Final Evaluation Report

We ask all grant recipients to complete a project evaluation that helps us to gauge the success of your project. This must be sent in **MS Word and not PDF 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 – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please DO NOT fill in and submit this form until the project has been completed.

Complete the form in English. Note that the information may be edited before posting on our website.

Please email this report to jane@rufford.org.

Your Details	
Full Name	Himani Nautiyal
Project Title	Assessment of a multidisciplinary framework for human–wildlife coexistence in the Indian Western Himalaya
Application ID	37193-B
Date of this Report	08/12/2025

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 (Refer to section 1.1 for more details)
Objective 1. The Tolerance Hypothesis Improve behavioural tolerance toward langurs through livelihood interventions such as kiwi farming and community empowerment.			✓	Short-term interventions such as education and kiwi farming reduced verbal deterrence but did not change aggressive responses within one year. However, the intervention villages showed early positive shifts toward neutral behaviour, indicating that sustained long-term interventions are likely to generate deeper behavioural change.
Objective 2. The Education Hypothesis Determine whether wildlife education programs in local school improve tolerance toward langurs.			✓	School-based education clearly reduced verbal deterrence responses and improved children's ecological knowledge. Children began exhibiting more observational, less aggressive behaviour. Aggressive responses remain culturally ingrained but began showing downward trends, indicating early-stage success.
Objective 3. The Tree Species Preference Hypothesis Test whether planting langur-preferred food and roost trees reduces langur crop-foraging and improves habitat quality.			✓	During the project period, we planted approximately **1,000 saplings** of langur-preferred food and roost tree species, exceeding the original target of 880 saplings. Plantation activities were carried out across the planned 11 degraded sites within langur foraging and roosting areas, with additional plantation plots established through community collaboration. In particular, **three extra plantation plots** were created on village-owned land and used for conservation education activities, where local schoolchildren participated in planting

				approximately **60 saplings per plot** as part of structured outreach programmes. All plantation sites were selected based on long-term data on langur feeding ecology and roosting preferences. Survival monitoring was initiated during the project period and continues as part of the Himalayan Langur Project's long-term research framework. As the development of functional forest habitat is inherently a long-term process, the full ecological effects of these plantations on langur foraging behaviour and crop use are expected to become evident over several years. Ongoing data collection will allow us to assess survival, growth, and eventual langur use of these restored patches.

1.1. This project successfully met or exceeded its scientific, educational, and conservation objectives. The work built on long-term foundations created by previous Rufford grants and advanced our understanding of how human tolerance toward Himalayan langurs varies across environmental, social, and intervention-driven contexts. Between May 2022 and May 2023, we conducted 2,124 hours of full-day follows across 177 field days, recording 1,152 independent human–langur interaction events within 25 meters. The focal study population was a well-habituated group of Himalayan langurs (*Semnopithecus schistaceus*), hereafter referred to as the "**S Group**." This group has been under continuous behavioral observation since 2014 and occupies an agro-forest landscape characterized by forest fragments, agricultural fields, and village edges. All individuals were individually recognized, including new entrants during the study period. Between May 2022 and May 2023, the group comprised 64 individuals, including 12 infants, 9 juveniles, 16 subadults, 20 adult females, and 7 adult males. Data collection and interventions were conducted across six villages (Gondi, Siroli, Sanso, Gweer, Kunkuli, and Makroli), representing Himalayan langur home-range and non–home-range areas within the Mandal Valley landscape (Figure 1). Each event was categorized into physical deterrence, verbal deterrence, or neutral response, and demographic and spatial context were documented. These data enabled rigorous hypothesis testing using Bayesian multinomial logistic regression.

The Tolerance Hypothesis was fully achieved. Distance emerged as one of the strongest predictors. Far interactions significantly reduced aggression ($\beta = -2.73$, 95 percent CI [−4.59, −1.39]) and verbal deterrence ($\beta = -0.83$, 95 percent CI [−1.58,

−0.13]). These findings have direct implications for zoning and buffer planning in fragmented forest–agriculture interfaces.

