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	Hitesh Kumar
Project Title	Functional ecology and ecosystem services of vertebrate scavengers in the Aravalli hills of Haryana
Application ID	42314-1
Date of this Report	23-01-2026

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 carcass (wild and livestock) utilization by vertebrate scavengers.			■	We have accomplished our goal of monitoring more than 100 carcasses of domestic (cow, buffalo, goat, and sheep) and wild ungulates (nilgai) at 20 carcass sites across summer, monsoon and winter seasons by camera trapping. At each carcass disposal site, we deployed one camera trap which remained active until the carcass was completely scavenged or the scavenger's visitation had completely stopped. The camera-trapping effort of 774 nights yielded 12572 independent detections of 28 species of vertebrates exploiting the carcass directly for flesh and bone or indirectly for insects thriving on it. The dumping sites were categorized as per the periodicity of carcass disposal i.e., frequent (gaushala-associated), infrequent (agropastoral household-associated), and single (randomly died or disposed). Using the existing references on the weight of wild & domestic ungulates in the study area, we estimated the biomass of diverse age-groups and categorized into small-sized (<110 kg; calf), medium-sized (111-150 kg; sub-adult), and large-sized (>150 kg; adult). We assessed scavengers' carcass preference correlating with various attributes of carcass like

				species, age-groups, biomass, and degradation stages (Fresh, bloating, active, advance, and dry). Their carcass visitations were significantly varying across categorized carcass dumping sites and were associated with different continuous predictors (Sampling days, distance from waterbody and human settlement) and categorical predictors (Carcass disposal and forest types).
To assess the spatio-temporal inter-species or intra-species interactions among vertebrate scavengers.				We analysed the time and date-stamped photographs to assess the activity pattern and differential behaviour of scavenging vertebrates at the carcass site. We hypothesized that mammalian scavengers will exhibit nocturnal activity patterns, while avian and reptilian, will show diurnal activity patterns. Carcass site visitation without approaching the carcass was considered a *Passing behaviour* of scavengers. The characteristics of approaching the carcass and sniffing only were considered as *behaviour of Interest*. The visitation at the carcass site and consuming the carcass was categorised as *Eating behaviour*. If more than one individual visited the carcass, it was considered an *inter- or intraspecific interaction*. The scavenging behaviour in case of multiple individual visitations was further classified as *Associative* (consuming the carcass in group and *sentinel behavior* in small mesoscavengers) or *Aggressive* (raised hackles, lowering the body, tucking the tail, and snarling in mammals, while jumping and

				expanding their wings in avian species). Due to the grouping ability and day-night scavenging efficiency, free-ranging dogs showed a negative relationship with the scavenging pattern of native wild scavenging vertebrates. However, presence of Indian leopard and striped hyena restricted the carcass utilization of free-ranging dog.
To study the local people's perception of the ecosystem services provided by the vertebrate scavenger community.				To assess the people's perceptions of ecosystem services about scavenging vertebrates, we administered the questionnaire surveys of more than 300 respondents of agropastoral communities. Considering the age groups of more than 26 years old, the questionnaire survey was conducted in local language, Haryanvi. During the questionnaire to avoid any mis-identification, each respondent was introduced with the photo-chart of scavengers. Based upon their past experience and ecological knowledge people admitted differential perceptions of each scavenging taxon.

2. Describe the three most important outcomes of your project.

a) Baseline data and conservation strategies

We have successfully achieved our goal of monitoring more than 100 carcasses and administering the perceptions of more than 300 households. We captured the carcass visitation of 28 species, including free-ranging dog (*Canis lupus familiaris*), golden jackal (*Canis aureus*), Indian grey mongoose (*Urva edwardsii*), ruddy mongoose (*Urva smithii*), Indian leopard (*Panthera pardus*), striped hyena (*Hyaena hyaena*), wild boar (*Sus scrofa*), unknown rodent (*Rodentia* spp.), jungle cat (*Felis chaus*), house crow (*Corvus splendens*), rufous treepie (*Dendrocitta vagabunda*), cattle egret (*Bubulcus ibis*), jungle crow (*Corvus macrorhynchos*), Bengal monitor lizard (*Varanus bengalensis*), Indian hedgehog (*Paraechinus micropus*), Asian palm civet

