

Final Project Evaluation Report

Your Details	
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Project Title	Ecological impacts of solid waste disposal patterns on terrestrial vertebrates
Application ID	19961-1
Grant Amount	£5001
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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
Characterizing garbage dumps				All data have been collected for a total of 18 garbage dumps (GDs) located (six GDs in each block) in three blocks in the study area.
Animal visitation and foraging behavior at dump sites				This has been successfully completed. An extensive data on vertebrate visitation patterns and foraging behaviour has been collected for 200 hours by scan and focal observations. Additionally, 384 hours of camera trapping at three different-sized GDs (large, medium, small) in the study area. Results and methods from our previous pilot study (<i>Katlam et.al. (2018)</i>) helped in quick execution of the data collection.
Fecal sampling for presence of plastic				We conducted field work in Kotdwar and Laldhang areas of the study site, for collection of faecal samples. A 26 % of elephant dung samples were documented with presence of plastic out of total 69 elephant dung samples. Two leopard scat samples were also found with plastic.
Citizen Science				<p>i) A Facebook page named "Trash & Animals" https://www.facebook.com/trashandanimals/ has been created to reach out wider audiences. Currently the page has 572 followers with 585 likes from India as well as outside India. The page is still active and has been regularly updated with project outcomes as well as new information on impacts of trash on wildlife around the world.</p> <p>Partially achieved: i) The online Google form for documentation of photos and videos of animals at garbage dump has been circulated</p>

			<p>through emails and other social media platforms to a large number of experts and naturalists. However, the data are yet to be analysed.</p> <p>ii) We are in the process of developing a website with a user-friendly interface for sharing results from the RSG project.</p>
Data Analysis			<p>i) All the data entry for scan and focal behavioural and camera trap images has been completed.</p> <p>Partially achieved: ii) The analysis part of the above data is half way done and further analysis is still under way.</p>
Outreach			<p>i) Organised outreach programme at three government schools near study area covering students of all the age groups (refer section 12).</p> <p>ii) A poster was developed based on our documentation of wild animals visiting the GDs to sensitise young students and local community about garbage segregation.</p> <p>Partially achieved: i) The sensitisation about the threat to wildlife from improper waste management has been done during data collection. However, an active engagement and an assessment in rural communities to identify how people react to this information and assess any shifts in their solid waste disposal behaviour needs more intensive work and funding support to reach out larger public.</p> <p>ii) Designing of more posters based on our RSG project result is under way.</p>
Assessment surveys			<p>The assessment surveys couldn't be conducted due to change in field site and lack of time management resulting in extension of field work.</p>

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

- a) Convincing the park managers to conduct study on the first documentation of wildlife visitors at garbage dump at the forest edges of the India's first and ecologically diverse Protected Area at the Corbett National Park (CNP) was

highly challenging. Although, we did preliminary surveys and observations and identified suitable garbage dumps outside the park at the forest edge, we were denied permissions for conducting camera traps and scan and focal observations around the park boundary, hence, further work could not be conducted.

- b) As we couldn't manage to get permission to work in CNP, we shifted our study site to Rajaji National Park (RNP). In comparison to CNP, which is highly affected by tourism, RNP has lesser infrastructure for nature tourism and there are village clusters adjoining it which do not have a single resort or lodge at this point of time. This led to a slight change in our objective, instead of impact of garbage generation from tourism; we looked at its impact from village and human presence clustering around RNP. RNP is comparable with CNP with similar habitat and biodiversity values and has a functional connectivity with CNP. Our entire field sampling was carried out in the Haridwar and Lansdowne forest divisions, which form unique animal corridor and lie at the edges of the RNP.
- c) Due to such inevitable circumstances as mentioned above, we had our entire time consumed by field data collection and we couldn't cover our outreach activities as planned, which also led to delay in production of outreach materials.

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

1. *First documentation of vertebrate visitors at the garbage dumps:* We were able to document the visitation and foraging patterns of wild and domestic animals at the garbage dumps. A total 34 species of wild and domestic mammals and birds were recorded during the study. Endangered species viz. Asian elephant *Elephas maximus*, leopard *Panthera pardus* and near-threatened species - striped hyaena *Hyaena hyaena* and Indian jackal *Canis aureus indicus* have been reported visiting garbage dumps in this study. Our study forms one of the pioneer study in the entire Asia looking at human-mediated food resources and their impact on wild animal behaviour.
2. *Documentation of presence of plastic in fecal samples:* We were able to report the presence of plastic in the fecal sample of endangered species – 18 Asian elephants and two leopard scats throughout the study area. We found 26% of elephant dungs contained plastic out of total 68 dung samples collected.
3. *Sensitisation about the plastic ingestion by animals and its impacts on them among the local community:* Our team conducted outreach programme at three local primary level schools. We successfully created a Facebook page on "Trash and Animals" with 572 followers and 585 likes so far and the page is still active with members adding to it. We also submitted a report on our initial results on completion field work with forest departments and Nature Science Initiative members.

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

Full support from the head of the villages we worked in and from the forest departments of the two divisions gave us enough confidence to complete this study successfully. People from the community and the forest staff were imperative in execution of the field work. Their personal experiences from the forest and knowledge about the wild animal movements in their vicinity helped us greatly in identifying garbage dumps, deploying camera traps and fecal sampling during transects.

While conducting field surveys, the interactions with community also enabled us to understand the level of awareness about the issue of garbage and wildlife among the community. The villagers also ensured safety of our camera traps. The members of community also informed about any sighting of the wildlife at garbage dumps from time to time.

