

The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details

Your name	Izabela Menezes Barata
Project title	Facing the fire on mountaintops: responses of a rare amphibian species to a stochastic event
RSG reference	21264-2
Reporting period	August 2017 - May 2018
Amount of grant	£3200
Your email address	izabela@biotropicos.org.br
Date of this report	18/06/2018

1. Please 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
Compare occupancy estimates before and after a fire event				With our data we were able to estimate occupancy for pre- and post-fire events
Describe population trends over the years				Data collected over the years was successfully analysed to estimate population trends
Define population status and species extent of occurrence				We concluded species status and threats assessment, which was submitted to IUCN
Evaluate the use of eDNA for long term monitoring of our target species				We sampled water and analysed the data successfully. However, one activity was not concluded, related to capacity building. Because of time constraints we were not able to delivery talks for Brazilian researchers about eDNA

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

We did not have major difficulties to develop this project, especially because it was based on previous results and we had a good working relationship established with park managers and rangers.

However, our objective related to eDNA was only partially completed. We were not able to complete one of the activities proposed: develop (at least two) talks at Brazilian universities about the eDNA method to encourage further research using this method in the country. This should have been concluded within 3 weeks in a trip to Brazil, planned for March 2018. However, with the discovery of the new species, we needed an extra field work to get a larger sample for species description. Therefore, we had to prioritise one of the activities and we choose the extra surveys for the description of the new species. This decision was not based on financial resources (we could manage to do both on a tight budget). Unfortunately, we have a very limited team and, considering the short time we were in Brazil (3 weeks) we would not be able to do both activities. Given the importance of this finding, we decided to focus on the description of the new species.

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

1. Increased knowledge on population declines and the effects of fire

We provided data on the effects of fire on mountain restricted species and population trends for bromeligenous frogs. There is little information on fire ecology on animal populations and even fewer studies focusing on amphibians. With our results we were able to understand the effects of fire on populations that are threatened or under extinction risk. Additionally, there are few data available for population ecology of amphibians in Brazil and long-term monitoring with occupancy trends are rare.

Our findings: We found that occupancy had a sharp decline after the fire, but it was followed by a fast population recovery. Structure of the plant is very important for species colonisation rates and fire negatively affected this estimate, decreasing colonisation rate by half if bromeliad was burnt. Lower density of plants at the lower elevations might be related to previous fires and trampling, and we detected a higher extinction rate at the lowland. Local climate is extremely important for extinction (high temperatures had a positive correlation with extinction rate), but it has no impact on colonisation rates (which was mostly affected by site characteristics). Overall, we found that population is stable, but individuals at sites at lower elevation are at higher risk of going extinct. In fact, a significant slightly decline was already detected during our analysis. If estimated extinction and colonisation rates are continuous, then occupancy equilibrium will decline by 66–24%, which is an alarming rate for a rare montane amphibian species.

2. Finding new populations was made easier with our approach

During our project we searched for new populations of our target species to get precise definition of the extent of occurrence and potential distribution. We used a novel approach to indicate locations that had higher probability of sheltering our target species. Instead of using our limited frog occurrence data, we used bromeliad points as a proxy for species distribution.

Our findings: Our approach worked successfully and could be easily applied to any other threatened bromeligenous and montane amphibian species with limited data. After extensive search, we concluded that species is indeed restricted to a single location and population occupies an area of less than 2.4 km². Perhaps one of the most exciting findings of this project was the discovery of a new *Crossodactylodes* species. This genus encompasses five frog species that are completely restricted to bromeliads throughout their life cycle. Species are rare and usually restricted to highland areas of the Atlantic Rainforest. Description of the new species is on its way and should be available by the end of the year.

3. Using eDNA method for bromeligenous frogs depends on circumstances

The feasibility of environmental DNA for detecting frogs in bromeliads and in tropical forests have been recently investigated, showing promising results for elusive species and species-rich sites.

Our findings: using water samples and eDNA we were able to successfully detect frogs in bromeliads that were occupied. We have had some false positives in our analysis (i.e., DNA detected in water samples with no frogs), but overall the method holds consistent results. However, because of material and lab costs, for species with high detection rates (such as ours) the method might not be as cost-effective as the traditional method of visual surveys. Although eDNA is very promising for elusive species in tropical areas, for monitoring highly detectable species in a long-term, the method might not be needed.

