The Rufford Foundation
Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in word format and not PDF format or any other 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. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

<table>
<thead>
<tr>
<th>Grant Recipient Details</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Your name</td>
<td>Rohit Chakravarty</td>
</tr>
<tr>
<td>Project title</td>
<td>Establishing a paradigm for long-term monitoring of bat communities along an elevational gradient in the Himalayas of Uttarakhand</td>
</tr>
<tr>
<td>RSG reference</td>
<td>24477-2</td>
</tr>
<tr>
<td>Reporting period</td>
<td>30 January 2018-19</td>
</tr>
<tr>
<td>Amount of grant</td>
<td>£5000</td>
</tr>
<tr>
<td>Your email address</td>
<td><a href="mailto:rohit.chakravarty77@gmail.com">rohit.chakravarty77@gmail.com</a></td>
</tr>
<tr>
<td>Date of this report</td>
<td>19/2/2019</td>
</tr>
</tbody>
</table>
1. Please indicate the level of achievement of the project’s original objectives and include any relevant comments on factors affecting this.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Not achieved</th>
<th>Partially achieved</th>
<th>Fully achieved</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey bat communities along an elevational gradient to understand the changes in diversity with elevation.</td>
<td></td>
<td></td>
<td></td>
<td>Along with capture data from 2016 and 2017 (Project no. 17772-1), and a combination of acoustic and capture data from 2018, we now have a good understanding of the change in species diversity with elevation. Acoustic sampling is the only solution to understand bat diversity in sites above 3000 m where we recorded eight species of bats.</td>
</tr>
<tr>
<td>Understanding the natural history and quantifying temporal activity patterns of sympatric bat species.</td>
<td></td>
<td></td>
<td></td>
<td>In 2018, we recorded 760 hours of audio. Analysis is pending for the entire dataset but we are able to see some insights on the habitat use patterns of different species of bats. After the 2019 field season we hope to have a more robust dataset.</td>
</tr>
<tr>
<td>Examine habitat associations of different species of bats</td>
<td></td>
<td></td>
<td></td>
<td>Same as above</td>
</tr>
<tr>
<td>Training local field staff and students in bioacoustics</td>
<td></td>
<td></td>
<td></td>
<td>We had one full-time intern in the project who worked from February to August 2018. He is now in the process of starting his own project on bats. A student from IISER Pune also worked on the acoustic data as a part of his summer project. We have a new intern for the 2019 field season. Additionally, we conducted a bat walk for students and faculty of IISER Pune. We plan to engage with the forest department staff after the 2019 field season.</td>
</tr>
</tbody>
</table>

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

Having worked in the landscape for the last 2 years, I did not face any logistical or technical challenges. However, in June 2018, I moved to Berlin to pursue my PhD. The research objectives of the project will be fulfilled as they form a subset of my
PhD project, but, for the next three years I will visit India only for 3 months, so my direct engagement with the forest department will be affected to a small extent.

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

a) More distribution records and improved understanding of elevational distributions. Using echolocation calls catalogued during my first Rufford project, we started acoustic monitoring of bat populations in this project. Due to acoustic sampling we now have far more occurrence data than conventional capture-based sampling. Species that evade nets by flying high were more widely detected using acoustics. We also obtained the highest elevation record (3700 m asl) of the European free-tailed bat (Tadarida teniotis) in the world. This species itself was a new record for western Himalaya in my first Rufford project.

b) Insights on the natural history of rare species. In my first Rufford project, the echolocation calls of 10 species of bats were recorded for the first time. Out of these, eight species occur in the current study area. Although the data from the 1st year are yet to be analysed we have now obtained more detections of these rare species. Using acoustic sampling we can know more about the natural history of these bats for which, hitherto, nothing was known.

c) Training of students in bioacoustics
Bioacoustics is a rapidly emerging field. More and more technology is being designed to make acoustic monitoring cost-effective. At such a time, I found it immensely satisfying to train a student in bioacoustics. We started right from choosing a suitable site for acoustic monitoring and went on to configuring a bat detector, and managing and analysing recordings. I look forward to training more enthusiastic students in the future and also engage with the forest department to set up a self-sustaining long-term bat monitoring project.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

The project did not directly involve communities. However, my field assistants were from the local community and they have benefitted in terms of training in bat identification and bioacoustics.

5. Are there any plans to continue this work?

Indeed. There is a lot of potential to collaborate with the forest department to establish a long-term monitoring protocol for bat communities in the Himalayas.

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

The results will be shared through:

a) Peer-reviewed publications.

b) Technical reports (for the forest department).
c) Popular articles.

These manuscripts will be prepared after the final data collection in 2019. So far, I have submitted a brief report on the threatened small mammals of Uttarakhand to the State Biodiversity Board. This report, which was largely based on data collected in my first and second Rufford projects, will be used as a reference to increase protection for certain species by amending the Biodiversity Act, 2002.

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

The grant was used from February to June 2018. The actual project proposal involves another field season in 2019. The balance amount from 2018 will be used to fund the 2019 field season.

