abundance and ecology of pollinator
-insects in high-altitude ecosystems of Himalaya: a case
-study from Kedarnath Wildlife Sanctuary**

Application ID: 24854-1

Grantee:

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Project Description

Pollinator insects play irreplaceable role in terrestrial ecosystems and are important bio-indicators; yet are threatened with rapid decline worldwide in the recent times. High-altitude ecosystems of western-Himalaya are fragile, data-deficient as well as host many rare, endemic and endangered insects and plants. Pollinator insects are much understudied in the region. Current project is the first attempt to address abundance of insect pollinators and ecology with their host plants beyond alpine tree-line eco-tone in Indian Himalayan region.

The objectives

- To document abundance and distribution of pollinator insects across critical habitats of high-altitude (~3000 m and beyond) Himalayan ecosystems
- To understand the interaction pattern of the pollinator insects with host flowering-plants
- To conduct relevant educational outreach programs among local community and tourists

Project so far

As per the proposed timeframe, we had planned for initial survey and selection of the critical habitats (March –April 2018), followed by collection of field data on abundance, distribution of insect pollinators and their interaction with host flowering plants during the entire flowering season (April - June, 2018) as well as corresponding identification of the insects and their host plants (July–August, 2018). We had plans to utilize the remaining time (September 2018 to April 2019) for data processing, analysis and interpretation; conducting the outreach, awareness generation programs and preparing for report and publication.

However, in reality, we could start the study at the selected site in southern Kedarnath Wildlife Sanctuary, Uttarakhand only during early May due to receipt of RSG fund and work permit from Forest Department by April end. We missed the peak flowering season for the habitats (near subalpine temperate forest and tree line ecotones) at lower altitude (~3000 m) and continued with scrub (~ 3300 m), meadow (~ 3500 m) and boulder scree slopes (~ 3680 m) habitats at the higher altitude during May – July, 2018. The work was interrupted several times due to snowfall, blizzards, fogs and mists as well as heavy rain fall. As a result, we missed to sample early season insect pollinators, and the data lack complete understanding of habitat preference, cross habitat migration and degree of host plant specialization/selective preference of the insect pollinators in high altitude Himalayan landscape. An extension of six months period (up to October 2019) is therefore requested so as to continue the survey for upcoming season (May-August 2019) for gap filling and producing best comprehensive results. Kindly note that snowmelt has not yet started in my study region this year; we therefore expect to get early season data by early May.

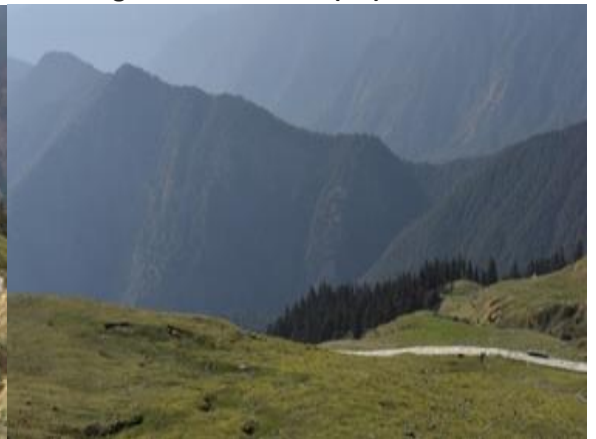
Various activities carried out so far

1. Selection of habitats:

Following critical habitats were selected for survey.



Left: Temperate forest/Treeline ecotone **(TF)** ~3030 masl. Right: Rock crevices **(RC)** ~3120 masl.



Left: Alpine Scrub **(AS)** ~ 3360 masl. Right: Alpine Meadows **(AM)** ~ 3495 masl.



Boulders and Scree slopes (BSS) ~ 3680 masl. Note: These habitats under survey were contiguously distributed along an altitudinal gradient (ranging between 3000 -3700 masl)

2. Field data collection:

Data collection on abundance of the pollinators and interaction with host plants were conducted mainly in scrubs (~ 3300 m), meadows (~ 3500 m) and boulder scree slopes (~ 3680 m). So far, we could work for a total of 48 days during the spring/pre-monsoon time in May and monsoon breaks during June and July. Habitat wise working days are shown in the Figure 1 below.