We hired local youth, who can read and write in English and local languages as project assistants. They were trained intensively for conducting field observations and sampling as well as camera trapping at the garbage dumps. The skill acquired from the training qualified them to work in other projects in Uttarakhand after the completion of the project. In addition, while working in the project they were sensitised about the issue of plastic ingestion in wild and domestic animals and disseminating the knowledge on the same. We have successfully built their capacities in animal observation techniques and research.

5. Are there any plans to continue this work?

Yes, certainly. I plan to continue this work further for my future research to investigate the physical effects of ingestion of plastic in wild animals visiting garbage dumps. Such data would be more helpful and make a solid foundation for constructive conservation measures for the species by conservation managers.

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

The initial results from the project were shared through poster presentation at "Student's Conference on Conservation Science" at IISc Bengaluru, India in 2017 to a diverse community of researchers, conservation practitioners and general public. Over 500 people visited the poster and appreciated the work. Further, all the findings from this study add up to my PhD thesis largely which will be published in the peer-reviewed academic journals. The facts and the photos gathered from the study will be collated in posters and they will be used for citizen science work. The same will also be shared on our social media accounts – Facebook page and website (*under preparation*).

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

November 2016 to July 2017. This period was actually where maximum amount of the grant was used for field work and outreach activity. The rest of the 4 months (August 2017- November 2017) were used for data compiling and social media outreach.

8. 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
Program Coordinator	1333	613	+720	The Program Coordinator was paid @ GBP 222 per month for one month. Later the program coordinator worked part time and was paid @ GBP 4 per day for 88 days and paid in total GBP 613
Field Assistant	1067	1507	-440	As three different blocks were covered simultaneously for observations and camera trapping. Six field assistants were hired intermittently for 6 months. The payments were done @ GBP 4 per day.
Field expenses	1067	1399	-332	Due to change in field study site from CTR and reestablishment of field station at Haridwar and Lansdowne forest division, the field expense budget was incurred more as estimated in RSG budget.
Transport and fuel	300	131	169	The cost estimated for this were cut down as bikes used for sampling were provided by NSI and, only their service charges and fuel cost were covered from RSG amount.
Camera trap	1000	1350	-350	Three Reconyx camera traps were purchased @ GBP 450 = 3*450 = GBP 1350
Communication	67	22	45	The expenses of communication were covered at much lesser cost as estimated
Production cost	167	44	123	The poster was self-designed by Project

for outreach material				coordinator. Only the printing cost was covered from this section.
Totals	5001	5068	-67	The overhead charges were covered by credit amounts of the RSG fund.

The exchange rate of 1GBP = INR 90 was followed to set the initial budget of the project. The same exchange rate was used for the final budget.

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

With data from this study in hand and in addition to the points mentioned in Q 5, there is an urgent need to sensitize general public living in the proximity of national parks, sanctuaries or forested habitats about the harmful effects of plastic ingestion on animals. Hence, a rigorous and constant outreach programme is much required to urge people about waste segregation and reducing the use of single use plastic.

10. 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 during the presentations made to the school kids for the outreach programme, which gained much publicity for RF among local stakeholders. I further used it during a conference poster presentation mentioned in Q 6. I will also use the logo and acknowledge the support from RF in my PhD thesis for funding my field work along with the mention in the academic publications made from this research work. In addition to this, the outreach materials will also have RF logo, which will be circulated widely.

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

I sincerely acknowledge and thank all the project team members for their constant guidance and support to bring the project objectives in action despite some unforeseen difficulties. Following are the list of team members along with their respective jobs performed:

Gitanjali Katlam (Project co-ordinator): Project execution and management, sampling design, field surveys, data collection- camera trapping and observations, outreach presentations, data entry, data analysis and production of outreach material

Soumya Prasad (Educator): Project design, outreach, handling of Facebook social media account, production of outreach materials, data analysis and logistics support (NSI)

Raman Kumar (Educator): Project design, outreach, data analysis and logistics support (NSI)

Mohit Aggarwal (Educator): Outreach and logistic support

Rajesh Bhatt (Programme coordinator): Outreach programme and logistics support

Taukeer Alam (Educator): Outreach program management and presentations, field surveys, data collection- camera trapping and observation, data entry

Netra Sharma, Basheer Baniya, Saddam Hussain, Mumtaj, Jareef, Shamshad (Field assistants): Field surveys, data collection- camera trapping and observation, data entry, logistics management

Neel Talhati, Shreeyash Patel, Sumit Prajapati (Volunteers): Field surveys, data collection- Camera trapping and observations, data entry, logistics management

Anant Pande, Lokesh Singh Dhruw (Volunteers): Field surveys, data collection and logistics support and management

12. Any other comments?

The RF was the only funding source for carrying out the field work, without its support the field work of this project couldn't be possible. This project was a great learning experience. With this experience and initial data in hand we would target to take this research work further for the future projects to spread the awareness for conservation.



Fig1. Outreach activity organized at Shaheed Manoj Singh Chauhan High School at Gaidikhata, Haridwar, India.



Fig2. Outreach activity organized at two government primary schools at Gaidikhata, Haridwar, India.





Fig3. a) Grey langur eating plastic soiled in anthropogenic food waste dumped at forest edges after a village function. b) Golden jackal retrieving anthropogenic food from food packaging material at a larger garbage dump near a village at the study site. c) Grey langur eating disposable silver plates soiled in anthropogenic food waste dumped at forest edges after a village function. d) Jungle crow feeding out of silver plates soiled in food waste.





Fig4. Camera trap images of visitation: top) Wild boar; middle) Striped hyena & bottom) Leopard at the garbage dump at the study site.



Fig5. a) Documentation of elephant dung with plastic.



Fig5. b) Analysis of presence of plastic materials in elephant dung.