

Final Evaluation Report

Your Details				
Full Name	Mariana Lopes Campagnoli			
Project Title	Identifying key-traits of birds and plants affecting seed dispersal effectiveness and their implications for conservation			
Application ID	33432-1			
Date of this Report	07/12/2022			



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
Recognition of the most important traits of seed dispersers and fruit resources of a fragment of Cerrado, a neotropical savanna.				Because this is a PhD project (lasting 4 years), some field experiments (seed germination trials) and most of the data analysis is still in progress. However, we were able to identify the most common seed dispersers and the fruit resources they exploit in our study sites. We used these data to produce a field guide to be used in schools and environmental education programmes (please see below). After data analysis is finished, we will share our results also in at least two manuscripts that will be send to scientific journals.
Consequences of dispersers extinction to plant regeneration				Through the records of the most important seed dispersers, we can estimate which "extinctions" would be the most problematic for the regeneration of plant populations and community structure. As described above, a more complete data analysis is still in progress, and will be shared in a near future. Our impression so far is that some migratory (such as the yellow- bellied Elaenia, for example) and abundant birds (such as the pale- breasted thrush) are among the most important for plant regeneration, together with some resident large, bodied birds (such as toucans) and mammals (such as marsupials).
Production of a field guide about plants and seed dispersers				We were able to produce a field guide showing the most important dispersers and fruit resources of the Cerrado of São Paulo State. Please find attached the field guide together with this report. The logo of The Rufford Foundation is displayed in the last page of the book as one of our sponsors.



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Distribution of field	We distributed 150 paper copies of the
guide about dispersers	field guide to visitors of "Trilha da
and plants to local	Natureza" and other 35 copies to the
guides	managers and park rangers of the
	study area. A PDF version of the field
	guide is available for free download
	(please see link for download below).
	Also, we did a workshop on "Frugivory
	and seed dispersal" to the students
	responsible for auiding and
	environmental education of visitors
	through the Cerrado at UFSCar (Trilha
	da Natureza). Thanks to these, the local
	auides can now introduce to visitors
	some topics about seed dispersal and
	its importance for the maintenance
	and conservation of Cerrado.

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

a). Identification of the most important seed dispersers and fruit resources in Cerrado of the São Paulo State. With a preliminary analysis, we can say that the most important seed dispersers seem to the most abundant, as well as those that act as gulpers (i.e., swallow fruits whole). Between those, migratory species of the genus *Elaenia* seem to be the most important, followed by the pale-breasted thrush (see pictures in the end of this document). However, some birds that act as mashers (i.e., those that manipulate fruits in their beaks without swallowing the seeds) can also be important dispersers for plants producing small seeds (see picture in the end of this document). In some cases, they carry fruits far away from the parent-plant in their beaks and drop intact seeds far from parent plants. We also found that plants belonging to the genus *Miconia* are key fruit resources for birds in our study area, used by a lot of bird species throughout several months. Through the identification of the most important seed dispersers, as described above, we can suspect which "extinctions" would be the most problematic for plant regeneration, a topic that will be investigated in deep in the next steps of the project.

b). Production of a field guide to be distributed to the public visiting Cerrado areas in São Paulo state. We distributed around 150 paper copies of the field guide to the local guides of "Trilha da Natureza" ("Nature walk") to be used during visitation, and 35 copies to the managers and park rangers of the study area. Also, the guide is available for download in

https://www.researchgate.net/publication/364354229 Guia de dispersores e frutos comuns do Cerrado do estado de Sao Paulo#fullTextFileContent.

c). Workshop of "Frugivory and Seed Dispersal" to the guides of "Trilha da Natureza", that are responsible for guiding visitors through a Cerrado fragment inside our university (see pictures in the end of this document). The idea of the workshop was to introduce the local guides to topics related to frugivory, seed dispersal and its importance for the maintenance and conservation of the remnant areas of



Cerrado, as well as to present the most important seed dispersers in the Cerrado of São Paulo state. So, the guides can now include those topics in their visitation itinerary. The workshop consisted in an initial talk introducing frugivory, seed dispersal, seed dispersers and fruit resources, followed by a field activity where guides walked through the Cerrado identifying animal-fruit interactions. Then, we installed a couple of mist nets to catch a few bird seed dispersers and show some of its characteristics. Both these activities were made to make guides familiar with some of the most common field methods to study frugivory and seed dispersal.

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

Our field trips began in 2021 when the pandemic was still peaking in Brazil, which delayed the process of obtaining the permits for doing research in one of our study sites. After waiting for almost a year for the permit, we decided it would be best to increase our field effort in the other sites we already had the permit to do research. Thus, we gave up the area that we didn't have authorisation to study. Also, during 2021 our study site suffered from an intense frost, followed by a major fire that burned a large portion of the park. Therefore, one of our plots was "recovering" from the fire during most part of our data collection, but fortunately, none of our equipment was damaged during the fire. By that time, we had sample plots hit by frost, other hit by fire and other ones without frost or fire. After those unforeseen events, we decided to use this opportunity to study the effects of frosts and fire over fruit production and bird abundance. The data analysis is still in progress, but a reduction in fruit production is clear in the plots hit by frost, while fire seems to stimulate fruit production in some plant species. The results that are yet to be published and shared with the public. Another unforeseen difficulty that aroused was that two of our camera traps had to be repaired after heavy rains and we used part of our budget to cover the repairing costs.

