

Final Project Evaluation Report

Your Details	
Full Name	Mayara Vescovi Assis
Project Title	Implications of Intraspecific Functional Variability to Stress Resistance and Response Capability to Environmental Changes in Brazilian High-Altitude Grasslands
Application ID	24663-1
Grant Amount	£3683
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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
Understand the role of intraspecific functional variability on stress resistance and response capability to temporal environmental changes in Brazilian high-altitude grasslands plants.				We had several difficulties in accessing the highest altitude area due to bad weather conditions and consequently, we did not accomplish all the physiological and growth measures from plant populations of this area.
Produce a short educational video to spread our work results to community and outsider people in general.				None

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

We have had difficulties in accessing our highest altitude area (2800 m asl) due to the frequently bad weather conditions experienced on the fieldtrips. The access to the highest altitude in Caparaó National Park is difficult, since it is necessary to hike a steep trail that is 3 to 4 hours long. Moreover, when was raining the hiking became dangerous, since lightning is very common. Consequently, some proposed activities in the original project were not carried out, for instance, plants growth measures. In order to overcome these drawbacks, we realised more fieldtrips than expected and extended the project deadline. Even so, we were unable to perform all the planned activities.

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

- To our knowledge, our work was one of the pioneer projects that studied areas of 2830 m asl in the Brazilian high-altitude grasslands. Thus, our work brings unprecedented environmental and ecological measures at the highest area of Brazilian high-altitude grasslands. Since Brazilian high-altitude grasslands are little studied environments, the knowledge accessed in our work can be very helpful to conservation strategies. Therefore, we studied the eco-physiological aspects of two plants that occur over the altitudinal variation of Brazilian high-altitude grasslands at Caparaó National Park. We studied areas with 700 m of altitudinal variation (ranging from 2130 m to 2830 m asl), which are associated with variation in soil conditions, as soil texture,

potassium and nitrogen amount, temperature and water availability. At the highest altitude area of study, Brazilian high-altitude grasslands plants are subjected to more sandy soils with lower amount of potassium and higher amount of nitrogen. The highest area of study (2830 m asl) also has lower soil water content in winter and lower soil temperature in summer compared to the lowest area (2130 m asl). Therefore, the altitudinal variation represents a complex gradient of several factors that varies in different directions: for most parameters the highest altitude area can be considered more restrictive for growth, but this should not be the case for soil nitrogen.

- The two study species, *Croton splendidus* and *Baccharis platypoda*, have different eco-physiological behaviours. Our work suggested that *C. splendidus* is a species that experienced more stress than *B. platypoda* in Brazilian high-altitude grasslands. *C. splendidus* showed an increase in phenotypic integration over the altitudinal variation associated to a more conservative ecological strategy at the highest studied area (lower photosynthetic potential in winter and higher isotopic values of C¹³, which was used as a measure of water use efficiency). The increase in phenotypic integration and the conservative ecological strategy exhibits at the highest areas suggest that to *C. splendidus* higher areas are more stressful, which are probably related to the lower water availability in such conditions. On the other hand, *B. platypoda* shows fewer differences between populations (e.g. decrease in trait variation over altitudinal variation during winter and some isotopic distinction). *B. platypoda* also shows higher Fv/Fm measures than *C. splendidus*, which is a measure often used as a stress indicator in plants (the lower Fv/Fm values, the higher the stress). Phenotypic integration was not related to lower phenotypic plasticity in the two studied species. In fact, the highest altitude population of *C. splendidus* exhibits higher plasticity on photosynthetic characteristics described by electron transport rates (ETR) than the lowest one. However, we cannot evaluate these plasticity consequences to species fitness (growth, reproduction and survival). As the highest populations of *C. splendidus* exhibits stress symptoms related to the lower water availability, we expected this population have more difficult to respond to climatic changes (specially related to drought) than the lowest ones and than *B. platypoda* populations. Our work suggested that Brazilian high-altitude grasslands plants and populations differently experience the altitudinal variation and exhibits differences in the responsiveness to stress environmental conditions and environmental changes. Consequently, at an environmental change scenario, Brazilian high-altitude grasslands can have significant changes in species composition and plants populations can be restricted at certain altitudes.
- We produced a science communication video that was available on YouTube (“Os Campos do Sudeste”) and involves 16 different people in its production. The main goal of the video was spread the scientific knowledge of Brazilian high-altitude grasslands and call attention for its conservation. The video brings basic information about Brazilian high-altitude grasslands, but also the current main threats to this type of vegetation. Another goal of the video was mobilising different people with distinct relationships with Brazilian

high-altitude grasslands (scientists, local community and tourists) in its conservation. At the interviews we could realize the strong relationship of the local community with the Caparaó National Park and the strong interest in its conservation. Until now, the video has had 662 views on YouTube.

