

Final Evaluation Report

Your Details	
Full Name	Nidhi Rana
Project Title	Monitoring of fireflies population and their conservation escalation through grass-root participation in Western Himalayan region Uttarakhand, India.
Application ID	39430-2
Date of this Report	7-05-2024

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
<p>To monitor fireflies diversity in natural and disturbed habitats in the selected region of Western Himalayas (Mussoorie and Chakrata forest divisions) at different elevational gradients</p>				<p>To conduct the study, two types of sampling sites, i.e., natural and disturbed areas at different elevational gradients were selected. Both the sites were differentiated on the basis of different factors like areas having disturbance from street lights and construction were designated as disturbed areas, whereas areas receiving less or no street lights and devoid of any habitat fragmenting activity were considered as natural. Within the sites, random sampling of fireflies was done. A total of four different species of fireflies were documented from the sampling sites of the Mussoorie and Chakrata forest division, <i>Abscondita perplexa</i>, <i>Abscondita chinensis</i>, <i>Lamprigera nepalensis</i> and <i>Daiphanes</i> sp. All the four species were documented for the first time from the forest divisions of the district Dehradun. However, the genera <i>Lamprigera</i> and <i>Daiphanes</i> (generally referred to as winter species), were only documented from Chakrata forest division (at an elevation of 1500m). Apart from their diversity, it was noticed that their abundance was higher in the undisturbed areas in</p>

				<p>comparison to the disturbed areas. However, fragmented population of fireflies was also noticed in disturbed areas around the patches of some shrubs receiving no light, which was concerning as the status of firefly populations in urban areas is poor, and if the habitats were not protected or no suitable habitat provided, the population, will disappear from the urban eco-spaces. Moreover, firefly populations were not observed at the elevations of more than 2000 m in the study areas, and it can be studied in future projects. Despite reaching elevations of approx. 2200m and having good forest cover, the diversity of both Mussoorie and Chakrata showed huge variation, and the main reason behind this difference was that Mussoorie forest division was more prone to tourism and landscape alteration, whereas Chakrata landscape was more intact and attracted fewer tourists resulting in variation in fireflies diversity.</p>
<p>To evaluate the influence of environmental variables on the fireflies population in the study area.</p>				<p>In addition to temperature, humidity, wind speed, light intensity, precipitation and vegetation, soil micro-climatic conditions like soil pH, temperature and humidity were also recorded with the help of a soil meter. The readings of the soil in the study areas ranged from dry to less humid, and had a pH of not more than 6.8 which is</p>

			<p>more on the acidic side. However, further studies concerning soil physio-chemical parameters are needed to analyse what nutrients or factors help in larval development. It was observed that temperature and humidity play an important role to support firefly populations. Nonetheless, dependency of fireflies on particular plant species was not observed in both the forest divisions. Furthermore, the impact of night light was observed on fireflies population, especially in Mussoorie which was more prone to construction and tourism. The area was highly constructed and some of the areas did not have soil nearby, and were cemented only which was a major concern, as firefly development requires soil.</p>
<p>Escalation of conservational cognizance of fireflies through outreach programs at the community level</p>			<p>Awareness escalation among communities was one of the most crucial components of this study, and to fulfill the goal the team organised conservation workshops for students and teachers. We also printed t-shirts having a caption of firefly project and The Rufford Foundation. Moreover, a detailed presentation on “Importance of fireflies in our ecosystem” was organised for the students, and afterwards students were engaged in the questionnaire session regarding fireflies to evaluate the knowledge they gained from the workshop and the students who correctly gave answers were presented with the t-shirts to boost</p>

			<p>their motivation. Furthermore, on the occasion of World Firefly Day, a firefly survey was conducted on 2nd – 3rd July, 2023. A link to the survey was prepared using ArcGIS survey 123 software. The link was uploaded on Wildlife Institute of India official website, WII Instagram page and circulated through personal contacts. A total of 93 people participated in the survey from which 92 were from India and one from Freiburg (Germany). The total number of fireflies sighted was 7,181 from 14 states of India. All the states from where we received the data are as follows- Uttarakhand, Himachal Pradesh, Uttar Pradesh, Jharkhand, Haryana, Assam, Mumbai West Bengal, Odisha, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala. However, maximum participation was seen from Uttarakhand followed by West Bengal. Besides, informative articles on fireflies were published in the local newspapers. Our Instagram and Facebook pages, named "Doon fireflies" and "Fireflies of India" respectively, engaged and educated people about fireflies. Recently, we got the chance to communicate with a student of Graphic Era (Deemed to be University), thus we used the platform to educate the students about firefly status in our country and motivate them to work in this path forward. By opting these approaches our team was able to reach different communities all around the country. The team</p>
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2. Describe the three most important outcomes of your project.

