Final Evaluation Report

Your Details	
Full Name	Anaid Cardenas Navarrete
Project Title	Movement ecology of an endangered primate living in the Anthropocene
Application ID	39179-1
Date of this Report	10 July 2024

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
Collect data from six groups of black howler monkeys (*Alouatta pigra*), rotating between groups each week, to complete 72 observation weeks. We will collect data on: a) group travel; b) diet; c) behavior; d) focal and non-focal howls; and e) feeding tree species.		■		On each day of observation, we randomly selected one adult once we located the groups and, every 5 minutes, registered their location with a handheld GPS device (GARMIN 65S), their activity, the plant parts on which they fed, and marked their feeding trees. Due to logistical issues, we went from two to one in the field team in October 2023. This prevented us from completing the observation cycles of six groups in 3 weeks, so we had to extend the duration of the project. From June 2023 to May 2024, we completed 55 observation weeks, for a total of 217 days of observation.
Conduct phenological surveys throughout the study period to account for variations in resource availability at each study site.			■	At each of the six sites, we placed 10 50 x 2 m transects separated by at least 50 m each covering 0.1 ha per site. We walked along the transects at the end of each observation week at a given site and estimated the phenology of all the trees with DBH ≥ 10 cm. We used a 0-4 scale based on the percentage of the plant items present in the canopy of each marked tree (e.g., mature and young fruits, leaves, and flowers). From June 2023 to May 2024, we conducted these

				surveys for a total of 55 field days.
Conduct a vegetation survey at each study site to describe the vegetation structure and composition of the habitat.				We surveyed the six sites during May and June 2024. We aimed to focus on both marked feeding trees and vegetation transect trees, for a total of 1094 individuals. By walking along the vegetation transects and a route that included all marked feeding trees, we measured their diameter at breast height and total height. In addition, we identified ~90% of the trees to species level with the help of a local botanist. We also recorded canopy cover measurements by photographing the canopy along the transects.

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

a) Comprehensive Data Collection: We successfully collected a substantial amount of data on movement, behaviour, and diet from six groups of black howler monkeys (*A. pigra*) living along a gradient of human disturbance for 12 months. Collecting data over the course of a year allowed us to observe variations in resource availability throughout the natural phenological cycle of plants at all sites. This dataset will be invaluable in answering the research questions about how black howlers survive and move within anthropogenically disturbed sites, providing a robust foundation for understanding the ecology and behaviour of these primates. Additionally, we hope that these data will support the development of conservation strategies tailored to the specific needs of black howlers, the tropical forests of southeastern Mexico, and the people who live there.

b) Skill Development and Professional Growth: All the research assistants had recently completed their studies at universities around Mexico and represented communities that had previously been underserved by research initiatives. Through the project, they had the opportunity to receive extensive training in primate and conservation research methodologies and rigorous data collection. Some of the research assistants have already benefited from new opportunities because of this experience. Thanks to The Rufford Foundation, I was able to cover their food and living costs, which was crucial in enabling them to focus fully on the research. Additionally, they've had the chance to build valuable professional connections and if interested, they will have the opportunity to co-author one of the research papers resulting from this project.

c) **Creation and reinforcement of connections with community members:** The project facilitated the formation and strengthening of relationships with local landowners and community members, creating an environment helpful to the development of new ideas for community-based conservation initiatives. By sharing preliminary findings and underscoring the significance of forest conservation, we have established the foundations for future projects that will engage local communities in conservation efforts and put conservation friendly practices in the forefront of future land management by the landowners. These participatory projects will aim to empower people to protect their natural resources, ensuring sustainable conservation outcomes.

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

As the project progressed, the field team and I faced some unexpected challenges despite our strong community. At one point, we unfortunately had to say goodbye to some of our field assistants for various reasons. Some were facing personal challenges at home, while others found the demanding conditions of fieldwork, including extreme heat, humidity, and the challenge of following monkeys all day, quite exhausting after 5 months.

The sudden departure presented a significant challenge to our data collection efforts, as I had to recruit and train an entirely new team from scratch. The transition from an experienced team to a new one inevitably affected the amount of data we were able to collect. However, I remained optimistic and focused on the task at hand. I invested time and effort in training the new team thoroughly and trusted their abilities. Their dedication and fresh perspective helped us continue our research effectively, albeit at a reduced capacity.