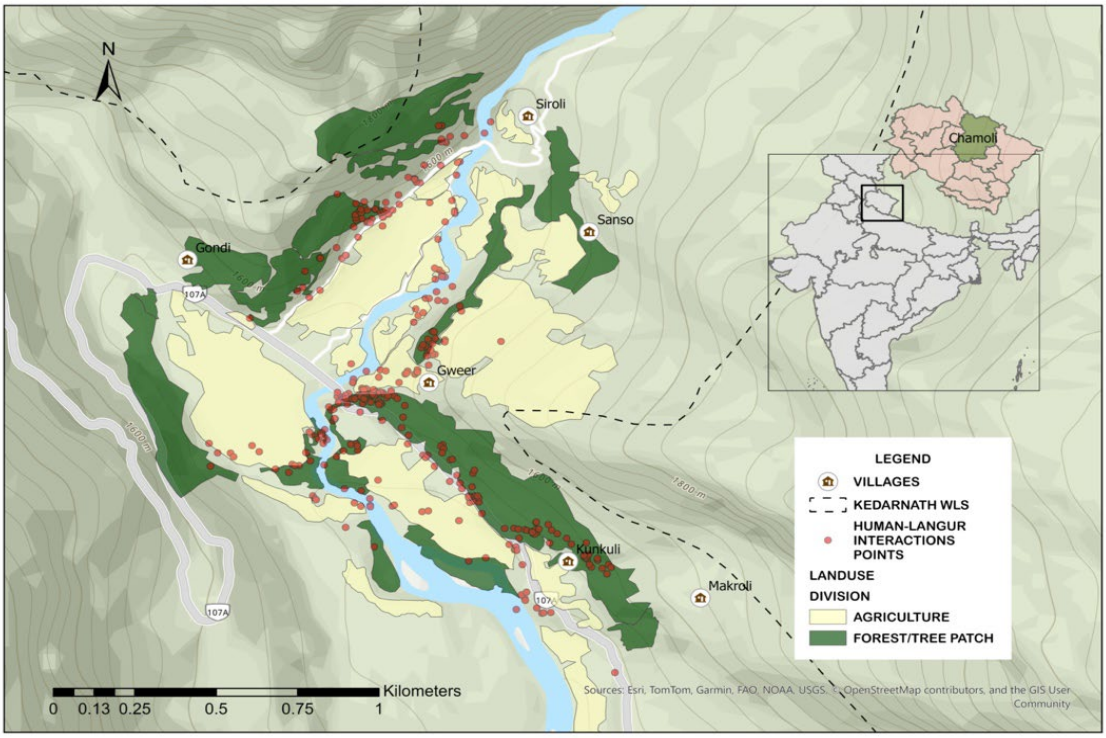

Figure 1: All six study villages (**Gondi, Siroli, Sanso, Gweer, Kunkuli, and Makroli**) fall within the established home range of the focal **S Group** of Himalayan langurs. The recorded human–langur interaction points represent locations where the S Group regularly uses agricultural fields, forest fragments, and village edges within its home range.

The Efforts Hypothesis was partially achieved. As shown in Figure 2, education and kiwi farming influenced verbal deterrence but did not reduce aggressive behavior in the short term. Education reduced the probability of shouting at langurs, consistent with expectations that awareness-building is effective first with moderate forms of conflict. More time and repeated exposure will likely be needed to shift deeper behavioral patterns, a well-known challenge in human–wildlife coexistence work.

The Activity and Season Hypotheses were fully achieved. Resource protection strongly increased aggressive responses (β = 2.39, 95 percent CI [1.91, 2.91]) and verbal deterrence (β = 1.99, 95 percent CI [1.46, 2.47]). Aggression was significantly higher during harvesting season (β = 0.73, 95 percent CI [0.31, 1.17]), confirming that conflict peaks when crops are most valuable.

