# Final Evaluation Report

| Your Details | |
|---|---|
| **Full Name** | Estefania de los Angeles Boada Viteri |
| **Project Title** | The behaviour and ecology of lava lizards: a neglected feature of the Galapagos ecosystem |
| **Application ID** | 29240-1 |
| **Grant Amount** | £5,010 |
| **Email Address** | 19135197@students.latrobe.edu.au |
| **Date of this Report** | February 2022 |

**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 relevant information about the natural history of Galapagos lava lizard species. | | | | The fieldwork season was very successful as we surveyed most of the planned localities. Overall, nine localities were surveyed in five islands. |
| Assess Galapagos lava lizard species' populations. | | | | I collected population density data, yet further assessment about predator occurrence and invasive species is necessary to determine more accurately lava lizard species population status. |
| Creation of links with Ecuadorian institutions for further monitoring programs. | | | | The collaboration with Dr. Juan Manuel Guayasamin was key for our project. I am still collaborating with him for the publication of my thesis data chapters, and a diet description project of the Galapagos lava lizards. |
| Build a strong ecological, morphological, and behavioural foundation knowledge for future research. | | | | I have obtained new information about the morphology, ecology and behaviour of Ecuadorian lava lizards. These results have been shared informally with local researchers already, and I will continue to do so when opportunities arise. Also, the data collected is described in my thesis dissertation, which will be available for other researchers via the university library (digital copy), and I will be publishing my data chapters in peer-reviewed journals in the coming months. |
| Revealing scientific knowledge gaps about Galapagos lava lizards. | | | | I was able to determine clear paths of future research key for the conservation of Galapagos lava lizards. |
| Training of local park rangers and scientist. | | | | Park rangers and local scientists were trained during the fieldwork for a period of 2 months. |

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

Initially the fieldwork cover by the grant included San Cristobal, Floreana, Santa Fe, Fernandina, and Santiago islands. However, we were unable to visit Santa Fe and Fernandina islands due to logistical reasons partly due to the accessibility of these distant islands. Therefore, I had to modify my plans a little but was able to add one new island – Pinzon Island. This allowed me to spend more time at each site and to develop a different project examining the impact of human development on the behaviour of Galapagos lava lizards.

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

- Collection of relevant ecological, behavioural, morphological and population data along with tissue samples of six out of 10 species inhabiting the Galapagos Islands (see Figure 1). Very little behavioural work has been undertaken on these important components of the ecosystem, so my results are novel and provide the foundation for the development of adequate conservation programmes.

- Establishment of a scientific collaboration with local authorities and local universities allowing the training of volunteers, but also the continuation of research project on Galapagos lava lizards.

- Completion of my thesis dissertation which passed with minor amendments and has been nominated for the Nancy Mills Medal at La Trobe University, awarded to theses of exceptional merit. The three data chapters of this thesis will be published in international peer-reviewed journals in the next months.

**4. What do you consider to be the most significant achievement of this work?**

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

This section is not relevant yet to my project.