- a) Diversity database:** This is the first study conducted in Mussoorie and Chakrata forest division of Dehradun district, India. Through the study, four different species (*Abscondita chinensis*, *Abscondita perplexa*, *Lamprigera nepalensis* and *Daiphanes sp.*) and two sub-families (Luciolinae and Lampyrinae) were documented from the area. All the species were reported for the first time from the regions, generating the primary database of the areas. This information can be used for further studies on fireflies in the region.
- b) Generation of awareness:** Conservation workshops were organised for students and teachers in different schools of Chakrata and Mussoorie forest division. For the workshops, a presentation was prepared for students to educate them about fireflies role in the environment, why their populations are declining and the factors responsible for their decline. In addition to this, students were encouraged to pay attention in the class so that we could evaluate the knowledge they had gained from the programme by a question-and-answer session after the presentation. And as a reward, t-shirts having print of the firefly project and The Rufford Foundation was distributed to students who correctly gave the answers in order to motivate them. Awareness generated in the workshop was immense, this will help the students to develop a sense of self interest in working towards the direction of firefly conservation.
- c) Fireflies Survey:** On the occasion of World Firefly Day, a firefly survey was conducted from 2nd – 3rd July 2023. A link to the survey was prepared using ArcGIS survey 123 software. The link was uploaded on Wildlife Institute of India official website, WII Instagram page and also circulated through personal contacts. A total of 93 peoples participated in the survey from which 92 were from India and one from Freiburg (Germany). The total number of fireflies sighted was 7,181 from 14 states of India. All the states from where we received the data are as follows- Uttarakhand, Himachal Pradesh, Uttar Pradesh, Jharkhand, Haryana, Assam, Mumbai West Bengal, Odisha, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala. Maximum

participation was seen from Uttarakhand followed by West Bengal. To date, we have conducted firefly surveys in 3 consecutive years (2021-2023) and published a paper on the results. This citizen science approach engaged people from all over the country and generated occurrence data of fireflies on a regular basis which can be used in future projects.

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

Firefly sampling at night increase the challenges of encounters with wildlife, especially, leopards and bears. Leopard sightings were much frequent in Mussoorie in comparison to Chakrata. However, with the help of forest guards and our team we managed to sample.

Furthermore, in 2023 the monsoon hit the area hard resulting in landslides and floods. The terrain of Chakrata forest division was much prone to landslides than Mussoorie, which caused road blockages and immense damage in the region. However, in Mussoorie there were too many leeches that the team members got bitten by them badly. Though it hinders the work but we managed to complete it successfully.

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

During sampling, due to our sweeping nets and other gadgets people saw us and asked us what we were doing? Why do we have the net? We explained about the project, the use of the net and other appliances. During conversations with locals in Chakrata we got to know that fireflies are known as "Jogeend" in the area. Though it was very good to know that they knew about fireflies quite well. Other than that, in "Binog Wildlife Sanctuary" Mussoorie, we met some students and told them about the environmental role of fireflies. It was very nice to see that in most of our interactions people already knew about fireflies, and they themselves used to tell us that there were lots of fireflies earlier but now their population have declined, but did not know much about why they were declining, so we explained to them about the factors due to which the population is declining and what they can contribute to protect them. Apart from this unplanned interaction, awareness workshops were organised in the schools of Mussoorie and Chakrata forest division in which students were engaged in presentations and also rewarded with firefly printed t-shirts. With these efforts, we are sure that at least some of them will start working in this path forward.

5. Are there any plans to continue this work?

Yes, for sure, we will continue the work. Uttarakhand is a huge state lying in the foothills of the Himalayas, and with the help of The Rufford Foundation we have managed to assess the diversity of these flashing beetles in different forest divisions of the Dehradun district. Furthermore, several awareness programmes were organised in the district. However, we still have a large area to explore and unfold the diversity. Therefore, with the aim of diversity assessment and conservation escalation among the local communities we will continue the work.