The Demographics Hypothesis was fully supported. Children displayed significantly higher aggression toward langurs than adults (β = 1.44, 95 percent CI [0.75, 2.13]), reinforcing the importance of school-based education.

The Tree Species Preference Hypothesis was partially achieved. Hundreds of saplings were planted in collaboration with communities, but measurable ecological outcomes will require several additional years of growth.

Overall, every major Rufford-funded component, scientific data, education, livelihood interventions, restoration, and outreach advanced meaningfully.

2. Describe the three most important outcomes of your project.
a) A robust, year-long analysis revealing predictors of human responses to langurs.

The dataset produced during this project represents one of the most detailed human–primate interaction studies in the Himalayas. **Figures 2 to 4** illustrate how tolerance and deterrence shift with interventions, distance, and human activity. Figure 1 shows the predicted probabilities of neutral, verbal, and aggressive responses across effort categories (no effort, education, kiwi farming). Education reduced verbal deterrence, while kiwi farming showed weaker short-term influence, suggesting that livelihood interventions require more time to alter behavior. Figure 2 demonstrates that aggression decreases sharply as distance increases. Figure 3 shows that resource protection greatly elevates aggression and verbal deterrence. These figures collectively provide a quantitative foundation for designing coexistence strategies. The analysis underlying these figures is supported by the model comparison results in **Table 1** showing that the Full Model best explains variation in human responses. This highlights that interventions must be integrated with spatial, seasonal, and demographic considerations.

Table 1. Model comparison results based on differences in expected log predictive density (ΔELPD). The Full Model shows the highest predictive performance (ΔELPD = 0), indicating the best fit among all candidate models.

Model	ΔELPD	SE(ΔELPD)
Full Model	0.0	0.0
Season + Activity + Distance	-30.8	9.6
Area + Season + Activity	-43.6	11.9
Season × Activity	-44.0	12.0
Activity	-46.5	12.4
Demographics	-98.8	15.2
Distance	-114.0	16.3
Efforts × Season	-123.4	17.9
Efforts	-125.5	17.3
Season	-131.1	18.1
Area	-134.0	18.1
Null Model	-134.1	18.1

ΔELPD = Difference in Expected Log Predictive Density, used to compare out-of-sample predictive performance across Bayesian models. **SE(ΔELPD)** = Standard Error of the ΔELPD estimate. Larger negative ΔELPD values indicate weaker model support relative to the top-performing model.

