Final Evaluation Report

Your Details	
Full Name	Melisa Nerea Cordero
Project Title	Effects of the recreation in the presence and activity of medium and large mammals in natural areas of the Yungas, Argentina.
Application ID	37320-1
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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
Bibliographic research			✓	We began by carrying out a bibliographic reading for a better understanding of the situation that we address in this research. The reading included bibliographic material on sampling design and data analysis of camera trap data. From this, the objective is to generate a review article to publish in a scientific journal.
Selection of the sampling sites.			✓	In this first stage, we began to work in three protected areas of the Yungas, in the province of Jujuy with different administration types: **Calilegua National Park** is the largest protected area in the Yungas in Argentina and is also well preserved. **The Lancitas Provincial Reserve** is an important natural area for conservation because it represents a transition between the biodiversity of the Chaco Serrano, and Yungas ecoregions. **Ecoportal de Piedra Private Natural Reserve** is a natural area adjacent to the Lancitas Provincial Reserve.
Sampling			✓	We have made seven field trips and reviewed the camera traps. Forty-two sampling stations were established, with one camera trap

				per station: 26 in the Calilegua National Park, eight in the Las Lancitas Provincial Reserve, and eight in the Eco-Portal de Piedras Private Natural Reserve. We also performed some night linear transects with binoculars to detect mammal species that are difficult to record with camera traps due to their arboreal habits or behaviour. After processing and analysing the data, they will be published in scientific journals.
Research on human activity (the public use of natural spaces)			✓	To measure the intensity of public use of natural spaces, we installed camera traps on the main trails and roads to count the number of people and vehicles that transit through the place at a certain time.
Social investigation			✓	We conducted 225 surveys of tourists and visitors to the Yungas protected areas and the local public.
Database			✓	The data obtained in this research contributes to the database of the institutions and organisations linked to this project, making them stronger thanks to the teamwork and joint effort of the scientific community. For example, through this work, we identify jaguar (*Panthera onca*) movements, which provides valuable information for future research and management.
Divulgation and environmental			✓	We have promoted our project through social networks and local

education				audiovisual media. We have also promoted this investigation through educational activities aimed at the general public and also in secondary schools. The public that participated found the work we did very interesting. For many people, it was novel and exciting to see in images the records of many species of mammals that live in the Yungas, but that they had never seen before or did not know that inhabit the places through what they usually travel. We believe that this way of working is essential to raising awareness about caring for the environment. We have also presented our work at the Argentine Conference on Mammalogy (Jornadas Argentinas de Mastozoología, 2023, Jujuy, Argentina).
Building local capabilities			✓	We have worked with several advanced university students to help them gain their first experience as future scientists with field tasks, data processing, and outreach science, and conservation. We have created a job space and training for environmental conservation. We will continue to work with local students to enhance their skills and the future impact of their careers in the conservation.

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

a). Ecological research: For observing the presence and activities of the species of medium and large mammals, we installed camera traps at different distances from trails and roads where people travel on foot or by vehicle, with a minimum separation of 300 m between each one. We fixed the cameras to the base of a tree, approximately 30 cm from ground level. And to measure the human activity, we installed one camera trap per trail or road on trees at least 3 m from the ground to avoid theft.

A total of 118,490 photographs were obtained with a sampling effort total of 7,414 days of activity of camera traps. We consider records independent where a species that was present at the same station but separated by intervals of greater than 1 hour from each other. In the case of tourists and vehicles, each event was considered an independent record because it is easier to identify them, and pedestrians usually follow a single direction.

We detected 22 native species of medium and large mammals (more than 200 g, excluding mice); 11 species of Carnivora, three of Artiodactyla, two of Pilosa, two of Rodentia, one of Perysodactyla, one of Didelphimorphia, one of Lagomorpha, and one of Cingulata. We also recorded four non-native species: horses, cows, pigs, and dogs. The 22 native species mentioned were found in Calilegua National Park, 11 of them in Lancitas Provincial Reserve, and 10 in Ecoportal de Piedra Private Natural Reserve, while non-native species were only recorded in Lancitas Provincial Reserve and in Ecoportal de Piedra Private Natural Reserve.