(*Paradoxurus hermaphroditus*), brahminy starling (*Sturnia pagodarum*), common babbler (*Argya caudata*), jungle babbler (*Argya striata*), large grey babbler (*Argya malcolmi*), common myna (*Acridotheres tristis*), Indian peafowl (*Pavo cristatus*), Asian pied starling (*Gracupica contra*), red-wattled lapwing (*Vanellus indicus*), Ashy prinia (*Prinia socialis*), rufous-fronted prinia (*Prinia buchanani*), plain prinia (*Prinia inornata*), and Indian robin (*Copsychus fulicatus*). Among all species, free-ranging dog, golden jackal, Indian robin, house crow, and rufous treepie were the most common carcass visitors, while the reptilian scavenger, Bengal monitor lizard mainly visited the carcass site during summer and monsoon seasons. Scavengers like Indian leopard and Indian grey mongoose mostly visited the frequent carcass dumping site and golden jackal, striped hyena, cattle egret visited infrequent dumping site. Relatively, infrequent carcass site supported the higher species richness. Collectively, scavenger visitation increased from fresh to the active stage, peaked during the active stage, and declined thereafter towards the dry stage. Bayesian projected normal regression revealed species-specific relationships between scavenging patterns and environmental/anthropogenic predictors; free-ranging dog with settlement, striped hyena with carcass disposal and settlement, golden jackal with forest and waterbody, Indian leopard with waterbody and settlement, Indian grey mongoose with sampling days and settlement, and house crow with disposal. Free-ranging dogs accessed all carcasses and showed a negative association with golden jackals, while a positive association with treepies and mongoose, which potentially exploited opportunities created by dogs when accessing buried or intact carcasses. In addition, dogs reflected avoidance strategies in response to Indian leopard and striped hyena activities. However, high abundance of free-ranging dogs and pack foraging propensity allowed them to frequently access and dominate carcass resources. In addition, a clear temporal segregation was observed, with most mammals being nocturnal and birds predominantly diurnal, reflecting behavioral adaptations that facilitate exploitation of a highly competitive and ephemeral carcass resource. Activity patterns reflected interspecific interactions, including association (Indian grey mongoose–ruddy mongoose), facultative commensalism (free-ranging dog–ruddy mongoose), and interference competition (Indian leopard–free-ranging dog). Overall, our findings suggest that the traditional practice of livestock carcass disposal by agropastoral communities serves as a lifeline, providing critical feeding opportunities that sustain scavenger communities in the non-protected Aravalli landscapes of Haryana.

Furthermore, questionnaire surveys of respondents revealed contrasting perceptions of scavenging vertebrates: herders and farmers expressed positive attitudes toward vultures for their efficient scavenging services and high existence value, but negative attitudes toward free-ranging dogs and Indian leopards due to livestock predation, and towards wild boars due to crop damage.

To our knowledge, this is the largest data set in northern India that will provide a comprehensive understanding of the ecology of scavenging vertebrates community. However, conferences and symposium presentations, and peer-reviewed

publications will circulate the findings from ecological and questionnaire survey data and contribute to spotlight the intact aspects of scavenger ecology in the global academic sphere.