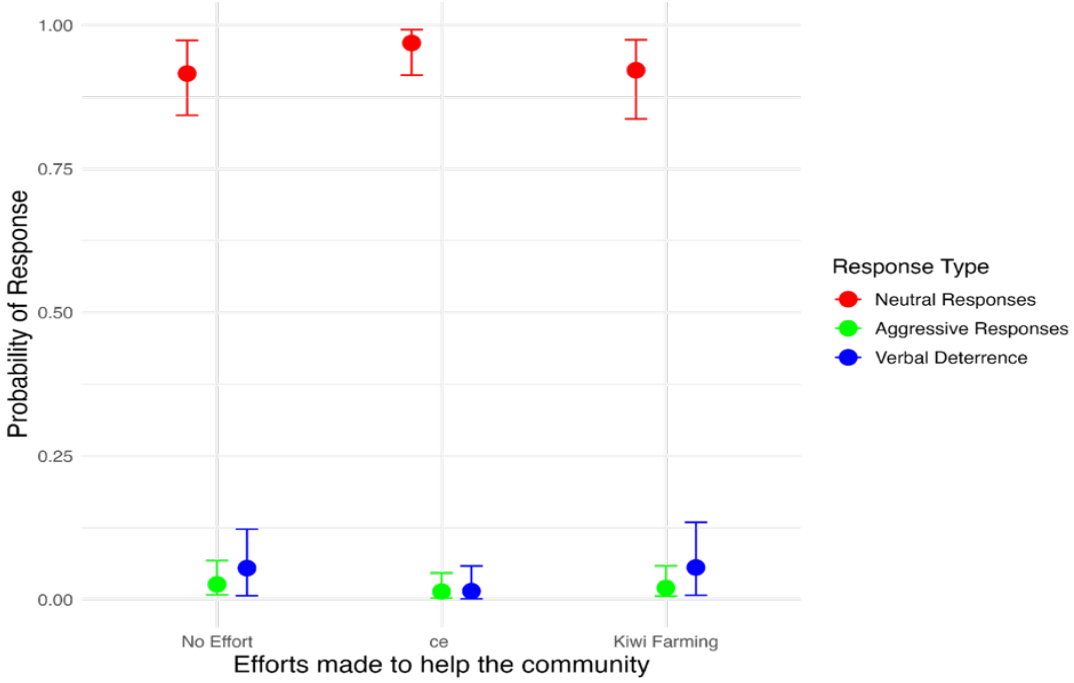

Figure 2. Predicted probabilities of human responses toward Himalayan langurs across conservation intervention categories. The plot shows the estimated probability (± 95 percent credible intervals) of three human response types and Physical Deterrence (PD) under three intervention conditions: No Effort, Conservation Education, and Kiwi Farming.

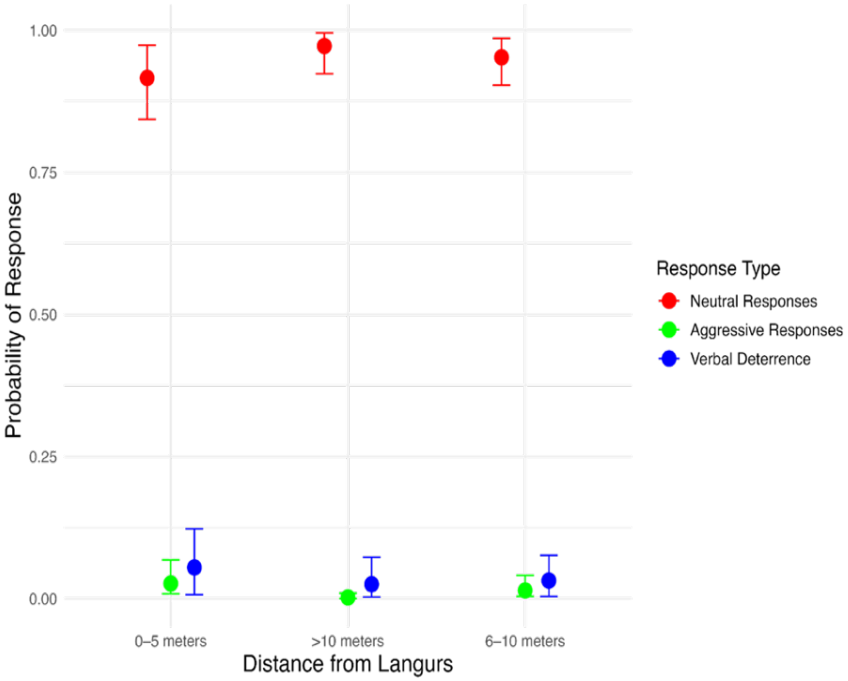

Figure 3. Predicted probabilities of human responses across distance categories. The plot displays response probabilities (± 95 percent credible intervals) when langurs were observed at Close (0–5 meters), Near (6–10 meters), and Far (>10 meters) distances.