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

Most of the staff of the park where we did our research are locals. We took the opportunity to talk to them about the project findings during the fieldwork expeditions. They shared with us their knowledge about plant-animal interactions in Cerrado. We believe the local community will benefit from our field guide and the workshop on Frugivory and Seed Dispersal we organized for the guides of "Trilha da Natureza". As explained initially in our project, "Trilha da Natureza" is an organisation that promotes environmental education by guiding students and the public through an area of Cerrado, trying to bring awareness about the importance of conserving the natural ecosystems. Unfortunately, most of the residents in the surroundings of the park have no idea about what kinds of animals and plants occur (or used to occur) in the area and the importance of the site for conservation of Cerrado. We hope the workshop and the Field Guide we produced will help the local guides to enhance the communication with people about the importance of seed dispersal and animals for the maintenance of remnants of native vegetation, raising awareness about conserving these ecological functions and the animals that provide it in Cerrado. Other benefits to the local communities are hard to measure,



but the field expeditions also inject some money in the local communities through the acquisition of food, fuel, and supplies for fieldwork, which are very welcome.

5. Are there any plans to continue this work?

Yes, we are currently running seed germination experiments in the field to investigate the effect of seed dispersal by animals on plant regeneration. Most of the data analysis of the project is still ongoing, and the data collected during those almost 2 years of field work will be analysed together with a researcher with experience in data analysis of animal-plant networks, named Guadalupe Peralta. Mariana, the student benefited with this grant from Rufford, will spend 6 months in Argentina next year to work together with Dr Guadalupe Peralta, an expert in plant-animal interaction networks. This visit will be possible thanks to another competitive grant obtained by Mariana from Brazilian authorities. During this stay we will invest in data analysis to identify, through simulations, the most important traits affecting the seed dispersal effectiveness of frugivores, as well as to estimate the consequences of disperser extinctions for plant regeneration. Also, we plan to continue doing workshops and sharing our field guide to the people responsible for educational programmes in other national parks of Cerrado, and possibly in local schools. Based on suggestions collected from field Guide users, we intend to produce an updated second edition of our field guide in the coming years. We are also glad to inform that thanks to the current project three new master's students were inspired and are joining our lab. They will study similar topics that will allow us to understand in more depth the role of seed dispersers to plant regeneration and conservation of Cerrado. Two of the master's students will investigate the role of greater rhea, maned wolf and crab-eating fox in seed dispersal and germination (through feeding experiments in a local zoo) while the other one will investigate the impact of the wildfire that hit our study site in the fauna that inhabit gallery forest within the savannas.

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

We plan on publishing our results in at least two main manuscripts in scientific journals devoted to ecology. We also intend to present the results of this research to an international audience of scientists in the "Frugivores and Seed Dispersal" workshop, which will be held in Ilhéus – Bahia, Brazil in 2024. If possible, we want to do similar activities with kids from local schools, adapting the content of the workshop to attend this different public.

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

The next steps are to fully analyse the data during my stay with Dr Guadalupe Peralta, write the manuscripts, and submit them to journals. We also want to expand our workshop to other educational programs inside national parks of Cerrado, and if possible, in local schools. In the future, we plan on making a second edition of the field guide covering more species of dispersers and plants and updating information based on suggestions of users (e.g., NGOs, schoolteachers).



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?

The logo of The Rufford Foundation was included in our field guide as one of the sponsors of our research (please see <u>https://www.researchgate.net/publication/364354229_Guia_de_dispersores_e_frutos</u> <u>comuns_do_Cerrado_do_estado_de_Sao_Paulo#fullTextFileContent</u>). We also display the logo of Rufford in the

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

Alexander V. Christianini (Universidade Federal de São Carlos, Brazil) – Alexander is my PhD supervisor. He helped during field work and data sampling, guided me through all the process of data sampling and initial data analysis, and participated in the production and revision of the field guide by making suggestions and comments on the text and figures (see a picture of Alexander in the end of this document).

Julia Thomaz, Pamela Oliveira and Liliane Pessini – Field assistants during data sampling, especially during bird sampling using mist nets. Liliane Pessini is now a Master student that will investigate the role of wildfires that hit the gallery forests in the local fauna of our study sites (see pictures of them in the end of this document).

José Carlos Motta-Jr (Universidade de São Paulo, Brazil), Alexsander Zamorano and, Giselda Durigan (both from Instituto de Pesquisas Ambientais, Brazil) and Augusto Batistelli (post-doc researcher from Universidade Estadual Paulista, Brazil) – Researchers that revised our field guide and made comments and suggestions to improve its content. Dr Motta Jr. also kindly shared with us some of his pictures about the wildlife from Cerrado that were used to illustrate the Field Guide of common seed dispersers and the fruits they eat.

10. Any other comments?

I would like to point out that this research would not have been possible without the financial support of The Rufford Foundation. In Brazil, researchers usually don't get a lot of financial support for their research, so I would like to thank you very much for supporting this project and making all of these happen!











