

Final Evaluation Report

Your Details	
Full Name	Rajan Prasad Paudel
Project Title	Breaching the Conservation Barrier: Genetic Diversity, Ecology and Threats to Sloth Bear (Melursus ursinus) Conservation in Foothills of Nepal Himalayas
Application ID	29046-1
Grant Amount	£6000
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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 elucidate the genetic status of Sloth bears in Nepal				We were able to provide the first ever genetic information of sloth bears from Nepal. Findings from this project will be valuable for long term conservation and management of sloth bear population in Nepal.
To understand the distribution and determinants of habitat use by Sloth bears				We found that the distribution of food resources, particularly termites, influenced sloth bear habitat use. We think that detailed information on occurrence data of sloth bears using camera traps and survey on distribution and abundance of termite, fruits, and risk from human and non-human predators like tigers is required in the future to increase our understanding of sloth bear ecology.
To understand the patterns of human-sloth bear interactions				We were able to analyse the trend of human death and injury from sloth bear attacks in Chitwan National Park. The human-sloth bear conflict was prevalent throughout the year and the injuries were often higher than for tigers. Interviews with the victims indicate that sloth bear ecology and behaviour as well as livelihood activities of local people and their behaviour may be related with the conflict. However, further investigation is required to fully understand the exact factors/reason that is driving these conflicts.

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

<u>Genetic aspect:</u> Quality genetic samples are required for genetic analysis. Blood and tissue samples are excellent for genetic analysis but obtaining such samples required darting and handling the wild bears which were not feasible in our project. Using hair traps was another method that was widely used in studies in America, Europe, and some countries in Asia such as Japan. Hair traps were not successful for



black bears in a study by Kadariya in Nepal. Careful placement of hair traps required at least one initial assessment of the whole area to identify sites and rub trees to place hair traps, further, it required continuous monitoring to collect hairs which were not very feasible for our project. We searched hair samples in the rub trees and trees near termite mounds and sloth bear dens. We focused on collecting genetic material from the scat samples of sloth bears. Obtaining fresh scat samples of sloth bears was very difficult, as we were not able to make multiple visits in the same location at different times. Particularly, we were unable to find such samples in required amounts in the southern side of Chitwan National Park and in other habitats outside Chitwan. We obtained previous sloth bear occurrence data and concentrated search in such areas. Outside the national park, we consulted with forest rangers and local people living nearby the forest. The DNA quality from all the scats was degraded. However, we developed a field protocol to categorise the quality of scats based on their different physical properties and collected the scats in the dry season to ensure the efficiency and quality of DNA extraction.

Ecological aspect: Major challenge was to ensure that we collect data information on sloth bear distribution with equal coverage of its habitat. We divided the study area into 4 x 4 km grids and followed a checkerboard sampling design. Adopting this design helped us to ensure a balance between the robustness of the research methods, ensure equal coverage of the study area, and ensure availability of resources for the fieldwork. We faced problems in identifying some fruit plants that were rare and difficult to identify if they were not flowering or fruiting. We developed a pictorial checklist of fruit plants with pictures and local names so that it could help us in identification in the field. It was difficult to quantify and classify the termite as some termites did not build mounds but remained as an underground colony. Similarly, the types of species of termites and ants present in the study area were not very clear, so we recorded presence-absence data and analysed data using the occupancy framework. However, we suggest future work on termites, ants, and wild fruits in relation to sloth bears.

The social aspect and the impact of COVID-19: The greatest challenge was, however, the situation created because of the COVID-19. During the fieldwork, we faced difficulties in traveling and procuring essential supplies for the field. While the periphery of the park was accessible through dirt roads, most of the park was inaccessible and the risk of attack from wild animals was high. We used elephants to access the swampy and tall grasslands and obtained permission from the park to use a tractor for increased accessibility and safety. We involved experienced local guides and wildlife technicians who were vital members of the team that helped us navigate the forests, identify potential bear habitat as well as support with the logistic arrangements. Because of COVID-19, we faced difficulties when we had to pass through villages to perform our surveys. We had to postpone our activities many times. During these times, we remained calm and communicated well with the local community leaders, community forest group members, and nearby park rangers to ease the tensions. Vaccination was still unavailable, but we remained masked, used sanitisers, and followed the health protocols. Our local team members were able to travel to their homes, but few members were stuck in CNP as transportation was disturbed. We were able to obtain support from the park office and National Trust for Nature conservation office, which is an established quasi-governmental



conservation organisation with a strong presence in many protected areas, during this time to ensure that we remained safe during this period.