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

Three of the research assistants and the botanist were biologists from communities near the city of Palenque. All the assistants received extensive training in rigorous data collection methods, which enhanced their skills and contributed to their professional development. The botanist further developed his expertise through his contributions to the project. All team members will have the opportunity to be co-authors on one paper resulting from the research if they are interested.

In addition, two of the forest fragments where the study was conducted were owned by community members who showed a strong interest in forest conservation. I shared preliminary information with them about the species found on their land and emphasised the importance of preserving these areas. This information underscored the value of their contributions to conservation efforts, and they were happy to participate in the study. They are one of the first people we would like to include in our following projects. I will share the results of this project as soon as they are ready to be disseminated.

5. Are there any plans to continue this work?

This work forms an integral part of my doctoral dissertation research, and I am committed to continuing this work in the future as a part of my career. I recently had

the privilege of becoming a member of "Miku Conservacion A.C.", a Mexican NGO dedicated to the conservation of Mexican primates, with a particular emphasis on engaging local communities. Through this research, I have gained invaluable knowledge and insights regarding the black howler monkey population that lives outside federally protected areas. I hope to apply this knowledge in real world, tangible conservation efforts. Our future projects will be based on Participatory Action Research, with the goal of collaborating closely with local people who interact with the monkeys daily.

6. How do you plan to share the results of your work with others?
I plan to share the findings of my work through a variety of channels to reach as many people as possible. My first step will be to prepare technical reports that include recommendations that stakeholders, local leaders, and the broader community can act upon. It is my hope that these reports will highlight the potential benefits of prioritising coexistence between humans and black howler monkeys.

To engage both scientific and non-scientific communities, I plan to publish my findings in indexed journals and present them at national and international conferences, such as the Latin American and the International primate societies' conferences. Additionally, I will use social media and outreach articles in Spanish to reach a broader audience. I also plan to conduct school presentations in Palenque, Chiapas, to discuss the importance of primate conservation for the wellbeing of tropical forests.

7. Looking ahead, what do you feel are the important next steps?
The first step will be to share the knowledge gained from this research with the people of Palenque, who will be most impacted by the conservation efforts for black howler monkeys and their tropical forests. By sharing comprehensive information with them, I hope to provide them with the tools to make more informed decisions about forest conversion and to understand the potential implications for the species that inhabit those forests. It would be beneficial to recognise the value of black howler monkeys not only for the ecosystem but also as an important source of tourism revenue for the area.

With Miku Conservacion A.C., we hope to prioritise the creation of projects focused on community-based conservation. These projects will aim to empower local people, providing them with the tools and knowledge to actively participate in conservation efforts.

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?
I will make use of it in all the presentations I am preparing for the dissemination of results. I will attend two conferences in the following months (one in Brazil and one in Colombia), and I will add the Rufford Foundation logo in the acknowledgments section. Regarding publicity, I have always been eager to share with the field assistants and anyone else interested in the project the support received from The Rufford Foundation. Some of the assistants have expressed interest in applying for funding for their future endeavours.

9. Provide a full list of all the members of your team and their role in the project.
Saúl Miguel Sánchez – Botanist
Ulises Lara García – Field research assistant
Ignacio Guzmán Aguilar – Field research assistant
Alba Cortés Ibarra – Field research assistant
Claudia Erika Frías Trejo – Field research assistant
Irais Elisa Fuentes Olivares – Field research assistant
Jorge Alberto Cortes Orantes – Field research assistant
Lizbeth Galicia Estrada – Field research assistant
Valeria Cuya Vázquez – Field research assistant
Dr. Onja Razafindratsima – PhD advisor
Dr. Sarie Van Belle – Collaborator and advisor

10. Any other comments?
I would like to express my heartfelt gratitude to The Rufford Foundation for their invaluable support and trust in my research project. Their contribution has been instrumental in gathering this essential knowledge regarding black howler monkeys that live in unprotected areas. Moving forward, I am committed to using this information to develop tangible conservation strategies that benefit the ecosystem and the community of Palenque. I look forward to the possibility of continuing to collaborate with The Rufford Foundation in implementing these strategies in the future.

Fig 1. The two initial teams (Anaid Cardenas and five field research assistants) entering the forest of Palenque National Park to conduct black howler monkey observations.