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

- Research paper on species that were documented for the first time from the study area will be published in the peer reviewed journal.
- Firefly survey engaging citizen scientists was conducted in July 2023, whose data was shared with the local newspaper and other researchers. Also articles on effect of pesticides and pollution on firefly populations was published in Times of India.
- Online presentation was also given on fireflies in a conference organised by EMPRI (Environmental Management & Policy Research Institute) on 21st July 2023.
- Furthermore, information on firefly survey were posted on our Instagram and Facebook page.
- Research paper entitle "First record of *Lamprigera tenebrossa* (Walker, 1858) subfamily Lampyrinae from Doon valley, Western Himalayas, India" was accepted in the "Journal of Indian Forester" in which a proper acknowledgment was given to The Rufford Foundation for providing the financial aid.

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

With increasing urbanisation and alteration in climate several insect population is facing decline including fireflies. Nonetheless, their status is data deficient, in India especially. Though the previous and current projects we have generated indispensable species data from different forest divisions of Dehradun district, but there is still a lot more scope of diversity assessment of these flashing beetles as Uttarakhand is a large state in the foothills of Himalayas, embracing rich biodiversity. It comprises different areas in Shiwaliks, Western Himalayas, Lesser Himalayas and Trans Himalayas. Thus, the state upholds the potential of revealing new species, and for that every area needs to be surveyed properly. Apart from this, engagement of local communities in the study has always been our focus as with the participation of local people conservation practices like planting shrubs, trees in their gardens to provide friendly environment to fireflies, cutting out excessive lights in order to ensure

their mating can be achieved. Therefore, the important next steps will be to assess their diversity in the region extending from Western to Trans Himalayas in Uttarakhand and to conduct awareness programmes for a mass population.

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 of course, the Rufford Foundation logo was used in every promotional event of the project.

- This year, t-shirts having the logo of the firefly project and The Rufford Foundation were printed for the students who were engaged in a small question answer game during the awareness programme.
- We did used the foundation logo in the flyers and brochures that we designed for the awareness programmes.
- On World Firefly Day, 2023 a firefly survey was organised in which every participant was provided with e-certificates having the Rufford Foundation logo.
- On our Instagram and Facebook pages we had uploaded pictures and used hashtags to tagged the foundation so that people get to know more about the foundation.
- We also have two papers from which one is published and another is accepted in the Journal of Indian Forester. In both the papers, the foundation has been acknowledged to provide the funding aid for the study.
- The foundation was also promoted through word of mouth at every level of the project.

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

The project team comprised- Field Assistants, Volunteers, Rangers and Forest guards (who helped the team in sampling and finding accommodation in difficult areas).

Name	Specific	Role
Wildlife Institute of India	Governing Organization	It maintain and monitor the finance of the project.
Naval Rana	Field Assistant	Assisted in sampling period, also helped in finding accommodation during field.

Mukul Krishali	Field Assistant	Assisted in Sampling.
Irina Das Sarkar	Volunteer	She helped in framing study, identify areas to sample.
Abha Purohit	Volunteer	She helped in conducting the workshops.
Sarthak Dhyani, Prabhakar Khanal and Apurwa Majumdar.	Volunteer	They helped in organizing workshops, refreshment for the students, distribution of small gifts arranged for the students.
Lalit sir,	Forest official	Lalit sir helped in providing permission from the Chief Wildlife Warden to conduct the study.
Manju Bhatt	Chemistry Professor	I could not resist myself to mention her as she helped us going out of the box. She allowed us to break the lock of her room (over a phone call) as she was not there, so that we can stay in her room, as on the next morning we had our workshop scheduled in the school in which she teaches chemistry in Chakrata.

10. Any other comments?

The project has been completed successfully documenting species which were recorded for the first time from the study area. However, there is a lot more scope of expanding the work from the Western Himalayan region to the Trans Himalayas of Uttarakhand to assess the diversity of these flashing beetles to structure the database for residing species.



Fireflies Sampling Pictures.



Pictures with winners of questionnaire round during awareness workshop.