

Final Evaluation Report

Your Details	
Full Name	Nidhi Rana
Project Title	Assessing the status of fireflies and its conservation practices through community participation in Doon Valley, Uttarakhand, Western Himalaya.
Application ID	33710-1
Date of this Report	25-07-2022

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 assess the diversity and abundance of fireflies in natural and anthropogenically altered habitats.				A total of five species from three genera were documented. Areas near human settlements and receiving high intensified lights were marked as anthropogenically altered habitats whereas areas without streetlights and far from human disturbance were taken as natural habitats. Their population was found most abundant near streams and areas having water nearby instead of forest edges and fields, as they remain lit by small lights to protect the crop from wild boars and elephants at night. However, we do find fireflies in urban areas, but their territory was limited to the patches of small shrubs and bushes without any light. Thus, with the assessment, we concluded that fireflies mainly avoid the areas receiving streetlights or any type of light, and this could be because they depend on their flashes for reproduction, and under those highly intensified lights their flashes were not visible to their partner.
Assessing the effect of ecological factors on the population of fireflies.				Temperature, humidity, wind speed, light intensity, and vegetation were recorded for each sampling location. Certain vegetation like <i>Parthenium hysterophorus</i> , <i>Bombyx coeba</i> , <i>Lantana camara</i> , and <i>Ficus benghalensis</i> (banyan tree) and habitat types supported the firefly population very well. They were witnessed flashing more around these trees. They were densely populated near riverine areas in comparison to urban and forest areas, leading towards an evaluation of their preference of a humid environment. In the Badkot range, an interesting observation was made where fireflies

			<p>were flashing only in the half portion of a <i>Bombyx coeba</i> tree as half of the tree portion was lighted by the streetlight. Through the observation it was interpreted that fireflies avoid the areas consumed by lights, since they use their flashes for attracting their mates and under these high intensified lights their flashes are not visible to their partner causing the decline in their mating process and ultimately affecting the population. In addition to this, soil composition appeared as a manipulating factor that would have an impact on fireflies' population, since they live their crucial phase (larva) in soil for 1-2 years. However, going for soil analysis was beyond the scope of the present study but the variable could be approached in further studies.</p>
<p>To escalate awareness about fireflies through outreach programs.</p>			<p>Outreach programs were organised in several schools for students and the faculties. Presentations comprising the ecology and ecological importance of fireflies were presented to the audience, whereas their vigilance was scrutinised through the question and answer session. Though, the session came out to be very informative, there were some very mischievous children in the schools giving us a tough time to deal with. Overall experience was wonderful, our presentation received satisfactory feedback from the school authority. Apart from planned programmes, a number of unplanned sessions were also there, where we interacted with a group of people who approached us out of curiosity seeing nets.</p> <p>Other than these activities, online fireflies survey involving citizen scientists was also conducted in 2021 and 2022 on the occasion of World Firefly Day (3rd-4th July). Links and barcodes were generated and circulated through the organisation's website and personal contacts. Participants (citizen scientists) were instructed to observe fireflies irrespective of urban landscape and</p>

			<p>filled the information in the datasheet provided via links. Though the proposed study was restricted to Doon valley, but with this survey we received pan-India data from more than 17 states on firefly occurrence, that will be made available on public domain for providing an already setup database to commence a study in any part of India.</p> <p>The study was also publicised through an interview with a news channel (Etv) and an article in newspaper emphasising the role of fireflies in our environment.</p>
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2. Describe the three most important outcomes of your project.

a). Diversity database: The current project was the first initiative to quantitatively assess the diversity and distributional status of fireflies in the Indian western Himalayas (IWH), particularly in the Doon valley. The study reported five species from three genera (*Abscondita chinensis*, *Abscondita perplexa*, *Asymmetricata circumdata*, *Asymmetricata ovalis* and *Lamprigera tenebrossa*). Given the novel approach of the project, all records reflect first occurrence reports in the IWH. It is noteworthy to mention that this taxon exhibits immense research potential in terms of assessing declining diversity, while also factoring in an increase in imminent threats from urban light pollution. Therefore, the preliminary result of this study forms a significant database to further systematics assessments of spatio-temporal variations in the taxon's taxonomic and functional properties.

b). Awareness escalation: The proposed study aims to strengthen the knowledge of people regarding fireflies. In context of which workshops were organised to deliver the information about fireflies to the students. Students were illuminated through concise presentations on firefly ecology and their ecological and biomedical importance. With this novel study, the awareness was generated on a prolific scale, which is either through workshops, interviews, articles, social media or citizen science approach. The sessions will help students to build an exclusive interest of working towards wildlife conservation.

c). Citizen science approach: To address the importance of fireflies, we celebrated the World Firefly Day in 2021 and 2022 on 3rd – 4th July. For the events an online firefly counting survey was organised and citizen scientists were engaged in the survey. The programme was aimed to gather the data on firefly occurrence from all over India. Considering which the participants were instructed to observe fireflies irrespective of urban landscape and fill out the information in the datasheet provided through the links. As a result of survey, we received a wholesome data encompassing more than 17 states of the country, according to the participants an insight to the real world of fireflies. Knowingly, that the proposed study was limited to the Doon valley, these surveys was organised which generated a pan-India database of firefly occurrence. Hence, the foster information will assist young scientists for commencing further pilot research on fireflies without any primary

survey of spatial-temporal conditions. This approach connected us with different people, who provided us feedback, questions and shared their opinions about the survey and fireflies. It was a great experience of learning, and such methods must be used frequently for conservation practices.