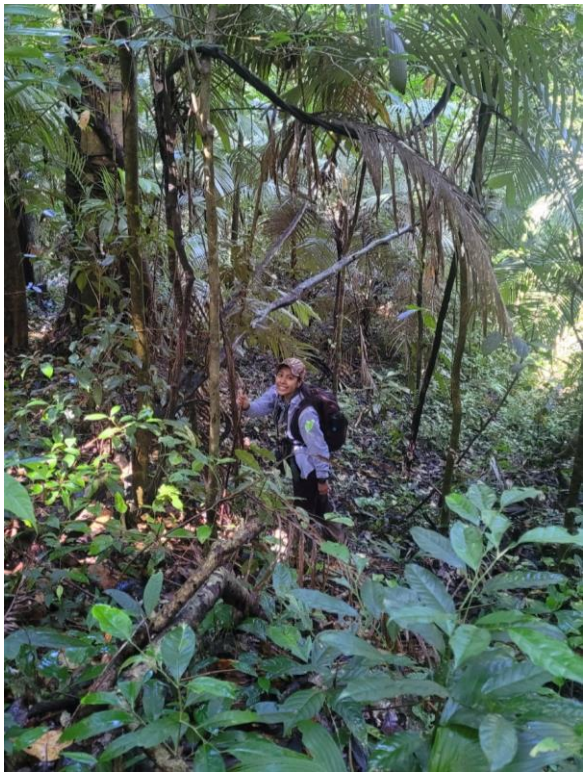

Fig 2. Irais Fuentes following the focal individual through the forest to register their GPS locations every five minutes.

Fig 3. Anaid Cardenas, Lizbeth Galicia, and Jorge Orantes observing the black howler monkeys to register their diet and activity on the day-long follows.

Fig 4. Erika Frías collecting urine from a black howler focal individual.

Fig 5. Ulises Lara measuring the DBH of a feeding tree (*Bursera simaruba*).

Fig 6. First five field research assistants during phenology surveys. From left to right: Irais Fuentes, Alba Cortés, Erike Frías, Lizbeth Galicia, and Jorge Orantes.

Fig 7. Field team during the vegetation study. From left to right: Ignacio Guzmán, Ulises Lara, Anaid Cárdenas, and the botanist, Saúl Miguel.

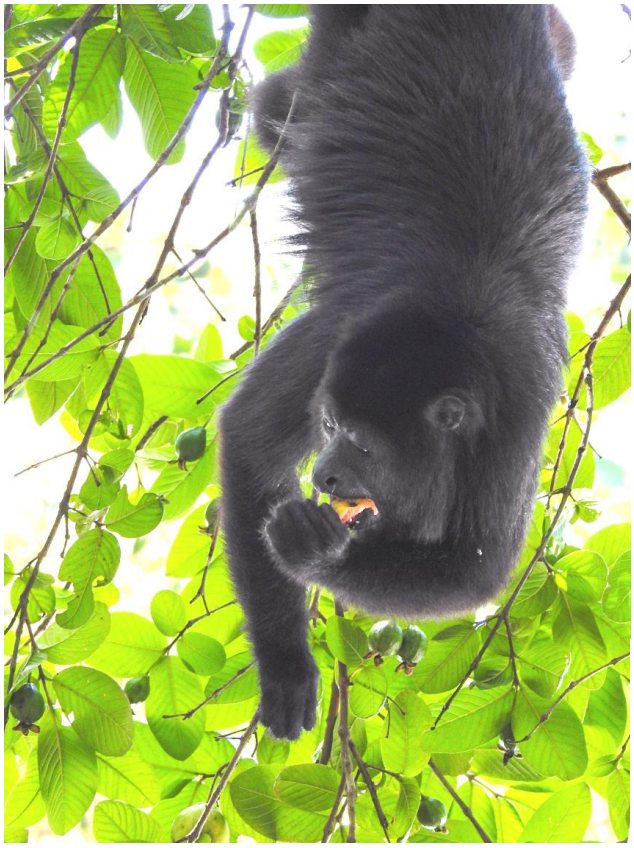

Fig 8. Female black howler monkey (*Alouatta pigra*) feeding on a guava (*Psidium guajava*). Photo: Anaid Cardenas Navarrete

Fig 9. Group of black howler monkeys resting on a non-native rubber tree (*Hevea brasiliensis*). Photo: Anaid Cardenas Navarrete