We also observed that, among the smaller herbivore species, *Dasyprocta* sp. and *Silvylagus brasiliensis* were the most frequent in the three natural areas studied, followed by other species such as *Subulo gouazoubira* and *Dicotyles tajacu*. Although among the largest herbivores, the species that was most frequently recorded was the tapir (*Tapirus terrestris*), it was only present in the Calilegua National Park along with other species, such as the jaguar (*Panthera onca*), giant anteater (*Myrmecophaga tridactyla*), tamandua (*Tamandua tetradactyla*), and red deer (*Mazama americana*), all of great importance for conservation.

We have also identified that, among the three natural areas in which we work, the greatest movement of people occurs in the Calilegua National Park, both at the level of pedestrians and vehicles. This is explained because the park is crossed by a provincial route (unpaved) that is widely used by the inhabitants of the towns surrounding the park, which are also highly promoted by tourist entities. Therefore, the high frequency of hikers on the trails of Calilegua National Park can be explained by the high promotion of this park as a tourist destination, which translates into high visitation. On the other hand, access to the Las Lancitas Provincial Reserve

and the Ecoportal de Piedra Private Reserve is more difficult. However, many factors must be considered to optimally interpret the results.

b). Effects of roads and trails: As part of the preliminary results, we applied Generalized Linear Models (GLM) to evaluate the effect of trails and roads on mammals use of space, and we observed that both the distance to the trails and roads and elevation are the most significant predictors for the number of species ($p = 0.005$ and $p = 0.001$, respectively) and also for the number of events per species per station ($p = 0.02$ and $p = 0.006$, respectively), with a significance level of ($p< 0.05$). We found that the distance to the trails and roads has a positive effect on richness (Coeff.estim = 0.02) and number of records per species (Coeff.estim = 0.01). While elevation has a negative effect on richness (Coeff.estim = -0.01) and frequency of records (Coeff.estim = -0.007).

The fit of the model for species richness was AIC = 52.214, and the fit of the model for the number of events per species was AIC = 1576.9. This could be reflecting the data limitations or the need to apply more complex models and deepen the analysis.

c). Social research: To accomplish this objective, we designed and implemented a survey that enabled us to gather information about people's level of knowledge and appreciation of the natural environment and wildlife attributes. This survey has been distributed online to the general public, mainly among tourists and visitors to the Yungas protected areas. Also, to increase our reach, we conducted the surveys in person among the local public in squares and parks near the sampling areas.

To carry out this part of our research, we have developed a survey to identify some social and cultural aspects and their effect on the level of people's knowledge regarding wildlife, as well as the personal opinions of the public surveyed. We carried out 225 surveys: 105 were answered online by people from different places in Argentina and other countries such as Brazil, Uruguay, Bolivia, Colombia, El Salvador, and Spain, and 120 in-person with residents of three cities of the province of Jujuy: 54 in Libertador General San Martín, 36 in Palma Sola, and 30 in San Salvador de Jujuy.

51% of those surveyed (n =225), indicated "having visited a natural area in the Yungas during the last year". 96% considered protected areas "important", and 65% considered the protection and conservation of large mammals "very important". 38% of those surveyed considered that tourist and recreational activities in nature could cause "moderately" some disturbance on wildlife, and 86% considered that "routes and roads generate impacts on wildlife". In everything that we have developed throughout this research, we also believe that quantity, quality, and how information arrives at people are important. In this sense, we found that 13% of the survey mentioned "not knowing" species of mammals native to Yungas, and 51% could correctly identify "native species" of mammals, with "tapir or anta" (*Tapirus terrestris*) and "yaguareté" (*Panthera onca*) being the most mentioned species.

On the other hand, among residents surveyed in-person (n =120), 46% indicated "not having visited a protected area of the Yungas." Additionally, in the city of Libertador Gral. San Martín, which is located about 10 km from the Calilegua National Park, 54% of the residents surveyed in this city identified "horses" (*Equus caballus*) as a native species; and in the city of Palma Sola, 13 km away from Las Lancitas Provincial Natural Reserve and Ecoportal de Piedra Private Natural Reserve, 83% of the residents surveyed identified the "cows" (*Bos taurus*) as a native species. In contrast to what happens with surveys carried out online by people from places more distant from these areas (n =105), 72% of them were "tourists/visitors" to the Yungas protected areas, whose main reason of visit was to get to know the place and its biodiversity, and 88% of them were able to correctly identify "the native species" of the Yungas mammals. In this sense, it is worth mentioning that many of them highlighted the quality of the information received during their visits and through the different means of dissemination and communication managed by the areas.