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

The three most important outcomes of our project are:

- Before the start of our project, there was no data and information on the genetic diversity and population structure of sloth bears from Nepal. We provide the first ever information on the genetic status of sloth bears in Nepal. Our results indicate that the genetic diversity of sloth bears is relatively lower compared to sloth bear populations in India, thus requiring a greater conservation effort.
- There was a gap in ecological understanding of sloth bear patterns of sloth bear distribution and factors influencing its habitat use. Our project has been able to fill this decade-long information gap as we were able to provide first of its kind habitat occupancy estimates for sloth bears in Chitwan National Park, Nepal. Sloth bears were relatively widespread in CNP compared to outside the protected areas. It indicates protected areas can be useful in maintaining the population of sloth bears and that similar conservation efforts need to be focused on other habitats within the sloth bear distribution range.
- The human-bear conflict had largely remained ignored; however, our project has shown that human-sloth bear conflict is prevalent throughout the year in and around CNP. Every year half a dozen people get injured some suffering serious injuries and others getting killed. The cost required to treat such injuries was often higher than their cash income, thus, relief and compensation, income generating activities, and alternative livelihood options may be needed for promoting human-sloth bear co-existence in harmony. Our project results have identified the hotspot areas of sloth bear conflicts is in the Madi Municipality in the vicinity of CNP. Thus, future interventions must be focused in this area, and conflicts in other areas besides CNP should also be explored.

4. What do you consider to be the most significant achievement of this work?

5. Briefly describe the involvement of local communities and how they have benefitted from the project.

During the project, students pursuing studies in forestry and environment supported our project activities. They were able to gain valuable experience in sloth bear research and monitoring. Their involvement in the collection of the genetic samples from scats, searching the sloth bear signs and related ecological information was valuable to enhance their knowledge and skills in wildlife research. At least 16 individuals including nature guides from local communities, park rangers, and wildlife technicians were involved in the fieldwork during various steps of the project. We were unable to conduct a community workshop because of COVID restrictions. However, we interacted with at least 100 human-sloth bear conflict victims or their



families to understand the conflict patterns and their perception of sloth bear conservation. This has set up an environment where few local community members are exposed to the skills for monitoring sloth bears. It has also set up an environment where local communities have become aware and hopeful of interventions to facilitate human sloth-bear coexistence in harmony. The project has breached an initial barrier by starting research and dialogue among local communities on sloth bear monitoring and conservation in Nepal.

6. Are there any plans to continue this work?

Yes, I will continue this work. I used microsatellite loci developed for sloth bears in India to understand genetic diversity. I plan to conduct further analysis using mitochondrial DNA and Y-chromosome analysis using more samples from other areas such as in Bardiya, and Udaypur. The presence of sloth bears is still not very clear outside Chitwan National Park. Thus, I plan to conduct assessments in other habitats using sign surveys, camera traps, and hair traps. Undertaking this project has raised many research questions: how are sloth bears responding to increasing tigers in their habitat and decreasing habitat connectivity?; do sloth bears prefer certain species of termite and ants or fruits?; what is the status of distribution, diversity, and abundance of termites, ants, and fruits and how are they responding to climate and land-use change?; do sloth bears and Himalayan black bears occur together in Churia hills and what factors bring them together and what factors separate them?; what are the ecological and social reasons for high conflict in some areas while lower conflicts in other areas?; how are the local people living together with sloth bears in this landscape?; are the current adaptation and mitigation measures for human-sloth bear conflicts adequate?; what kind of measures work and what does not?; how can we enhance community support for conservation?; and how can a favourable policy and decision-making environment be created for bear conservation in Nepal? We formed Bear research and conservation, Nepal group to expand our work on bears in Nepal. More than 650 individuals have already joined showing their support for the importance of this work. We will seek local, regional, and international support and collaboration to continue our work on bear research and conservation.