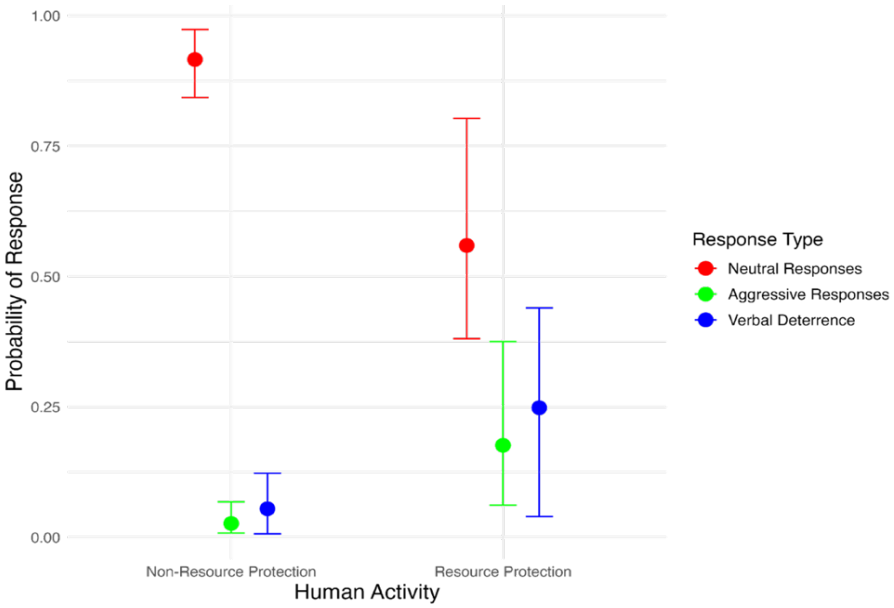

Figure 4. Predicted probabilities of human responses toward Himalayan langurs during Resource Protection and Non-Resource Protection activities.

b) Demonstrating early-stage effects of conservation education and the potential of livelihood interventions.

Conservation education activities were implemented both prior to and during the formal study period. Between June 2021 and December 2021, daily education sessions (excluding Sundays) were conducted across all six villages within the S Group home range, when local schools were closed due to COVID-19. In response to community requests, these sessions extended beyond environmental topics to include basic science and mathematics, ensuring continuity of learning during prolonged school closures. Education activities initially reached **83 students**, forming the foundation of a long-term engagement programme.

Conservation interventions consisted of structured educational initiatives designed to enhance children's understanding of langur behaviour, forest ecology, and local wildlife within the S Group home range. Although langurs are a familiar presence in daily life, these programs aimed to build upon existing local knowledge by fostering systematic learning, ecological reasoning, and curiosity rather than replacing traditional understanding. During the project period, education sessions were conducted **twice per week for 12 months**, totalling **approximately 104 instructional days and 208 hours of classroom and field-based engagement**. Participation varied across villages, and not all children living within langur home-range areas were exposed to conservation education, reflecting realistic constraints of attendance, school schedules, and household responsibilities. A core group of approximately **65 students** participated regularly throughout this period. The interventions included:

- **Classroom-based learning:** Interactive sessions introducing concepts related to forest ecology, biodiversity, food webs, and the ecological roles of wildlife.

- **Awareness workshops:** Discussions and presentations focused on interpreting langur behavior and linking everyday observations to broader principles of primate ecology and conservation.
- **Guided outdoor observations:** Supervised field visits during which children observed langur social behavior in natural settings while learning about forest dynamics, plant–animal interactions, and ecological interdependence.

Pre- and post-education surveys were conducted with participating students to assess changes in knowledge and awareness. While the full dataset is still being compiled and analysed due to its scale, preliminary results indicate **substantial improvements** in students' understanding of ecological concepts, forest dynamics, and langur behaviour. Assessing attitudinal change toward langurs is ongoing and intentionally cautious, as crop protection remains central to household livelihoods. Importantly, however, many students demonstrated a shift toward **non-harmful deterrence strategies**, with low dependance on physical deterrence and increased use of peaceful chasing methods when langurs entered agricultural fields. This behavioural adjustment represents a meaningful early-stage success within a realistic coexistence framework.

Livelihood interventions focused on kiwi farming as an alternative income source less vulnerable to wildlife crop damage. Training and planting support were provided to approximately **85 women farmers**, of whom **55 women successfully adopted kiwi cultivation** by the end of the project period. Early adoption rates and continued engagement indicate strong community interest and the potential for long-term scaling.