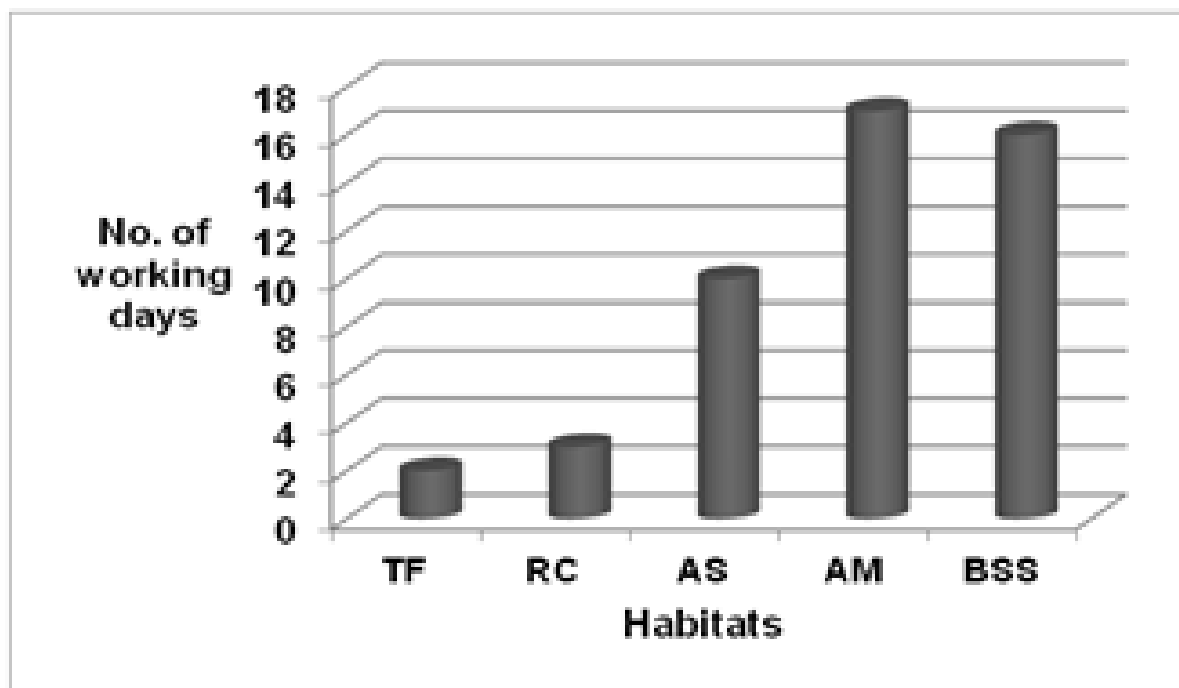


Figure 1: Habitat wise working days during May – July' 2018: TF=> Temperate forest; RC=> Rock crevices; AS=> Alpine Scrub; AM=> Alpine Meadow; BSS=> Boulders and Scree slope

3. Specimen identification:

Common insect and plant species have been identified in the field; however, identification of rare specimens is partially complete due to lack of adequate specimens together with certain other technical and administrative constraints which are on process to be solved soon.

4. Outreach and awareness program:

Pre-outreach survey (questionnaire and picture based survey, informal discussion) on people's perception on insect pollinators have been conducted during October – December, 2018 in villages adjacent to the study region in order to identify target groups for outreach programs. This gave us opportunity to interact with local community, local NGO workers and other stakeholders as well as understand their awareness level on the ecological and conservation values of pollinators. Accordingly, we are planning our up-coming outreach program. More comprehensive result on pollinator assemblage composition (which is to be acquired during the upcoming season) is necessary for successful outreach programs. We also introduced 'spot your pollinator contest' (photography based) in order to enthuse the locals about the insect pollinators and their habitats. Kindly refer to some relevant plates below.



5. Data analysis and dissemination of project findings:

Data processing, analysis and interpretation as well as preparation for publication are ongoing. Further collection of data in the upcoming season is required for gap filling. Preliminary findings on abundance and ecology of pollinator insects in high-altitude ecosystems of Himalaya have been presented in 'The Rufford India Conference held at Goa, India on 18 - 21 September, 2018 [Plate A]. Local community perception on native pollinator insects in high altitude settlements of Kedarnath wildlife sanctuary have been presented in 'The Rufford India Conference held at Corbett National Park, Uttarakhand, India on 8 to 11 February, 2019 [Plate B, C]. Kindly refer to the conference reports for more details.



Plates (A), (B) & (C)

Key results

1. Pollinator insect community composition:

Total of 27 species of pollinator insects recorded so far. Details about group wise species count, habitat distribution are provided in Table 1. Plates of some of the observed insect pollinators (including the common and abundant as well as rare ones) are provided.