8. Budget: Please 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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Budgeted Amount</th>
<th>Actual Amount</th>
<th>Difference</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airfare for 1 round trip from Pune to Dehradun (via Delhi)</td>
<td>186</td>
<td>119</td>
<td>-67</td>
<td>My study was planned to be a two-year study. Hence I had budgeted for two round trips. The remaining amount will be used in the coming field season in March 2019.</td>
</tr>
<tr>
<td>One round trip from Dehradun to Mandal</td>
<td>150</td>
<td>123</td>
<td>-27</td>
<td>The taxi fare was higher than the previous years due to increase in fuel prices in India.</td>
</tr>
<tr>
<td>Local transportation in KWLS</td>
<td>116</td>
<td>111</td>
<td>-5</td>
<td>Local transport costs were higher due to increase in fuel prices and we did more trips than anticipated.</td>
</tr>
<tr>
<td>Lodging for 4 for 60 days</td>
<td>1258</td>
<td>622</td>
<td>-636</td>
<td>The reported prices are only for the first season of field work. The balance amount will be used in the 2019 field season.</td>
</tr>
<tr>
<td>Food for 4 for 60 days</td>
<td>1258</td>
<td>765</td>
<td>-493</td>
<td>The reported expenses are only for the first season of field work. The balance amount will be used in the 2019 field season.</td>
</tr>
<tr>
<td>SongMeter SM4 Bat detector</td>
<td>874</td>
<td></td>
<td>-874</td>
<td>I obtained 3 SM4 bat detectors from the Wildlife Acoustics</td>
</tr>
<tr>
<td>Equipment Grant. I used this balance amount to buy other equipment.</td>
<td></td>
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<td>---------------------------------</td>
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<td></td>
<td></td>
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<tr>
<td>Nikon D3400 camera kit</td>
<td>444</td>
<td>+444</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mistnet poles (4 pairs)</td>
<td>116</td>
<td>+116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kestrel data logger (1)</td>
<td>70</td>
<td>+70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA, AAA and D batteries</td>
<td>33</td>
<td>+33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 GB SDXC cards</td>
<td>70</td>
<td>+70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 TB Hard drive</td>
<td>47</td>
<td>+47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication (Phone and internet bills)</td>
<td>35</td>
<td>17</td>
<td>-18</td>
<td></td>
</tr>
<tr>
<td>Rabies vaccines for two field assistants</td>
<td>35</td>
<td>23</td>
<td>-12</td>
<td></td>
</tr>
<tr>
<td>Stationery</td>
<td>12</td>
<td>13</td>
<td>+1</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous equipment (machete, sample collection boxes, spike guard) and freight</td>
<td>28</td>
<td>43</td>
<td>+15</td>
<td></td>
</tr>
<tr>
<td>Salary for two field assistants for 3 months</td>
<td>1048</td>
<td>560</td>
<td>-488</td>
<td></td>
</tr>
<tr>
<td>The reported expenses are only for the first season of field work. The balance amount will be used in the 2019 field season.</td>
<td>1824</td>
<td>1824</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total** 5000 3176

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

a) **Developing call classifiers**
It is imperative to develop accurate call classifiers for different species of bats. This is a challenge in areas with high diversity where some species often have overlapping call frequencies. A preliminary analysis done by my intern showed that the species in
our study area could be reasonably identified from their calls. We will work towards strengthening the call classifiers in the coming years.

b) Training more students and ground personnel
The importance of training students can never be underestimated. This is even more important as bioacoustics is a rapidly developing field in ecological monitoring. Alongside students, we need to train the forest department’s ground staff in setting up detectors and in retrieving the data.

c) Evaluating the cost-effectiveness of the acoustic monitoring protocol
Our paradigm needs to be evaluated in terms of the amount of expenditure in time, money and manpower. This will guide subsequent efforts in establishing this protocol as a standard for acoustic monitoring of bat populations in the Himalayas.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

So far, I have not printed any material related to this project. I do plan to use the Foundation’s logo in the reports and in PowerPoint presentations.

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

**Mr. Zareef Khan Lodha:** Zareef was the chief field assistant in the project. He has been working with me since 2016 (my first Rufford project) and his excellent training in field craft meant that he was my go-to person for any doubt regarding logistics related to sampling.

**Mr. Baseer Baniya Gujjar:** Baseer was the second field assistant. This was his first project with me but he has more experience with mist netting than both Zareef and myself. Baseer picked up bat identification and acoustic sampling skills very quickly. Being the least forgetful and most responsible person in the team, I also trusted him with maintaining finances. Both Zareef and Baseer formed the backbone of the fieldwork.

**Mr. Ram Mohan:** Ram joined the project as an intern. He had volunteered with me in 2016 during my first Rufford project. Ram brought to the plate a lot of motivation, interest and dedication. Not only did he contribute intellectually to every aspect of the study, he also performed fieldwork effortlessly. He also led the sampling for a brief while during my absence. From June to August, Ram also analysed a significant amount of the data.

**Dr. Anand Krishnan:** Dr. Krishnan is my former supervisor. The study design and the project objectives took shape because of his guidance. His inputs during the analysis stage have been invaluable.
In 2019, I will be working with new supervisors from my current PhD position and will have a new intern working under me.

12. Any other comments?

Like earlier, I would just like to use this space to express my gratitude to the Foundation for their generous support. Both the grants from the foundation allowed me to explore a hitherto unexplored area and establish a crucial baseline, and now, explore further, the ecology of bats. In doing so, I have also been able to achieve personal ambitions.

![Eastern barbastelle](image)