Particularly, **three current field assistants** working with the Himalayan Langur Project were themselves participants in earlier education activities and later expressed a specific interest in animal behaviour, which motivated them to join the project. Their transition from local students to trained field researchers shows the project's long-term capacity-building impact and its role in creating locally rooted conservation expertise. Together, these education and livelihood interventions demonstrate early-stage behavioural and social effects while, more importantly, establishing durable pathways for sustained coexistence, local stewardship, and community-led conservation beyond the project's formal timeframe.

c) Long-term capacity building and community empowerment.

Over the past decade, support from **three consecutive Rufford grants** has been central to building the scientific and community capacity of the Himalayan Langur Project. More than 60 students and early-career researchers have been trained through HLP since 2015, and this project directly strengthened that pipeline. **Two researchers, Diganta Mandal and Soumalya Ghorui, worked as research assistants on the current Rufford-funded project**, and the skills, field experience, and mentorship they received through this work enabled them to secure fully funded PhD positions at **Indiana University** and **Boston University**. Their career progression reflects the long-term training impact of Rufford's investment. Local assistants **Suraj** and **Mohit**, who also joined during this project, are now permanent members of the HLP team, providing

continuity in data collection, community engagement, and long-term monitoring. Their profiles are available here: https://www.himalayanlangur.com/who-we-are.
This project also provided tangible community benefits. School-based conservation sessions, women-led kiwi farming initiatives, and collaborative plantation efforts strengthened local participation in coexistence work. The conservation documentary produced under this grant (https://youtu.be/E7LZKChCWu4?si=RFjYSItWLHM657Sk) helped amplify local voices and highlighted the shared challenges faced by people and langurs in the region. Led by Dr. Himani Nautiyal, HLP continues to merge scientific research with livelihood support and awareness-building, especially by empowering the women who form the socio-economic backbone of Himalayan hill communities.

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

Although our team has been conducting long-term fieldwork in these sites since 2015, the severity and unpredictability of weather conditions have increased noticeably since 2018. During this project, fieldwork was repeatedly disrupted by intense monsoon rains, landslides, flooding, and unusually prolonged winter droughts. These shifts in seasonal patterns are consistent with broader climate change impacts reported across the central Himalayas, and they directly affect both local communities and langur habitat. The plantation component was also affected, as extended dry spells reduced sapling survival despite regular community monitoring. In response, we increased watering frequency where feasible, improved tree-guard protection, and prioritized planting sites with higher soil moisture retention for the next phase. These challenges, while significant, reinforced the importance of long-term, climate-informed conservation planning. As climate instability continues to shape the livelihoods of mountain communities and the availability of natural resources for langurs, our work increasingly focuses on helping communities adapt while strengthening coexistence strategies.

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

Local communities were central to every stage of this project, and their involvement is one of the strongest long-term outcomes of a decade of Rufford support. Women participated actively in kiwi-farming, schoolchildren engaged in multiple rounds of conservation education, and households worked with the team to plant and protect saplings of langur-preferred species. These partnerships created genuine shared ownership over conservation actions and strengthened trust built since 2015.
Community engagement is also the foundation of our coexistence model. Based on the insights gained during this Rufford-funded project, Dr. Himani Nautiyal initiated a new, region-wide study across the Garhwal Himalayas to document Traditional Ecological Knowledge (TEK) as part of her postdoctoral research funded by the National Science Foundation (USA). This work directly builds on community relationships fostered through Rufford support. Future projects by **HLP aim not only to "include" communities but to work *with* them as equal partners, recognizing that local people have protected these landscapes for generations and hold ecological knowledge essential for long-term coexistence.**

Local assistants Suraj and Mohit, who joined during this phase, are now permanent HLP staff, ensuring continuity in data collection and strengthening community-based conservation capacity. Children gained ecological awareness and improved attitudes toward langurs through repeated school programs. Our kiwi-farming initiative, designed as an alternative livelihood less vulnerable to wildlife crop damage, has now been adopted by the forest department and scaled across the wider Garhwal region. Communities further benefited from increased visibility. The HLP YouTube channel (https://www.youtube.com/@thehimalayanlangur), Instagram outreach (https://www.instagram.com/thehimalayanlangur/), and the Rufford-supported documentary on coexistence showcased local voices and highlighted their challenges and resilience.