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

We involve the local community at the project through the production of “Os Campos do Sudeste” video. We interviewed and film five local community members, two Caparaó National Park tourists and one Caparaó National Park volunteer. We could identify the Caparaó National Park importance to local community and tourists in your speeches where are highlighted:

- An historical rescue and integration of local community with the Caparaó National Park creation.
- The financial importance of the Caparaó National Park to local community, due to tourism.
- The Caparaó National Park appreciation by the local community and tourists.
- The perception and appreciation by the tourist about the local biodiversity.
- The appreciation and recognition of the importance of the Caparaó National Park to ecotourism.
- The importance of the relationship between local community and tourists, since the local community encourages tourists to conserve the region.
- The recognition of the Caparaó National Park to Brazilian high-altitude grasslands conservation and maintenance of ecosystem services.

The local community was also benefitted from the showing of the “Os Campos do Sudeste”, since the video spread the local culture and the importance of the Brazilian high altitudinal vegetation to then. Currently, the video has had 662 views on YouTube. The local community also was indirectly benefitted by the reports of our research to Caparaó National Park staff, since we provide information that can be used to improve the Park conservation strategies.

5. Are there any plans to continue this work?

We still need come back to the study area to clear the studied plant individuals. We also have the material for the anatomic analysis of the plant material collected and we are planning to do the measures next year. We also hope to continue investigating the relationship between intraspecific variability and Brazilian highaltitude grassland plants and their responsiveness to environmental changes.

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

We have shared the results of our work in the video “Os Campos do Sudeste” available on YouTube and in periodic reports to ICMBio, the Brazilian Government agency responsible for the environment conservation. We also presented our results at scientific conferences. Thus, we were able to sensitise different persons that have direct or indirect interactions with the Caparaó National Park, raising the importance

of different initiatives for Brazilian high-altitude grasslands conservation. We also plan to publish a scientific paper describing the stress tolerance and responsiveness to environmental changes of Brazilian high-altitude grassland plants.

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

We used the Rufford Foundation grant during all the project period. We started in April 2018 and ended in July 2019. Because the difficulties experienced at the first fieldtrips, it was necessary to extend the length of the project.

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
Gas	505 £	545£	+40£	Conversion rate 1£ = R\$ 4,463 (+ = overspending and - = saving)
Car rental	1686£	298£	-1388£	In most fieldtrips we did not need to rent a car.
Food supply at field	987£	506£	-482£	
Accommodation (house rental)		644£	+644£	The free park accommodation was not available in all the fieldtrips.
Bank tax		123£	+123£	In the budgeted we did not foresee a bank tax for the grant transference.
Lapel recorder	36£	93£	+57£	
Memory stick (64gb)	25£	32£	+7£	
External HD	79£	79£		
Numbered aluminum plates	126£		-126£	We did not need to buy the plates.
Microscope slide	9£	4£	-4£	
Plastic pots	93£	4£	-89£	
Glacial Acetic Acid	36£		-36£	We did not use.
Formaldehyde 37%	25£		-25£	We did not use.
Ethylalcohol 70%	37£	6£	-31£	
ZiPloc bags	17£	5£	-12£	

Paper Towel packages	10£	3£	-7£	
Black garbage bags	4£	3£	-1£	
Paper bags	8£	1.7£	-6.3£	
Toll		36£	+36£	In the budgeted we did not foresee the road toll.
Stationary		36£	+36£	We needed to buy some stationary material for the project execution.
Flashlight and batteries		22£	+22£	We needed to buy flashlight and batteries.
Bus ticket		21£	+21£	In the last fieldtrip one of the volunteers needed to come back to the city before the end of the campaign.
Total	3,683£	2,462£	-1,221£	The difference corresponds to the amount of money that we do not spend. Returned to Rufford.

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

- To continue studying the ecology of Brazilian high-altitude grasslands plants.
- To implement field experiments to evaluate Brazilian high-altitude grassland plants responsiveness to environmental changes, specially climate changes.
- To continue investing at scientific divulgation about Brazilian high-altitude grasslands.
- To continue involving and sensitise the local community in Brazilian high-altitude grasslands conservation.

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 Rufford Foundation logo in the video "Os Campos do Sudeste" and at lectures presentations about the project. Thus, The Rufford Foundation received publicity during the course of our work through different initiatives, which approach a diversity of persons with different levels of involvement with conservation initiatives and with the Park. I believe that this kind of initiative reinforce the whole of Brazilian conservation units to protect vulnerable species and ecosystems.

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

Mayara Vescovi Assis: Project coordinator (Managed, implemented and analysed data of the work) and Video producer (Filmed, directed and edited the video "Os Campos do Sudeste")

Eduardo Arcoverde de Mattos: Project coordinator (Managed, implemented, and advised the work)

We also count with 6 volunteers at the fieldtrips that helped in data collection.

We have implemented this project with the support of ICMBio (main Brazilian Government agency responsible for the environment conservation).