

Final Evaluation Report

Your Details	
Full Name	Álvaro Hernández Rivera
Project Title	Urbanization of the Mexican Cloud Forest: Conservation and knowledge of Orchids, Euglossine bees and their interactions
Application ID	38315-1
Date of this Report	02-19-2024

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
Orchid bees list of species and abundance				We monitored for 3 months euglossine beerichness and abundance; our findings are robust and reliable.
Quantifying pollination of orchids				We were able to measure the reproductive success of a model orchid that depends exclusively on orchid bees for its reproduction.
Spreading the knowledge and concern about orchids and their interaction with bees				Through a photographic exhibition and guided tours, we were able to expand knowledge about the importance of bees for orchids in such a fragile ecosystem as the Mexican cloud forest.
Relocate orchids in suitable habitats				Contrary to expectations, we found higher pollination rates in urban areas. We attempted to reintroduce orchids into these habitats but encountered issues with orchid extraction due to the public nature of the locations. In forests all it works without problems.

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

- a) We assembled a team of people passionate about working with orchid bees. These individuals were trained and now possess knowledge of field methods and non-lethal identification techniques for these crucial bees.
- b) We disseminated knowledge about our project at various levels. Initially, we connected with the public through an instructive photographic exhibition, attracting attendees of all ages, including children, teenagers, university students, and adults (with more than 600 visitors). Furthermore, we extended our insights to individuals in academic development who are integral members of our team. They gained hands-on experience in crafting a research project and actively contributed to its outreach efforts. Lastly, we shared our findings with a more specialised audience by drafting a scientific article manuscript. This document outlines our innovative methodology for quantifying orchid pollination in urban gradients, and we are currently in the process of finalising the manuscript.
- c) We analysed how populations of orchid bees respond to urbanisation. This resulted in a list of species in the area, and by evaluating the habitats where

they were found, we could identify which ones are more likely to be negatively affected by human impact.

- d) We analysed the response of orchid pollination to urbanisation. Interestingly, we found that it responds differently than to species richness or abundance.

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

We attempted to reintroduce the orchid *Gongora galeata* in urban areas. Some of these plants were quickly extracted, despite being placed in hard-to-reach areas. For subsequent placements, we tried to hide them more effectively, which was successfully accomplished.

For the photographic exhibition, we faced challenges due to a lack of knowledge on the subject. We had to learn on the fly about displaying photographs, proper preparation, understanding materials, printing, and mounting. Despite these hurdles, we ultimately carried out our exhibition successfully and received positive feedback. To the extent that we have been invited to showcase our exhibition in other venues.

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

We primarily worked with urban dwellers, conveying information about bees, orchids, and their interaction to this audience. We highlighted that even in urban environments, a significant diversity of bees and orchids can be found, emphasising the importance of understanding for conservation purposes. Many people were amazed to realise that what they had previously thought were flies were actually bees. Several individuals expressed interest in learning how to conserve these organisms and take measures from their homes.

5. Are there any plans to continue this work?

Yes, now we are interested in understanding which bee species interact with which orchid species since many interactions involve a specific bee species and a specific orchid species. We also greatly enjoyed the experience of setting up a photographic exhibition and giving talks, so we intend to continue in this line of research and science communication.

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

I want to continue sharing our work across different audiences. Firstly, through photography, as I am personally passionate about wildlife photography and believe it has significant power to connect with people. Additionally, I would like to disseminate the knowledge generated to the scientific community and individuals in academic training, particularly to undergraduate biology students who are searching for their passion.

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

I would like to continue building on the basic knowledge of interactions between bees and orchids. Understanding which relationships are more specialised is crucial, as they are more prone to disappearance. Hopefully, I can photograph these interactions and share them with people. Additionally, I want the team we formed in this project to continue working towards knowledge and conservation. I aim to establish new venues for the photographic exhibition and reintroduce more orchid species to their habitats.

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?

That's correct. We used the Rufford Foundation logo in our photographic exhibition, infographics, various publications of the Wild Bee Project, and in all formal presentations of the research project.

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

Alvaro Hernández Rivera – leader of the team.

PhD Daniel González Tokman - Project advisor, decisions regarding the protocol and monitoring were discussed with him.

PhD Milton Hugo Díaz Toribio - He is in charge of the botanical garden and orchidarium at the institute. He donated some orchids that were rescued from the garden for our project. Additionally, he provided support with knowledge about the care and maintenance of the orchids.

PhD Rebeca Menchaca - Director of the orchidarium at the University of Veracruz, she possesses knowledge about the orchids in the area and is a highly relevant individual with connections to various entities working on environmental and orchid-related matters.

Karla Paola Flores Vázquez - Student of the biology program in her 5th semester. She was present during much of the orchid bee sampling, working primarily with me on the project.

Oriana Gómez Luna - She was in charge of leading a monitoring team (Because we worked at multiple sites simultaneously to optimize time.). Extremely responsible, with excellent organizational skills for fieldwork.

Lot Sinuhe Pérez Ortega - He worked in the field for a long season. For hard-to-reach sites, he was always available. During the project period, he gained a considerable amount of knowledge in the taxonomy of bees and orchids.

Kevin Ramírez Rodríguez -He worked in the field throughout the entire sampling, one of the most involved individuals. Additionally, he contributed to the presentation of the photographic exhibition, assisting with arrangement and explanations.

10. Any other comments?

I would like to extend my heartfelt thanks to The Rufford Foundation for making my project a reality. This endeavour was truly ambitious, tackling issues that demanded extensive fieldwork and logistical efforts. Without the foundation's support, my project would have remained a distant goal. The collaboration with the team and individuals involved marked a significant milestone in my doctoral journey. Your support not only allowed me to delve into my true passion within the field of biology but also became a guiding force. Now, armed with this knowledge, I aspire to reach more people, particularly budding biologists, and share the enthusiasm for the work I am deeply passionate about.