Continued support from Rufford also enabled Dr. Nautiyal to secure independent postdoctoral funding and develop one of the largest data sets on Traditional Ecological Knowledge among Garhwali communities and the Bhotiya tribe, including their adaptive strategies in the face of climate change. This work contributed to the award-winning film **Himalayas: Tradition in Balance**, which has given these communities a platform at global conservation forums (https://filmfreeway.com/HimalayasTraditionsinBalance). HLP will continue to share findings with local partners and policymakers to support long-term coexistence strategies rooted in both science and community knowledge.

5. Are there any plans to continue this work?

Yes. This project is part of the long-term Himalayan Langur Project established in 2015 with sustained Rufford support. All data collection streams will continue, including daily behavioral follows, interaction monitoring, and plantation tracking. Objective 3, relating to tree species preferences and habitat restoration, will be assessed as saplings mature.

Partnerships with CEDAR, Doon University, UPES, and the Uttarakhand Forest Department ensure that future work will be collaborative and policy relevant. Data from this project are being prepared for submission to Conservation Biology and additional manuscripts are planned. The project is also expanding geographically into neighboring valleys for comparative coexistence studies.

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

Results from this project are being shared widely through scientific publications, public engagement, and direct communication with local communities and government agencies. A peer-reviewed paper examining dog and human impacts on langur behaviour was published in *Biology* and the current human–langur interaction dataset is being developed into a new manuscript for submission to *Conservation Biology*. These publications ensure that the findings from Rufford-supported work contribute to the global literature on human–wildlife coexistence.

Beyond academic outputs, dissemination has been a major focus of our long-term strategy. The conservation documentary funded by Rufford is available on the Himalayan Langur Project (HLP) YouTube channel provides an accessible introduction to the challenges and opportunities of coexistence in the Garhwal Himalayas. Short-

form educational videos shared through the HLP YouTube and Instagram platforms help translate scientific results for broader public audiences, especially young people. These findings have been widely communicated through significant academic engagement at national and international levels. Across the past decade of Rufford-funded work, Dr. Himani Nautiyal has presented results from this project and previous Rufford grants at more than 30 conferences, invited seminars, and university talks, including presentations in India, the USA, Europe, and international online forums. This includes participation in some of the most prestigious global conservation platforms, such as the International Congress for Conservation Biology (ICCB) in Kuala Lumpur (2019) and Brisbane (2025). She has also delivered a keynote address, further amplifying the project's visibility and highlighting Rufford's long-term contribution to advancing conservation science in the Himalayas.

At the community level, we shared results with schoolchildren, farmers, women's groups, and village leaders through presentations and informal discussions. Findings were also communicated to the Uttarakhand Forest Department through meetings and briefings that support more informed management decisions. As the dataset continues to grow, future results will be shared through additional peer-reviewed manuscripts, local and regional workshops, policy briefs, and continued outreach via digital media and film.

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

The analysis from this project clearly identifies when and where conflict between people and langurs is most likely to occur. The next phase of our work focuses on turning these insights into concrete coexistence strategies that communities and local authorities can realistically implement. Spatial planning will be essential. Establishing buffer zones around high-conflict areas, promoting crop varieties less vulnerable to langur foraging, and guiding land-use decisions can significantly reduce risky encounters. Education programmes must continue and expand, especially for children, who showed the highest rates of aggressive responses and therefore represent the most important group for long-term cultural change.