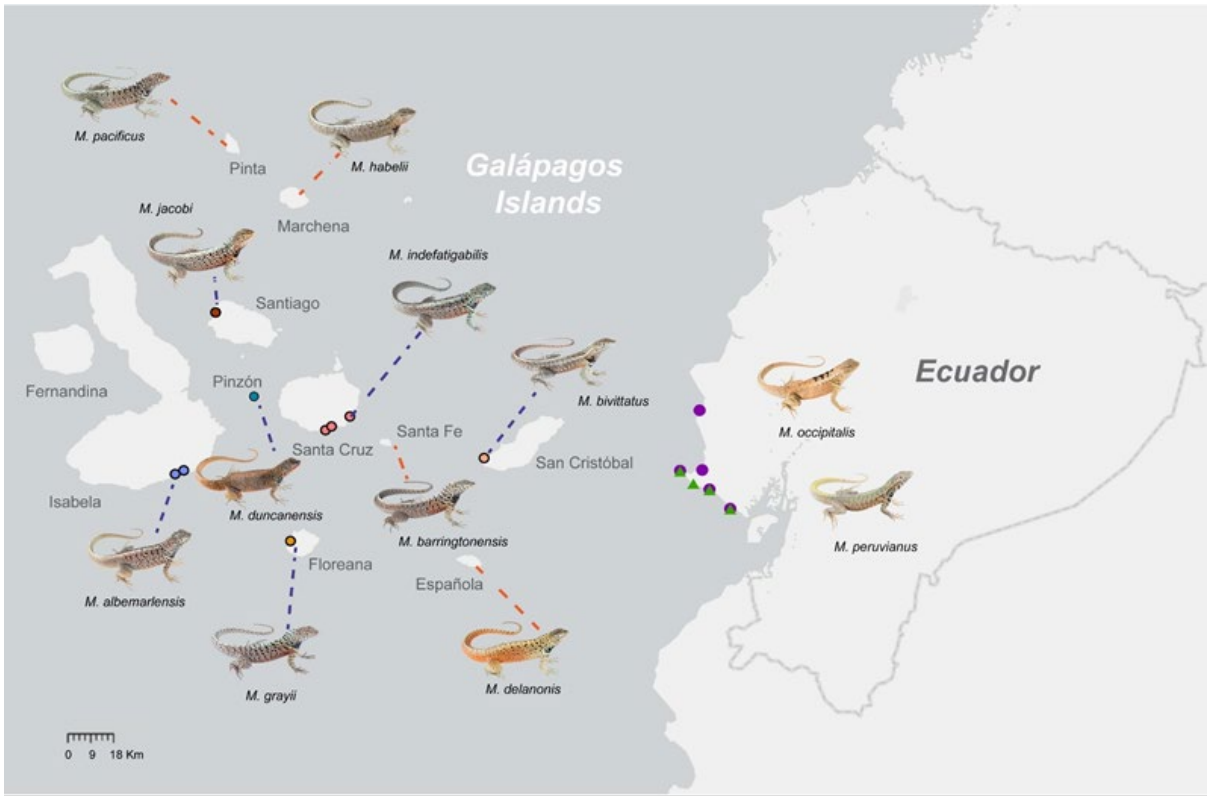


**Figure 1 –** Mainland and island Ecuadorian lava lizards' (Microlophus species) distribution with sampled points for the sites surveyed during the three fieldwork seasons. Galapagos fieldwork season for Rufford grant comprises Floreana, Pinzon, Santiago, and San Cristobal Islands.

**6. Are there any plans to continue this work?**

Currently, I am collaborating on a diet description project with Dr. Juan Manual Guayasamin from the Universidad San Francisco de Quito (USFQ) with the plan being to characterise the diet of Island species and to identify ingestion of invasive ants (see Figure 2). Also with Dr Guayasamin, I hope to continue with genetic studies of Galapagos lava lizards to determine their conservation status. In addition, I am developing personal projects focused on the study of lava lizards' behaviour and I am currently looking for financial funds.

I am planning to publish three articles on peer-reviewed international journals, where two of them (2, 3) contain data collected during fieldwork funded by The Rufford Foundation. I will also present at scientific conferences when possible and will talk to local authorities and community groups when I am able to return to Ecuador.