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

We have already shared the project results through speed talks, oral presentations, and poster presentations in three international conferences. The conference brought together hundreds of renowned scientists, researchers, conservationists, and students from different countries, institutions. Our presentations in these conferences and publication in the prestigious scientific journals have helped us to reach thousands of members, readers, and supporters. We plan to publish more articles from the project as well as share the project results through awareness campaigns and community meetings in the future.

Already Shared:

• Speed talk in Student Conference on conservation science, New York 2020.



- Oral presentation at the 14th Asian society of conservation medicine and 27th Japanese society of zoo and wildlife medicine joint conference, 2021.
- Poster presentation at International Bear Association conference, 2021.
- A scientific article under consideration for publication in the Journal of Ecology and Evolution, 2022. Future plans:
- Scientific publication to share our results on genetic analysis (Manuscript is under preparation)
- Sharing results in Sapporo summer seminar for one health (SaSSoH) in 2022.
- Sharing results through online and print media

8. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?

The project grant was used for the period of 15 months from December 2019 to March 2021. Most budget was used during fieldwork from December 2019 to June 2020. The emergence of COVID-19 and additional work to increase our sample size for genetic analysis extended our project by 3 months until March 2021. Field activities and project update was provided. Analysis of genetic and ecological data to share project results through scientific publications is ongoing and expected to be complete around December 2022.

9. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Community workshop	500		-500	Not conducted due to prohibition on mass gatherings because of COVID, and to adjust cost incurred during human- wildlife conflict survey.
Human Wildlife Conflict Survey	250	770	+520	Number of HHs surveyed was increased
Institution overhead	250	250		
Medical supplies	50	120	+70	
Food and Accommodation	1600	1260	-340	



Outreach materials	300	50	-250	Normal printing, professionally designed posters not distributed.
Field assistant reimbursement	800	1440	+640	Number of man-days for survey increased
Laboratory consumables	1600	1300	-300	
Equipment and supplies	500	460	-40	
Transportation,	150	610	+460	Cost increased due to vehicle hire
Total	6000	6260	+260	Additional cost covered from co- funding of Cleveland Metroparks Zoo and in-kind contribution from laboratory of wildlife biology and NTNC is not included.

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

This project successfully elucidated the genetic status of sloth bears using noninvasive DNA samples obtained from scats. The results indicate that the genetic diversity of sloth bears was relatively low. We also found that sloth bears were distributed throughout the park and human-sloth bear conflict was prevalent throughout the year. The next steps are to confirm the population structure and estimate the population of sloth bears by combined use of hair and camera traps particularly outside the Chitwan National Park. We found that termites and fruits were important habitat components that determined patterns of habitat use by sloth bears. Thus, another step would be to assess the distribution, abundance and diversity of termites and fruit plants across the sloth bear range. We also found that human-sloth bear conflict is prevalent in the area so, identifying social and ecological causes of human-sloth bear conflicts and implementing programmes to promote harmonious co-existence between humans and bears is essential next step.

11. 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, I used the logo of The Rufford foundation in speed talks, posters, and oral presentations. The financial support of The Rufford Foundation is acknowledged in scientific articles and in conferences.

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

The research activities were implemented under my leadership with the close supervision of **Professor Toshio Tsubota** and Associate professor **Michito Shimozuru** from Hokkaido University. **Dr. Naresh Subedi, Dr. Rabin Kadariya, Dr. Baburam Lamichhane** provided valuable suggestions for planning and implementation of fieldwork. Numbers of people and organisations supported the successful organisation of research work including field data collection and lab processing.



Staff at the biodiversity conservation centre of the National Trust for Nature Conservation supported laboratory analysis, field coordination, and logistic arrangement. Harkaman, Tika, Binod, Ramesh, Umesh, Munna, Pooja, Bachhe, and others assisted in data collection and analysis at a different stage of the project.

13. Any other comments?

We are very thankful to The Rufford Foundation for promoting research and researchers across the globe.