b) Carcass management strategies

The carcass sites were in proximity to the Aravalli landscape of 30 village clusters. The frequent cow carcass provisioned sites associated with gaushala had larger carcass biomass than infrequent livestock carcass provisioned sites associated with agropastoral households, and sites with a single carcass, were random dead wild ungulates or disposed livestock carcass. Several reasons accounted for livestock carcass mortality, like plastic intake while consuming the organic disposed waste, disease (foot and mouth disease, sheep and goat pox*, haemorrhagic septicaemia*, and mastitis), malnutrition, and weak immunity. After the mortality, the livestock carcasses were either randomly disposed or buried in a pit. The buried carcass made it difficult for the scavengers to access the carcass, especially avian scavengers. The openly disposed carcasses on plain landscapes have raised concerns of unhygienic conditions, especially because free-ranging dogs often drag carcasses away from dumping sites, scattering bones and skin near human settlements. This problem becomes more pronounced during the dry stage of decomposition. The cultural tolerance towards free-ranging dogs enhances their easy and frequent interaction with humans, prompting concerns about disease spread. However, this issue can be reduced substantially by properly disposing the carcass at a reasonable distance from human settlement in an appropriately sized open-pit located in the vicinity of the Aravalli hills. It needs to be ensured that the pit is filled at the right time to bury the carcass remnants as this will help to mitigate various concerns related to sanitation and spread of diseases to a great extent. We found that leopards strongly deterred free-ranging dog activity at the carcass site, suggesting top-down regulatory effects to control the ecological impacts of free-ranging dogs. Carcass management-based policies, will contribute not only to the long-term conservation of the scavengers but also to the improved health quality index of local people in the vicinity.

c) People awareness and participation

Through outreach activities, we have tried to deliver our message on the ecological importance of scavenging vertebrates to more than 2000 people and tried to change their negative perceptions towards scavengers through outreach programmes. We have conducted awareness workshops with eight schools (Swami Vivekanand Sr. Sec. School, Batori, Rewari, Govt Sr. Sec. School, Musnota, Mahendergarh, Govt. Sr. Sec. School, Rajawas, Mahendergarh, Govt. Sr. Sec. School, Bayal, Mahendergarh, Govt. Sr. Sec. School, Panchnota, Mahendergarh, Haryana, RPS Sr. Sec. School, Mahendergarh, Asha Academy, Patan, Rajasthan, Govt. Sr. Sec. School, Panchu Kharkada, Patan, Rajasthan) four colleges (Baijnath Choudhary Govt College for Women, Nangal Choudhary, Mahendergarh, RPS Degree College, Balana, Mahendergarh, Govt. PG College, Adarsh Nagar, Narnaul, Mahendergarh, Govt. PG

College, Mahendergarh), five Gaushala authorities (Shri Dev Narayan Gaushala Musnota, Baba Jairam Das Gaushala, Khudana, Mahendergarh, Dhundhkot Gaushala, Khol, Rewari, and Gopal Krishan Gaushala, Mamria Asampur, Rewari, Mansa Mata Gaushala, Nyorana, Patan, Rajasthan), and three local panchayats (Rajawas, Mamria Asampur, and Sareli villages).

Before the workshop, we introduced photo-charts of scavengers, we questioned the locals about the scavengers and their importance. Locals, especially the herders, were able to identify the species that they had encountered during livestock grazing in the Aravalli landscape. However, they were unable to explain the roles and ecosystem services provided by scavenging vertebrates. Then, we exhorted the threats of hazardous diseases and the consequences of carcass rotting without scavenging events. We addressed the possible anthropogenic threats and their immediate and ultimate repercussions on the survival of scavenging vertebrates. Relatively later on, people started to participate in various field activities of this project, and especially the youth from herder community and gaushala authority played a crucial role by providing timely updates on carcass availability and disposal and also assisted in camera-trap deployment.

Fig. 3: Awareness materials (stickers and t-shirts) distributed to the locals (Photo credit: Hitesh Kumar).

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

During the field exercises, we faced many unforeseen difficulties. However, with the support of the locals and team coordination we have overcome most of these challenges.

- To assess the carcass utilization by scavengers, we monitored the carcass by categorizing them into various biomass groups. The small-sized carcasses were difficult to monitor as they were readily displaced away from the camera trap focus by free-ranging dogs and jackals. However, fastening the small-sized carcass to a tree or rock helped us overcome this challenge.

