

Final Evaluation Report

Your Details	
Full Name	Touseef Ahmed
Project Title	Effect of Extreme Heat on Indian Flying Foxes (<i>Pteropus medius</i>) in Pakistan
Application ID	33825-1
Date of this Report	6/16/2023

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
What are the temperature thresholds for different thermoregulatory behaviours that help Indian flying foxes in Pakistan cope with extreme heat				We determined the temperature threshold for all the heat stressed behaviours of Indian flying foxes at seven different roosting sites in central and northern regions of Pakistan. We also recorded deaths of 107 Indian flying foxes potentially due to heat stress in Pakistan.
What role do Land Cover and Land Use variables play in reducing the effects of extreme heat and modifying the intensity of Indian flying foxes' thermoregulatory behaviours?				The roosts associated land use and land cover variables, collected using remote sensing techniques in 700m, 5km and 14.7km buffer zones around studied roosting sites, were found to have a significant impact of heat stress behaviour. Water bodies presence around the roosting site is most significant predictor in reducing the impact of heat stress.
Quantitative assessment of the physiological stress levels experienced by flying foxes in relation to land cover and land use, seasonal variations in food resources, and high temperatures.				We collected year round samples to quantify faecal cortisol levels. The samples are now imported in the United States for lab work. This is only piece left in the completion of this task and over all projects.

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

- a). There is a significant variation in temperature thresholds for various heat stress behaviours at studied roosting sites of Indian flying foxes in Pakistan.
- b). Proximity to water bodies reduces heat stress-related deaths in Indian flying fox populations, emphasising the importance of land use and land cover variables.
- c). We recorded heat stress related deaths in Indian flying foxes when temperature exceeds 42C for 3 consecutive days.

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

Despite encountering challenges in locating suitable roosting sites for this study, our team successfully selected eight sites out of the initial 10, considering factors such as proximity to research assistants' residences for daily thermoregulatory behaviour monitoring and ensuring safety from extreme heat and wildlife risks. Additionally, conducting fieldwork during the COVID-19 pandemic raised concerns about the health risks associated with public transport for research assistants.

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

Our fieldwork during extreme hot days revealed a remarkable shift in people's attitudes towards bats. Previously considered useless or associated with bad omens, the public's perception changed as we conveyed the significant role bats play in their fields and the environment. We were pleasantly surprised by the increased interest and inquiries from people regarding bat-related issues after completing our fieldwork.

5. Are there any plans to continue this work?

Yes, our upcoming research aims to address two key questions to better understand and mitigate the impact of extreme heat on Indian flying foxes in their natural habitat. Firstly, we want to conduct molecular dietary analysis to identify potential fruit tree resources that serve as rich sources of micronutrients, helping to mitigate the effects of extreme heat. Additionally, we want to employ Convolutional Neural Networks to accurately identify crucial heat stress relieving micronutrient rich fruit tree resources. Secondly, we are eager to develop a heat stress forecaster utilising temperature threshold data generated as result of this project, to predict and prevent heat stress-related deaths among Indian flying fox populations, thereby addressing important conservation and public health challenges.

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

To disseminate our findings, I plan to publish our results through peer-reviewed research papers and incorporate them in my PhD dissertations. Additionally, we have effectively communicated our research through documentaries featured in local and international media platforms:

<https://www.youtube.com/watch?v=C1cQ05rczwU&t=4s>

https://www.youtube.com/watch?v=V9mcpMUp_OY&t=49s

We are also spreading public awareness about bats conservation in Pakistan through our website: <https://batconpakistan.org/> and our Facebook social media platform: <https://www.facebook.com/batconpakistan>

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

Moving forward, my project involves several key steps. Firstly, I will focus on completing the necessary lab work, including the extraction of cortisol to establish physiological stress levels in Indian flying foxes. Secondly, I aim to publish the findings from this study, sharing our insights with the scientific community. Lastly, I will embark on writing a proposal for our next project, laying the foundation for future research endeavours.

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, I have used Rufford Foundation logo in my project completion ceremony on posters and t-shirts.



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

Fieldwork Team:

The following individuals comprised the fieldwork team, responsible for monitoring thermoregulatory behaviors and collecting fecal samples at designated roosting sites:

Adeel Kazam (MPhil) - University of Punjab, Lahore

Mamoona Arshad (DVM) - College of Veterinary & Animal Sciences, CVAS Jhang

Mudassar Hussain (MPhil) - University of Veterinary and Animal Sciences, Lahore

Wajahat Ali (MPhil) - University of Haripur

Shamran Ullah (BS) - University of Haripur

Abdul Ali (DVM) - University of Veterinary and Animal Sciences, Lahore

Muhammad Nauman Faisal (MPhil) - University of Punjab, Lahore

Ahmed Bilal (MPhil) - University of Punjab, Lahore

Lab Work Team:

The following individuals comprised the lab work team responsible for processing fecal samples at the Animal Sciences Institute (ASI) of the Pakistan Agricultural Research Council:

Muhammad Armaghan Shahzad (DVM, MS) - COMSATS University, Islamabad

Abdul Ali (DVM) - University of Veterinary and Animal Sciences, Lahore

Ayesha Javid (MPhil) - University of Agriculture, Faisalabad

Technical Assistance:

The following students provided technical assistance, including tasks such as receiving fecal sample shipments, printing posters, and arranging logistics:

Muhammad Armaghan Shahzad (DVM, MS) - COMSATS University, Islamabad

Yashua Sohial (MPhil) - University of Veterinary and Animal Sciences, Lahore

A Brief description of my team can be found here:

<https://batconpakistan.org/bat-conservation-pakistan/our-team/?fbclid=IwAR06mc8DCRo1EC1ypifpDtUWusQKPGW2J7YHGveNMVG7k6Vj6kZV V1phyzQ>

10. Any other comments?

I am immensely grateful for the trust and confidence that The Rufford Foundation has placed in me and my research. Your organisation's commitment to supporting young researchers and conservation initiatives is commendable and inspires me to continue working diligently towards the conservation and sustainable management of our natural world. As a student passionate about wildlife conservation, this support has been instrumental in enabling me to carry out important research and conservation efforts focused on bat populations.