Table 1: Various pollinator insect groups observed during May-July 2018 and habitat wise distribution

Taxonomic order of Pollinator insects	Pollinator insects in their common/scientific names	Total No. of species	Habitat wise distribution and species count				
			TF	RC	AS	AM	BSS
Hymenoptera	Bumble bee (<i>Bombus spp.</i>) : Apidae	4	1	-	1	1	3
	Honey bees : Apidae (<i>Apis indica</i>); (<i>Apis florea</i>)	2	1	1	2	2	-
	Non-Apidae bees	4	-	-	1	4	1
	Wasps	2	-	-	1	-	1
Diptera	Syrphid flies	5	3	3	3	4	1
Lepidoptera	Butterflies	8	1	-	-	3	5
Coleoptera	Beetles	2	-	1	-	1	-
Total no. of pollinator insect species observed in each habitat during May-July 2018			6	5	8	15	11
Total no. of pollinator insect species (pooling data of all habitats) observed during May-July 2018			27				





Plates of some of the observed pollinators

2. Documenting pollinator insect abundance and habitat wise distribution:

- We found that pollinator insect abundance in general was influenced by weather conditions
- Species belonging to bee groups (Hymenoptera) were usually the most abundant
- Average abundance was 21 insects/100 m transect with species richness range of 2-5 in scrubs (AS), 37 insects/100 m transect with species richness range of 3-8 in meadows (AM) and 18 insects/100 m transect with species richness range of 2-5 in boulder scree slopes (BSS)

3. Documenting interaction with host plants:

- A total 34 plants species recorded in the study area of which 13 plant species were visited by pollinator insects (pooling all the habitats). Further details are provided in Table 2.

Table 2: Plant – insect pollinator interaction patterns

Habitat	No. of constituent flowering plant species	No. of visited plant species	No. of visiting pollinator species	Interaction intensity (visits/ m ² /5 min)
TF	3	1	4	-
RC	5	3	4	-
AS	1	1	7	7
AM	22	10	15	16
BSS	6	2	4	23

- Most of the plants, recorded in the meadows, are high value medicinal and aromatic plants. However, any threatened plant and its corresponding pollinator visitation has not been recorded so far. Further extensive sampling is required.
- Abundant/dominant pollinators (e.g. Honey bees, Syrphid flies and one non-Apidae bee species) showed a general tendency to visit more abundant and more rewarding plants and had a wider host plant range.
- Selective foraging was prominent in meadows (AM) and boulder scree slopes (BSS). More extensive data is required to identify occurrence of specialized interaction, if any.

4. Pre-outreach survey findings and recommendations for upcoming outreach program

- Education level and socio-cultural practices (e.g. agriculture, bee-keeping, dependence on forests and alpine meadows for fuel, fodder, food, medicine etc.) were closely related with the awareness level of the local community.
- We recommend that outreach/awareness programs should be aimed to eliminate negative/wrong perception on insect pollinators, to differentiate between harmful pests and useful pollinator insects, to promote the link between insect pollinators and sustainable livelihood option as well as sensitize local people for identification, abundance monitoring and habitat protection for the conservation of pollinator insects.
- Younger population especially students and women can be treated as main target group for active conservation and management of the pollinators. So far we have got enthusiastic response from the local community regarding their direct/indirect involvement in the project.

5. General comments

Although we are behind our proposed timeframe (proposed period was till April 2019) due to unavoidable circumstances, we have succeeded to achieve preliminary baseline data on abundance and ecology of insect pollinators from this understudied region. Certainly, data collected in the upcoming season would provide complete understanding of habitat preference, cross habitat migration and degree of host plant specialization/selective preference of the insect pollinators in the region. Since we were able to establish a good contact with the local people; it is thus expected to be helpful in initiating long-term conservation activities in the area. An extension of six months (till October 2019) is therefore requested so as to continue the survey for upcoming season.

Work ahead

- Field work to be started during the upcoming season at forests-tree line ecotone habitats immediate after the onset of snowmelt in order to sample early season insect pollinators
- More extensive sampling from habitats like scrub, meadows and boulder scree-slopes during the upcoming season to fill gaps and cross-validate the last season's trends
- Identification of the insects and plants as well as collection of specimens to be completed
- Identify species and interactions at risk (if any) followed by production of appropriate conservation recommendations
- Conduct outreach programme
- Publication of results