

Final Evaluation Report

Your Details	
Full Name	Sofia Graffigna
Project Title	Study of reproductive success and other aspects in pollinators and biological controllers within urban green areas to conserve ecosystem services
Application ID	37571-1
Date of this Report	14/02/2024

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
Reproductive success of wild bees and wasps along urbanization gradient				Reproductive success was estimated, both for bees and birds that nest in cavities, by calculating births/cells. Furthermore, I determined the clear number per site and the average number of cells per site across an urbanisation gradient.
Body size of wild bees and wasps along urbanization gradient				This objective cannot be achieved, given that the corresponding measurements of all adults are still being taken (2827 in total).
Evaluate the number of parasitoids that attack wasp nests, with respect to the degree of urbanization. The degree of parasitism in the nests allows us to infer the health of the natural environments.				In this case, only the degree of parasitism on wasp nests of the genus <i>Trypoxylon</i> was evaluated, given that it is a very stable and known interaction, in addition to the fact that we were able to identify up to the species level of the parasitoids in most cases.
Sex ratio of wild bees and wasps along urbanization gradient				I determine the proportion of sexes (female/male) born of each species in each site across an urbanization gradient.

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

- a) Significant decrease in the abundance of wasp and bee nests with respect to the impermeable surface. On the other hand, the average number of cells decreased in both cases, although this decrease was not significant. On the contrary, reproductive success (measured as number of adults emerged/number of cells) showed a positive relationship with the increase in impervious surface for both taxa.

- b) The number of parasitoids attacking nests of wasps of the genus *Trypoxylon* decreased significantly as the percentage of impervious surface increased. Both parasitoids and spider hunting wasps (*Trypoxylon*) are at the top of the food chain, therefore, they are the most vulnerable groups to changes and disturbances in the ecosystem.
- c) The sex ratio in the two most abundant species of wasps varied with respect to the percentage of impervious surface: one of the species showed a bias towards males and another of the species a bias towards females. These results are important and represent many ecological implications, given that these species are different in size and diet. On the other hand, bees have not yet been analysed.

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

The project did not present major difficulties. The most notable were climatic difficulties since during the months in which the nest traps were found in the field, Argentina went through a period of extreme drought, with almost no recorded rain, which influenced the abundance and floral richness of the work sites and therefore, nest construction, especially by bees, is combined with nest construction and reproductive success by wasps. Finally, two insect hotels were lost due to banditry.

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

We managed to include local communities by holding informative talks on the operation of insect hotels, biology and ecology of nesting bees and wasps, as well as through visits to sampling sites. They managed to learn how to build their own insect hotels and how to create green spaces that are attractive to different groups of floral visitors. Finally, given that the sampling sites, for the most part, included public spaces and/or urban reserves, they disseminated the project through their social networks. Citizens are eagerly awaiting the results of the project, which we will communicate through in-person presentations.

5. Are there any plans to continue this work?

I plan to continue with this work, since the preliminary results obtained are novel, given that we discovered that not all wasp species are affected in the same way by urbanisation. Furthermore, one of them is favoured in urban environments with a high degree of disturbance. On the other hand, although we expected the hotels to be occupied by bees and wasps, the high presence and reproductive success of

the latter was surprising, such a number of specimens had never been recorded before. Therefore, my group and I want to explore this taxonomic group more deeply given that they fulfill very important ecosystem functions such as biological control, which becomes even more essential in environments as taxonomically limited as cities are. Finally, we are still taking measurements of the born specimens to carry out studies regarding body size.

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

The dissemination of the results will be carried out through the writing of scientific articles and their publication in refereed scientific journals. On the other hand, part of the dissemination of the entire project was carried out at each sampling site with local communities. In addition to that, when the results are ready, more talks will be given to inform them.

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

The next important step is to perform adult measurement and statistical analysis to discover if there is a relationship between body size and the degree of urbanisation. The results obtained so far, evaluating reproductive success, number of parasitoids and sex ratio in each of the taxonomic groups are of utmost importance because they are already revealing differential effects on them. Finally, in the future it is planned to build insect hotels so that volunteer citizens can place them in their green spaces and monitor them regularly.

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?

During each presentation and on the insect, hotels sounded, the foundation's logo was placed accordingly. In turn, it was used in each email sent to purchase supplies or carry out procedures related to project 37571-1.

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

Hugo Javier Marrero: construction of hotels for insects and data analysis

Juan Pablo Torretta: Visits to sampling sites, participation in informative talks, taxonomic determination of emerged adults and monthly field work

Sofia Graffigna: construction of hotels for insects, data analysis, assembly and taxonomic determination in collaboration with JPT, monthly field work, dissemination of results and scientific writing

10. Any other comments?

During the end of 2023, I managed to carry out a short research stay at the BeeLab (Department of Ecology, University of Sao Paulo), directed by Professor Isabel Alves-dos-Santos, in which they work with bee biology and ecology. During this stay I managed to learn satellite image analysis techniques that will allow me to carry out exhaustive studies on the different sampling sites, since they are very heterogeneous scenarios. On the other hand, during my stay I managed to hold talks where I communicated the project carried out and the results obtained up to that moment. Finally, this subsidy obtained from The Rufford Foundation was of vital importance to carry out the proposed project.

I also attach an accreditation note from Professor Dr. Isabel Alves-dos-Santos, who directs the bee laboratory (BeeLab) and who received me in the city of Sao Paulo.