Final Evaluation Report

Your Details	
Full Name	Julian Felipe Peña Polania
Project Title	Patterns of genetic differentiation in the bumblebee *Bombus atratus* (Hymenoptera: Apidae) on the Colombian Eastern Cordillera
Application ID	26114-1
Grant Amount	£4850
Email Address	Jf.pena1714@uniandes.edu.co
Date of this Report	03/01/2020

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
Understand how land use is affecting the genetic diversity of a widely distributed bumblebee.				
Teach farmers communities the importance of insect pollination				For problems of security the entrance to some areas has been difficult

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

During field trips, the entrance to different sampling areas was restricted because they were private properties, sometimes the farmers did not let us pass, when this type of rejection was found, the municipal mayors were contacted. These helped us to communicate with the farmers and landowners so that they would allow us to enter and in turn have a more formal relationship with the landowners. Communication with the farmers through the mayor's offices was essential since it allowed our research to be known by many more people and have a much safer stay in the different locations sampled.

Difficulties occurred during the DNA extraction process, fungal contamination was found in a high amount, to solve this it was decided to change laboratories, use more stringent protective measures and handle samples with greater care. The results were samples of excellent quality that substantially improved and helped better sequencing.

Due to the devaluation of our national currency, the price of research rise considerably, for this reason we decided and tried to increase the amount of talks during our stay in the different places, in this way we made sure to give the information to the largest number of people, so monitoring could be done better when we return to the different areas, since we would have a greater acceptance

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

- The processes that are affecting genetic variation may be related to local factors and possible physiological restrictions, as the use of land and altitude.
- We shed important light on the life history of *B. atratus* and highlight the role of land use as a phenomenon of change regarding the genetic diversity of

these bumblebees. Likewise, our research reveals for the first-time patterns of local inbreeding and loss of genetic diversity in this species in Colombia.

- Only 50% of farmers in different locations know about the importance of pollinating insects, the remaining 50% believe that the insects that inhabit the crops have negative consequences and must be eradicated.

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

It is difficult to describe briefly the help of the local communities, however something incredible to highlight is that after the talks given in schools to children of different ages the reception of the parents was much greater. Once the word began to spread, people approached us and asked us to visit different areas, they felt the interest of knowing what types of pollinating insects could exist in their lands, this caught our attention, and in this way we managed to get closer to the communities.

Something important was the commitment of the mayors by providing us with spaces to give the talks, in different places with internet access and energy. Although the processes that we are giving understand show their long-term benefits, the main benefit for local communities, was to understand the importance of pollinating insects and learn that caring for them can lead to better land production.

5. Are there any plans to continue this work?

Yes, we want to understand even more the neo-tropical communities of bumblebees, and how land use is affecting these communities. Thanks to this research funded by the Rufford Foundation, we want to start an investigation on these bumblebees in a PhD.

Also, thanks to the help of this financing, the foundations for the creation of the foundation with emphasis on the diversity and conservation of neo-tropical insects in Colombia were started, which aims to improve the knowledge of insects in Colombia in order to understand how anthropogenic processes affect genetic and ecological diversity

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

The results have already been shared twice, the first in the "VII Simposio Colombiano de Biología Evolutiva", and the second in the "Octavo Congreso DCB de la Universidad de los Andes", it is expected to present at the Twelfth International Symposium on Pollination (ISPXII) and publish in a high-impact magazine.

At the level of local communities, the project has been shared in different municipalities and schools. Where we managed to give talks to more than 250 farmers and 320 children

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

The grant was used from February to October 2019, before it had been anticipated to use the grant until July and dedicate the rest of the time to the results, before the final delivery. However, certain problems occurred during the process of obtaining results that delayed the use of the grant as mention above. For this reason, the grant was used until October.

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
NGS sequencing (SNPsaurus)	£2000	£3556	+1556	
DNA extraction kit	£700	£1009	+£309	
PCR tubes, Markers, Eppendofs, pipette tips 10-100-1000 ul, ladder-1KB.	£500	£487	-13	
Quantification Kit	£600	£463	-£137	the kit was purchased in conjunction with another laboratory
Transportation Bogota-Duitama 5 persons	£113	£115	+£2	
Transportation Bogota-Morro 5 persons	£113	£110	-£3	
Transportation Bogota-Villa Pinzon 4 persons	£112	£85	-£27	
Transportation Bogota-Facatativa 5 persons	£113	£121	+£8	
Transportation Bogota-Sotaquira 3 persons	£112	£67	-£45	
Transportation Bogota-Ubate 4 persons	£112	£83	-£29	
Transportation Bogota-Arcabuco 5 persons	£112	£110	-£2	
Transportation Bogota-Guasca 5 persons	£113	£123	+£10	
Food in the field trips	£150	£159	+£9	
TOTAL	**4850**	**6488**	**+1638**	

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

There are several important steps to follow, the first is to complete the delivery of informational posters in the different areas where the study was conducted. The second is to expand the collection sites to understand broadly how the loss of genetic diversity due to land use, can lead to the decrease, and in the worst-case extinction, of bumblebees that were previously widespread. Finally, the last step is to understand how other non-representative bumblebees may be affected. Taking into account that those with a wide range are in decline it is possible that anthropogenic processes are affecting species with a lower range of distribution.

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. we used the logo in the materials published.

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

Emilio Realpe: Project advisor.

Jeffrey Lozier: Investigation Advisor.

Nickole Andrea Villavona: Field assistant

Nicolas Perez: Field assistant

Paula Castiblanco: Field assistant

Andre Tobian Herreño: Field assistant

Ana Isabel Rios: Field assistant

Esteban Saade: Field assistant

Below: promotional materials

Importancia de las abejas polinizadoras en tus cultivos

The Rufford Foundation
www.rufford.org

J. Peña Polania (Universidad de los Andes)

80% de los insectos que polinizan **tus** cultivos son abejas

Las abejas son **esenciales** para la salud de nuestros cultivos, sin embargo, no siempre están en todo momento y dependen en gran medida de factores ambientales

Bombus atratus

Temperatura de actividad 3 a 22°C

Apis mellifera

Temperatura de actividad 10 a 29°C

Uso del paisaje

El uso extensivo de la tierra puede afectar de manera considerable la salud las abejas que frecuentan nuestros cultivos

Polinización Cruzada

La mayoría de abejas tienen lugares especiales para cargar el **polen** y presentan vellosidades que sustentan una carga electrostática para adherir mejor el **polen**, este es recolectado del estamen de la flor y dispersado hacia otra para poder producir un **fruto**.

¿Como puedes ayudarlas?

1. Disminuye el uso de productos químicos
2. Usa de manera responsable la tierra no monocultivos
3. Aumenta las plantas benéficas para abejas