- Sometimes, people disposed the carcass slightly away from the tree, which was to be used for the camera-trap deployment. So, we had to drag the carcass upto the focused range of the camera-trap. Although small or medium-sized carcasses were easy to drag, large-sized carcasses were a concern for adjustment. Locals with ropes and poles helped us to shift the large-sized carcass as well.

- Cows hold a specific spiritual value among the Hindu community and cow carcass monitoring is prohibited in some areas.
  To tackle this issue, we marked the sensitive regions on a map and organized several awareness workshops with students, panchayat community, and herders. Eventually, people understood the importance of our study and things turned out in a positive direction up to a major extent.

Fig. 6 (a & b): Interaction with the manager of Gopal Krishan Gaushala, Mamria Asampur, Rewari (a) and herders in Madhogarh village, Mahendergarh, Haryana to highlight the importance of our study and their contribution (Photo credit: Hitesh Kumar).

- After livestock mortality, local people would bury the carcass, which made it difficult to assess the attributes of the buried carcass.

However, on behalf of our request, the gaushala authority and locals started to provide openly disposed carcasses for the purpose of the study.

- Lack of information about the disposal of livestock carcasses at an appropriate time.

  Awareness workshop organization and frequent conversations with the agropastoral communities got them engaged to the project as they shared their carcass disposal practices, the places and times when they would dispose. This way we were able to access the scavengers' visitation across all the degradation stages.
- Water-logging condition at carcass disposal areas such as a depression, cavity, dug-out hole or gravel pit during the monsoon made camera-trap placement difficult.

  Eventually, in support of our project which involved camera-trap placement for carcass monitoring, the stakeholders started disposing the carcass outside the pit/dug-out cavity to avoid the water logging issue.

- Ensuring safety of the camera-trap from getting damaged by cattle. At locations when there was frequent movement of cattle grazing and two camera-traps were damaged.

  To overcome such problems, we created a circular barrier of thorns around the deployed camera-trap to avoid cattle movement near the camera. This helped us in safeguarding the camera location from getting damaged or displaced by cattle.
- Another major issue was ensuring the safety of the camera trap from getting stolen. Although, three cameras were stolen, with field experience we tackled this challenge by following these strategies.
    1. We stopped carcass monitoring at locations which were frequently accessed by the local people.
    2. We placed a visible warning slip written in Hindi, mentioning that these camera-traps are being placed to monitor wildlife, and any tampering of camera-trap is not allowed as it is placed entirely for research.
    3. We first ensured the camera trap's safety by deploying a dummy or an old damaged camera-trap for 20-30 days. Once we were certain that the location was safe, we then replaced the dummy camera-trap with a real one.
    4. Some actively engaged volunteers and locals in the project also assured about camera-trap safety. They ensured there was vigilance as they monitored suspicious activity, unknown person or any trespasser's movement near the dumping site. Thus, they helped a lot in reducing the chances of camera-trap theft.
- Some respondents were boorish and behaved mischievously during our questionnaire survey, so, we had to switch to other households to accomplish

our target of 300 households' for collecting information on scavengers based on people's perception.

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

We had developed a very good cooperative link with the local youth, Mr. Manoj Kumar, Mr. Bijender Kumar, Mr. Chirag, Mr. Nathu, Mr. Ankit, Mr. Rampal, and Mr. Sandeep, who were actively engaged in various field exercises like providing the carcass disposal information, cooperating in the questionnaire survey, assisting in camera trap deployment, and ensuring the camera-trap safety from getting stolen. Their information was very crucial in the achievement of the proposed objectives.

We addressed the locals about the ultimate consequences of threats to scavenging vertebrates, which made people acknowledge their ecological services to them. We introduced them with appropriate solid waste and carcass disposal practices to reduce disease transmission and improve their health quality status. Locals have admired the proposed management strategies as these applications coordinate with improving their life quality index. Their participation ensured that project aligned with their agropastoral-based livelihood, representing a sense of ownership and relevance.