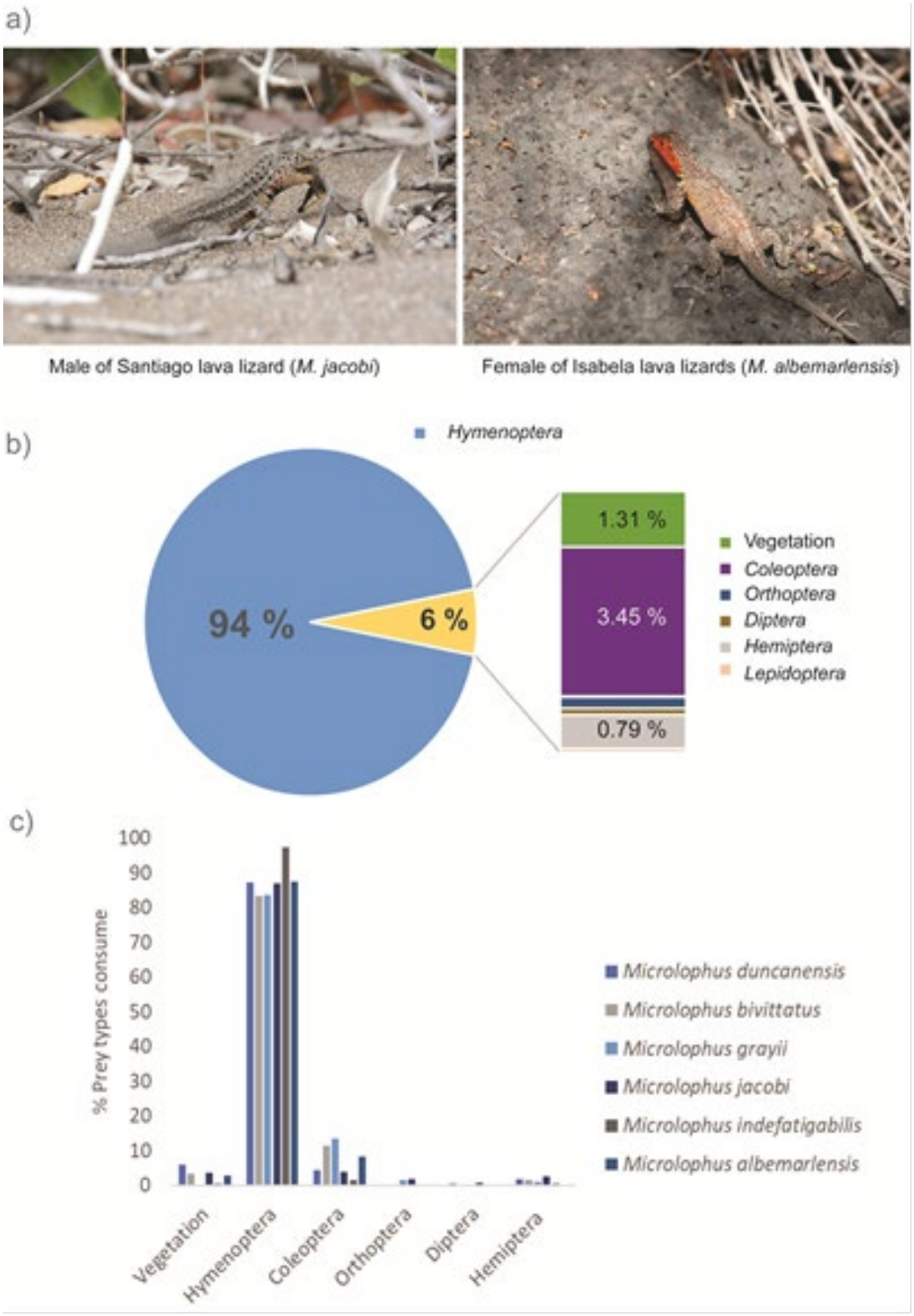


**Figure 2.** Preliminary results of the Galapagos lava lizards diet project carried out in collaboration with member of the USFQ in Ecuador.

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

My project on the Ecuadorian lava lizards' behavioural ecology has three data chapters (Figure 3):