This is the novel study, which incised the steppingstone of setting up the “primary database of fireflies diversity” of Doon valley and “escalate the conservation awareness” among students and citizen scientists. The pan-India database of firefly occurrence produced through huge participation of citizen scientists helped the study to reach as many people as we could and helped in fulfilling one of our objectives.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

The predominant obstacle of the project was its functional timeline during the ongoing pandemic, especially during its peak in the Indian subcontinent. Although much of the field work was successfully covered during the project duration, certain setbacks were unprecedented, at both logistical and personal fronts.

Another big challenge that arose during the project was the sudden encounters with mammals in the forest. Being nocturnal, fireflies were sampled at night. Though, the chances of immediate encounter with elephants and leopards were low in Malhan and Asharodi, the risk was very high in Thano and Badkot ranges. Nonetheless, with the assistance of forest officials who maintained the regular track of their movement, we were timely informed, so that whenever the animals were in proximity, we used to get informed, and skipped to another location with proper protection.

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

Within the duration of proposed project numbers of local people were involved in formal and informal sessions. Unofficial sessions encompass people who approached us out of curiosity seeing sweeping net and equipment, resulting in a discussion of firefly ecology, their preferable habitats in extend to reasoning behind their diminishing population. Moreover, planned conversation with students and villagers regarding these fascinating beetles were successfully completed over presentations and small talks.

Apart from these practices, fireflies online survey rendered an excellent platform to numerous people across the country to participate and contribute information on firefly occurrence. Congregated data, mainly comprised of states, from where the information was collated, which can be used to set up further projects on fireflies. The outcomes of the survey will be available in public domain in the form of a research paper. The involvement of local communities in such practices benefits the target species and helped in accomplishing the objective of awareness escalation. A notion of wildlife conservation develops with self-interest for which we tried to

make an effort of building an interest through our sessions and encourage students to think and work in this path forward.

5. Are there any plans to continue this work?

Yes, there are plans to continue the work with a purpose to expand the study on other different regions of Uttarakhand, western Himalayas. Sampling locations will be upgraded at different elevational gradient to have an account of diverse vegetation and their influence on fireflies' population.

I also want to make a short documentary on fireflies, in their natural habitat to educate communities about their recreational benefit that people in different countries like USA, Thailand, Mexico, and Malaysia are already availing.

Conservation through ecotourism with proper guidelines for the forest officials and local stakeholders, can also be achieved for fireflies as their tourism is generating lots of income in countries mentioned above. There are firefly sanctuaries and parks that have been opened with a vision of providing livelihood to the locals and protection to fireflies. On a long-term vision of setting up fireflies' ecotourism these studies should be done first.

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

- The initial outcomes of the study will be shared in the International Mountain Conference 2022, at Innsbruck, Austria.
- A citizen science paper from the survey data conducted on the World Firefly Day was submitted in the Journal of Threatened Taxa and is under review.
- An Instagram page named- "Doon fireflies" (https://www.instagram.com/Doon_Fireflies/) was created with a vision of sharing information among people having background other than wildlife conservation or for someone who could not attend workshops and any events like this but are fond of nature and wildlife.
- A Facebook page called- "Fireflies of India" has been created to engage firefly lovers and many interested people. Where they can also share their pictures, sightings and thoughts on fireflies.
- Work also gets shared through a popular article in Hindi in the local newspaper and an interview was also given to ETV news channel talking about the details of fireflies, explaining the reasons behind their declining population, and the threats to them.
- Experience and knowledge also get shared in two conferences organised by FERAL in cooperation with Rufford in India (Mumbai and Udaipur).

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

Current study was limited to Doon valley and has been completed successfully, but now we look forward to exploring how vegetation, soil composition with different elevational gradient mainly above 1000 m asl affect the firefly diversity and for that we will expand the study area to different elevational level.

Apart from this, documentaries on fireflies will be filmed to use in awareness camps. From the idea of firefly survey which was previously held as an online survey we will plan to do the watch in person and take students, teachers, forest officials out in the nature to see the beauty of fireflies in nature following all necessary protocols so that we do not bother them. For which we will reach out to The Rufford Foundation for their financial support.

8. 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, we did use the Rufford logo in every promotional event.

- The brochures and the flyers for awareness programmes comprised the logo.
- We had organised fireflies counting survey for 2021 and 2022 and we have provided certificates to every participant comprising the Rufford logo.
- We have generated an Instagram page named "Doon fireflies", and the Rufford foundation was tagged in every post of it. Through the hashtags (#) other people also get to know about the foundation
- The foundation was also acknowledged in the research paper submitted in the Journal of Threatened Taxa that is under review.
- Foundation promotion through word of mouth to different researchers, in different conference was also done during the course.
- The foundation logo will also be publicised in the International Mountain conference (IMC), 2022 at Innsbruck, Austria.

9. Provide a full list of all the members of your team and their role in the project.

Our team consists of Institute, field Assistant, Intern, volunteer and forest guards (whom I want to give the credit as their help during the sampling period was immense).

Name	Specific	Role
Wildlife Institute of India	Governing Organization	Monitor finance of the project.
Naval Rana	Field Assistant	Assisted during the sampling period
Mukul Krishali	Intern	Assisted in sampling.
Amit Kumar	Volunteer	Assisted in sampling.
Neelam Shah	Volunteer	Assisted in sampling and workshops.
Vandana Mehrwar	Volunteer	Helped in conducting workshops.
Ritesh Kumar Gautam	Volunteer	Helped in technical part of the study.
Laxmi Prasad Gairola, Balwant Singh Jangpangi, Suman Rathore, Manohar Lal Bhatt.	Forest officials	Provide protection during sampling from elephants and leopards.

10. Any other comments?

The study has been completed successfully, receiving positive response from community. But the work is not done yet, we wanted to expand the work in different parts of the Uttarakhand and to its nearby states, to setup a broader database of fireflies' diversity.