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

During this first stage of work, some complications arose with logistics. For example, when institutional vehicles were not available, we had to reschedule the dates of the campaigns or reorganise them depending on the availability of other vehicles. These delays also affected our linear transects with the thermal binoculars, losing the window of time to perform the survey in the appropriate season, when the trees have fewer leaves, between autumn and winter, improving the detectability of arboreal mammals.

Among other difficulties, we can also mention failure and theft of cameras and memory cards, causing data loss. For this, we took the necessary care and increased the number of visits to the sampling sites to review the cameras and check that everything was in order and working correctly. And when it was necessary, we changed the location of camera traps and/or replaced them.

Finally, it is worth mentioning that during the first months of being awarded this first Rufford Small Grant, I had to go through a health problem that kept me out of work for 6 months. But during that time, another member of the project took over some activities, particularly those related to camera trapping. However, this also involved modifications and delays for the other activities planned in the schedule.

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

In the initial phase of our project, the local community took part in educational activities we conducted in two rural secondary schools in the province of Jujuy and in a science fair we hosted in the city of San Salvador de Jujuy, where students of various levels and the general public participated. Using a variety of didactic

activities, posters, photos, movies, booklets, guides, and speeches, we educate participants about the Yungas' natural environment and the local animals.

5. Are there any plans to continue this work?

Yes, we plan to continue working on this project. We are satisfied with everything achieved until now, and we want to continue increasing our efforts, expanding to new areas, and bringing more and better information to more people. My team and I believe that there are many things to do and a lot of information to understand and present to generate a contribution to the conservation of the species in our region. There is also a lot to work on with local communities to achieve a friendly relationship between humans and the nature that surrounds them.

We want to expand geographically to increase our efforts to generate knowledge and information. We also plan to continue educational activities. Some teachers have offered us their classroom as a space to carry out our activities. This shows us the success of this type of inclusive approach, and we want to continue working in this way, improving everything necessary to connect experiences, knowledge, ideas, and efforts.

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

To begin with, the results obtained during this year will be shared and disseminated through the websites and social networks of the partners involved. In addition, we plan to publish our results in scientific journals and participate in some upcoming scientific events (conferences, meetings, etc.).

As we have been doing until now, we will take advantage of any opportunity to participate in workshops, interviews, or any community activity where we can show and communicate our progress to the local audience. In addition, the results of this project are shared through reports with the organisations responsible for each place where we work, whether they are national, provincial, or private administrations.

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

For us is very important to continue our work, surpassing this first stage. All parties involved in the development of this research are interested in continuing and agree that environmental promotion and awareness processes are less likely to be successful if they occur for only a short period of time. In addition, we intend to add other natural areas to our research. We are working on the permits to work in more protected areas and natural spaces in the Argentinean Yungas. This will allow us to work with other local communities in our social approach. But, to expand we need to secure financing and we are working on that. Additionally, we will most likely consider applying for a second Rufford Small Grant.

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?

Every time we've had to submit a report on our initiative, we've included The Rufford Foundation's assistance with the logo. We always include the logo of The Rufford Foundation when sharing camera trap images, as well as other materials used to raise awareness about local wildlife, such as the materials used for the dissemination and promotion of our project and the times that we have used social media to give updates or progress on our research.

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

Juan Ignacio Reppucci: He is one of the main advisors of the project. He helped manage the necessary permits to enter the natural areas in which we have been working in this first stage. He also assisted with field tasks and logistics and helped in the design and preparation of the survey implemented in this project.

Lucio Malizia: Project advisor. It provides the physical space for laboratory work and the tools and supplies necessary for the development and dissemination of this research and participated in the preparation of the survey.

Pablo Perovic: Project advisor. Collaborated with the development and logistics of the project in making decisions that were necessary throughout our work, motivation, interpretation and communication of this research.

Matías Godoy, Gabriel Arroyo, Iván Pereyra, and Carlos Cuñado: Main assistants with field tasks.

Other Park Rangers and volunteers collaborated at different times in this research with field tasks, data processing and conducting surveys.

Ramiro Zamora, Adrián Soriano, Belén Rojas, and Giovanina Domínguez: are advanced university students who have participated in field activities and laboratory work.

10. Any other comments?

We want to mention that this research is part of my doctoral training project and that, therefore, I will continue working on it within the time established for the submission of my thesis.

We also want to express our deepest gratitude to The Rufford Foundation for the funds provided to make this work a reality.