Fig. 8: Members of local youth team who volunteered in all field exercises.

5. Are there any plans to continue this work?

Yes, I will continue this work after my Ph.D. has been completed. I plan to continue working on scavenging ecology as a postdoc fellow

In our findings the presence of obligatory scavengers near the dumping site was less. Although during the questionnaire survey, people have admitted that before the repercussions of diclofenac, huge flocks of vultures used to thrive in this landscape. For the comparative assessment of the scavenging patterns of vultures, we have collected the data from the carcass dumping sites of Bikaner, Rajasthan, as well. Furthermore, we will explore the threats to obligatory scavengers and prepare a baseline map for vulture reintroduction, and emphasize on carcass management plans to enhance their preference for dumping sites in Haryana's wildlife habitat.

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

Over a period of 2 years, we have developed a strong network with various stakeholders, gaushala authorities, local panchayats, schools, and colleges. Locally, we have disseminated our study with more than 15 awareness workshops comprising of various stakeholders. Moreover, we have circulated our work through various platforms of print media and social media. We have prepared a small documentary on our work and we will release it on social media platforms like YouTube, Instagram, WhatsApp, and LinkedIn to reach a large audience (Instagram: hiteshgurehaya; LinkedIn; Hitesh Kumar).

Our plan is to share our work globally among the academic sphere through peer-reviewed publications. I will present my research at national and international conferences and symposiums. In September 2024, I had acknowledged the crucial support extended by Rufford Foundation while presenting our work entitled "Ecological services and significance of vultures in maintaining the ecosystem health and balance in Haryana's Aravalli hills" at the National Symposium on Vulture Conservation, Gujarat, India.

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

We will be looking forward to sharing our work globally via publications and conferences. It is important that we publish several interesting animal behaviours recorded at carcasses such as allo-grooming and scent marking in specialized peer-reviewed journals as anecdotes or short-notes. We will prepare at least five scientific papers from the PhD objectives and present my study at national and international conferences. I had presented my work entitled "Activity patterns of vertebrate scavengers at carcass sites in western part of Aravalli landscape in Haryana" at XXXVIII International Ethological Congress Behaviour, 2025, Kolkata, India.

Considering the management point-of-view about the impact that free-ranging dogs can have on the scavenging pattern of other small mesoscavengers, which are majorly confined by the presence of an apex predator like the leopard. It is essential that the existing Aravalli's forest ecosystem and the landscape is conserved through active native habitat restoration programme as this would not only improve the prey-base for large carnivores but also provide a good habitat for an apex carnivore like the Indian leopard to thrive. Thus, biological control by improving the population of apex predators and the change in people's negative perception towards leopards by managing the ongoing man-leopard conflict will be one of the best biological mechanisms for controlling the population of free-ranging dogs.

People proclaimed that after carcass consumption by free-ranging dogs, there were sanitation and hygiene issues resulting from the scattered bones and skin close to the human settlements. So, the carcass management plans considering such issues should be formulated, like the disposal of the carcass in a dugout or large sized pit can reduce this problem to a major extent.
Questionnaire surveys showed that there was a lack of information and regular livestock immunization, which were the major accounts of livestock mortality, especially during the winter season. Programmes of awakening people and regular immunization will reduce livestock mortality.
During fieldwork, we identified serious concerns on substantial livestock mortality due to the ingestion of inorganic waste, particularly polythene. This may result in the biomagnification of inorganic pollutants to higher trophic levels and can lead to multiple physiological consequences. Public awareness is therefore critically important to reduce reliance on single-use plastics and to promote appropriate waste disposal practices and most important aspect is the timely collection of inorganic waste. The local authorities from animal husbandry units must tie up with small-scale waste recycling units based in the nearest developed township so that their waste collection and recycling can be better managed.