1. Interspecific interactions examining the effect of between-species competition on mainland Ecuador.

2. Ecological and environmental factors in an evolutionary context explores factors influence lizard behaviour.

3. Anthropogenic influence considered across multiple islands of the Galapagos with different levels of human impact.

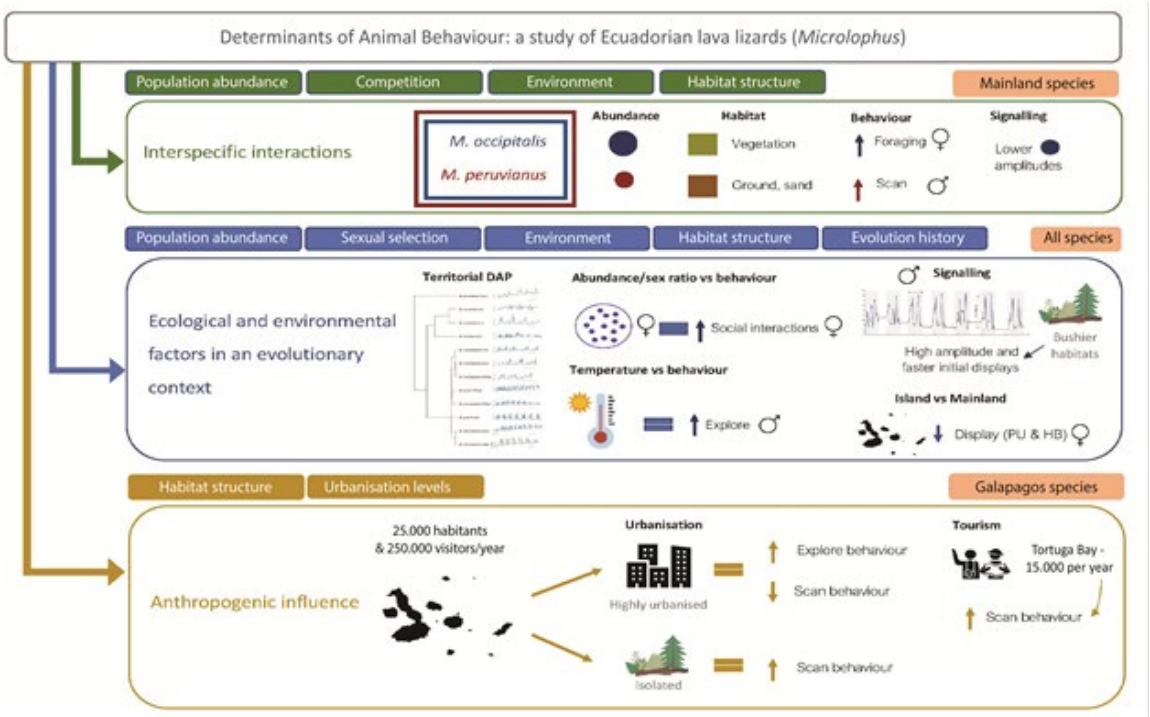


**Figure 3.** Dissertation summary that examined variation in the behaviour of Ecuadorian lava lizards as a function of multiple factors. (a) The role of interspecific interactions was considered in Chapter 2 (green) and indicated shifts in mainland lava lizards (Microlophus occipitalis and M. peruvianus) abundance, habitat selection, foraging and scanning behaviours, as well as signal structure. (b) In Chapter 3 (blue), I considered the influence of multiple ecological and environmental factors in an evolutionary context, elucidating the relevance of extrinsic factors on lava lizards' social, exploring and signalling behaviours, as well as the influence of habitat structure on territorial displays. (c) Chapter 4 (beige) considered the impact of human development on the Galápagos lava lizards' behaviour, showing variation in vigilance and exploring behaviours on highly urbanised and touristic islands.

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

The Rufford funds were used over a period of 2 months starting on the 27th of November 2019 till 24th January 2020. It was used to cover food, accommodation, and mobilization on the Galapagos Islands. The grant funds were spent in the time frame expected.

**9. 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 |
|---|---|---|---|---|
| Food | 1000 | 2060 | +1060 | The difference value was co-funded by other external funds. |
| Accommodation | 1000 | 1500 | +500 | The difference value was co-funded by other external funds. |
| Materials | 10 | 110 | +100 | The difference value was co-funded by other external funds. |
| Mobilization | 3000 | 4690 | +1690 | The difference value was co-funded by other external funds. |
| **TOTAL** | **5010** | **8360** | **+3350** | |

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

I believe that my project has laid the foundation for multiple scientific research projects. However, one key finding was evidence of negative impact of human activities on lizard behaviour, particularly apparent on Santa Cruz Island, which is the most populated of the Galapagos archipelago. A detailed follow-up study is required. Also, an important next step is to determine population sizes on the island and to better protect their habitat. These lizards are neglected organisms and I think people have the wrong idea about their abundance and adaptation to these new anthropogenic factors. Local authorities must start to develop community education projects about the local species, including lava lizards. My views and recommendations have been delivered to the local authorities at the Galapagos National Park in a final report highlighting the main issues and research knowledge gaps about the Galapagos lava lizards.

**11. 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?**

The Rufford Foundation logo was used on the Animal Behaviour Group web page to announce the funding success for my research project (https://www.abg.eriophora.com.au/2019/10/10/funding-success/). I will list The Rufford Foundation as financial contributors in all relevant publications.

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

**Dr Richard Peters - Supervisor | Group leader of the Animal Behaviour Group (ABG) and Associate Professor in the Department of Environment & Genetics at La Trobe University, Australia.**
Richard has broad interests in animal behaviour, with a particular interest in the evolution of animal signals related to the sensory system function and evolutionary processes covering vibratory, acoustic, and movement-based visual signals. Richard works in a broad category of animal groups (e.g., spiders, birds, lizards, frogs) in Australia, China, and Ecuador. Richard was involved in developing methods, designing protocols, assist in data collection, and supervision.

**Dr. Juan Manuel Guayasamin - Local Collaborator | Researcher and Professor from San Francisco de Quito University (USFQ) in Ecuador.**
His research is related to the evolution, taxonomy, ecology, morphology, and conservation of the neo-tropical biodiversity. Juan Manuel contributed on the fieldwork logistic, data analysis, results in communication to the local and international community, and he co-supervised the project in Ecuador.

**PhD Candidate Estefany Guerra – Volunteer | Animal Behaviour Lab**
Estefany is a PhD candidate at the Animal Behaviour Lab in La Trobe University. Her main interest is on thermal ecology in reptiles. She was part of the previous fieldworks as a volunteer and helped during the logistic and data collection.

**Lic. Sebastian Valverde – Local Collaborator | Researcher**
Sebastian main research is focused reptiles' ecology and taxonomy. He contributed with fieldwork logistic, local community communication, and data analysis.

**Simon Villamil - Park Ranger | Galapagos National Park**
Simon helped with the logistic during the fieldwork and was trained to take populations and behavioural data.

**13. Any other comments?**