Livelihood interventions, such as kiwi farming, need to be scaled up and monitored over multiple years to evaluate how sustained economic stability influences attitudes and tolerance toward langurs. Our restoration sites will continue to be tracked for seedling survival, growth, and eventual use by langurs, as these habitats may help reduce pressure on agricultural areas over the long term.

The partnerships strengthened during this project with CEDAR, Doon University, UPES, and the Uttarakhand Forest Department provide a strong foundation for testing, refining, and scaling coexistence models across the wider Garhwal region. Integrating community knowledge, long-term behavioural data, and adaptive management approaches will be central to building durable coexistence strategies that work for both people and langurs in a rapidly changing Himalayan environment.

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?

Under the Himalayan Langur Project (HLP), led by Dr. Himani Nautiyal, the Rufford Foundation logo has been consistently used across all outreach, training, and communication materials for many years. Because HLP is a long-term initiative established and directed by Dr. Nautiyal, all awareness, education, and scientific communication carried out under HLP directly reflects her efforts and continues to promote Rufford's support. The logo has been included in educational materials, school presentations, community posters, plantation event documents, and scientific slide decks used during national and international talks. It is also prominently featured in the conservation documentary produced through this Rufford grant, as well as in social media outreach, website updates, and short educational videos shared through the HLP YouTube and Instagram platforms. These channels reach a wide audience, from local Himalayan communities to global conservation networks. Additionally, Dr. Nautiyal regularly acknowledges Rufford's long-term support in her professional engagements. Findings from this project and previous Rufford-funded studies have been presented in more than 30 academic and conservation events, including invited seminars, university talks, conference presentations, and a keynote address. This has ensured that Rufford's contribution is recognized across the international conservation community and associated with rigorous, community-centered research in the Himalayas.

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

The project was led by Dr. Himani Nautiyal, who oversaw the scientific design, field methodology, data analysis, community engagement, and overall project management under the Himalayan Langur Project (HLP). Prof. Anindya Sinha and Prof. Rui Diogo provided conceptual and scientific guidance, contributing to study design, interpretation of results, and broader theoretical framing. Field data collection and behavioural observations were carried out by Dr. Nautiyal, Diganta and Soumalya, both of whom served as research assistants on this Rufford-funded project and are now pursuing fully funded PhDs based on the foundational training gained through HLP. Local field assistants Suraj and Mohit supported daily tracking of langur groups, documentation of human–langur interactions, plantation monitoring, and community liaison work; both are now permanent members of the HLP team.
Virendra Mathur, another key team member, contributed to field data collection and played an important role in community outreach and coordination, strengthening communication between the research team and local households.
Institutional support came from Forest Authority, CEDAR, Doon University, and UPES, who facilitated research permits, provided academic collaboration, and supported community engagement workshops. Media and communication outputs, including the documentary film and outreach videos, were produced in collaboration with members of the HLP media team.

10. Any other comments?

Rufford's long-term support has been central to the development and success of the Himalayan Langur Project (HLP). Since 2015, three consecutive Rufford grants have enabled Dr. Himani Nautiyal to build and sustain an independent conservation initiative that now functions as one of the most comprehensive long-term human–primate coexistence programs in India. This support allowed HLP to establish

continuous data collection, train local and early-career researchers, engage communities, and develop a landscape-level understanding of langur ecology and human–wildlife interactions. The continuity of Rufford funding has also empowered HLP to grow beyond field research into a broader conservation platform. It has supported community outreach, youth education, livelihood initiatives, species restoration efforts, and the production of internationally recognised media outputs. Many students and local assistants who began working under Rufford-funded projects have since built long-term careers or permanent roles within HLP, demonstrating the lasting capacity-building impact of these grants. Through this support, HLP has evolved into a trusted conservation presence in the Garhwal Himalayas, strengthening relationships with communities, NGOs, academic institutions, and government agencies. Rufford's investment has created deep and enduring scientific, social, and ecological benefits, and continues to play a foundational role in shaping the future of coexistence work in the region.

ANNEX – Financial Report

[Intentionally removed]