Furthermore, we will continue to monitor scavengers to suggest habitat restoration plans for their long-term conservation. We will extend our efforts to safeguard the future of obligatory and facultative scavengers. The catastrophic decline in the number of obligatory scavengers that occurred years ago will be compensated by analyzing the potential anthropogenic threats, prohibiting habitat destruction, and making livestock carcass dumping sites free from the toxicity of non-steroidal anti-inflammatory drugs by regular carcass sampling.

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 have utilized the Rufford Foundation logo in various programs related to awareness materials such as t-shirts, jackets, stickers, banners, posters, reports, and publications. Some of these materials are shown as images in this report. We ensured that the contribution of the Rufford Foundation to our project's success was highlighted and recognized in all relevant awareness programs and outreach activities.

Yes, the Rufford Foundation was acknowledged throughout the project duration. We acknowledge the support through several platforms:

- Awareness workshops with schools, colleges, and panchayats.
- Newspaper articles such as Dainik Jagran and Dainik Bhaskar
- Educational and awareness materials.
- National and international conferences, symposium, research publications, and institutional reports.

Fig. 12: Presented at National Symposium on Vulture Conservation, 2024 organized by the Bird Conservation Society, (BCS) on 29th September 2024, Gujarat, India.

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

Mr. Hitesh Kumar, Ph.D. Scholar

Role: Responsible for project planning and designing, conducting literature surveys, supervising field activities, and coordinating between institutions and field teams. Led survey planning and camera-trapping exercises, conducted awareness, education, and outreach programs, performed data analysis, and trained volunteers and students in field and analytical methodologies.

Ms. Pranali Trivedi, Field Intern

Role: Assisted in camera-trap deployment, carcass monitoring, conducted questionnaire-based surveys, supported awareness and outreach programmes, and performed data entry and basic data management.

Ms. Chaitrali Suhas Gore, Field Intern

Role: Assisted in camera-trap deployment, carcass monitoring, conducted questionnaire-based surveys, supported awareness and outreach programmes, and performed data entry and basic data management.

Ms. Vandana Rani, Field Intern

Role: Assisted in camera-trap deployment, carcass monitoring, conducted questionnaire-based surveys, supported awareness and outreach programmes, and performed data entry and basic data management.

Mr. Rahul Nandi, Field Intern

Role: Assisted in camera-trap deployment, carcass monitoring, conducted questionnaire-based surveys, supported awareness and outreach programmes, and performed data entry and basic data management.

Mr. Surya Raj N., Field Intern

Role: Assisted in data entry and analysis, and preparation of technical and project reports.

Janani K., Field Intern

Role: Assisted in data entry and analysis, and preparation of technical and project reports

Enitha B., Field Intern

Role: Assisted in data entry and analysis, and preparation of technical and project reports

Mr. Rakesh Ahlawat, Birder

Role: Providing carcass dumping site information and sign survey.

Mr. Chandergupt, Forest Range officer

Role: Provide field administrative support.

Locals (Mr. Manoj Kumar, Mr. Bijender Kumar, Mr. Chirag, Mr. Nathu, Mr. Ankit, Mr. Rampal, and Mr. Sandeep).

Role: Assisted in identifying carcass disposal sites, providing carcass disposal information, supported carcass handling, facilitated camera-trap deployment, and helped ensure the safety of camera-trap.

Dr. Riddhika Ramesh (Kalle), Senior Scientist

Role: Supervised the project, contributed to project design and planning, data analysis, and provided administrative support.

10. Any other comments?

We are highly grateful to the generous support from Rufford Foundation through the Rufford Small Grants programme, therefore contributing to our study of a comprehensive evaluation of the functional ecology of scavenging vertebrates. We received this support at a critical time of the study, which enabled us to expand our boundaries of field exercises. This support significantly improved my skills in project

designing, planning, management, and academics. Beyond the tangible outcomes, this opportunity for a student from lower-middle-income countries inspired confidence, creativity, and renewed commitment. We deeply acknowledge this support for our early-conservation programme and faith in the potential outcomes of our work. We value your support and look forward to continued collaboration in the future.

ANNEX – Financial Report

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