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

We did not have a specific aim for community engagement. However, we work in the area for a very long time (since 2009) and we have a good relationship with park managers and rangers, as well as the local community. In our next projects, we aim to strengthen our relationship with the local community and deliver the results of this long-term project.

One thing we did aim for was to develop talks about eDNA to graduate students at Brazilian universities. Unfortunately, we were not able to develop this activity, mainly due to the schedule and the reduced time available in Brazil. Talks were planned to happen during our second visit to Brazil, in March 2018. However, with the discovery of the new species, we had to add an extra activity to collect a larger sample and complete species description. This new field work could only be developed in that same period, March 2018. In this case, we had two activities to be completed in the same period and, because our team is not big enough, we had to prioritise one.

5. Are there any plans to continue this work?

Yes. Declining populations might be challenging to detect and the relationship of climate and changes in occupancy will be difficult to evaluate for short time series. In a near future, we plan to continue species monitoring and get a larger time series to evaluate the effects of climate change on species occupancy and population dynamics. We are particularly interested in montane bromeligenous frogs.

Personally, I aim to get community involved in my next research. In collaboration with a Brazilian film producer, we are submitting a grant proposal to teach members of the local community some photo skills and video techniques. The main goal is that they participate in every process of the creation of a short documentary that will be produced by them and will show their own perceptions of nature and conservation.

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

As this project is part of my PhD thesis, most of our outcomes are scientific publications and technical reports. We have a list of coming work that will be soon submitted for publication, including: effects of fire, population trends and amphibian declines, species distribution models and description of new species. We have had a

few publications out from this research already. The Rufford Foundation is always acknowledged in these publications.

Published papers are:

- <http://dx.doi.org/10.2994/SAJH-D-16-00029.1>
- <https://www.nature.com/articles/s41598-017-16534-8>

Papers accepted for publications are:

- Barata, I.M., Griffiths, R.A. and Ferreira, G.B. 2018. Activity pattern and behaviour of a rare bromeliad frog observed through camera trapping. (accepted at *Herpetological Review*)
- Barata, I.M., Silva, E.P. and Griffiths, R.A. 2018. Predictors of abundance of a rare bromeliad-dwelling frog (*Crossodactylodes itambe*) in the Espinhaço Mountain Range of Brazil. (accepted at *Journal of Herpetology*)

With this research we were able to complete the first IUCN species assessment, which was done with the assistance of Rob Ward and submitted to Jennifer Luedtke, who is the manager of IUCN Red List Assessments. Based on our data, species was classified as CR (Critically Endangered).

We are writing up a final report for the park manager, summarising years of our research and providing guidance for species and habitat management.

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

It was used thought the year. We first had two different seasons to sample data and we then used the grant to develop the eDNA analysis.

8. Budget: Please 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.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Flight costs	300	500	-200	We though we had £500 secured from other sources, but it was less then we first predicted. To cover this cost, we used the money left from car maintenance
Food	900	900	0	

Petrol	500	600	-100	We used more than expected in our budget because: 1) we had to cover a larger area during species search, and 2) petrol had an unexpected rise in Brazil. To cover this extra cost, we used savings from bus tickets
Lab material	1000	860	+140	We had some reagents left in the lab that were used in this project. We also had some disposable materials (e.g., gloves, syringes) that were donated.
Car maintenance	400	200	+200	Car maintenance costed less than we predicted (money was used to cover flight tickets)
Bus tickets	100	0	+100	Bus tickets were not necessary, as we had access to all field sites by car (money was used to cover petrol)
Equipment	0	80	-80	We needed records of calling activity to describe the new species. To get those records, we had to buy portable recorder. This item was not listed in the budget and was an unexpected (but extremely necessary) item. We bought it using savings from lab material.
TOTAL	3200	3140	+60	We have a positive balance of £60, which we intend to spend in an international conference (ATBC 2018) (e.g., poster and food) – otherwise we can return the money to Rufford Foundation

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

1. Secure funding for next years.
2. Continue species monitoring.
3. Getting local community involved.
4. Share results: publish our findings.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

We did not produce any printed materials or videos.

However, we did talks and presentations in different conferences and meetings, national and international, and The Rufford Foundation was always acknowledged during presentations (sometimes by using the logo in the powerpoint and/or posters). One poster presented in an international amphibian conference was

awarded the best student poster, receiving cover in the social media. The discovery of the new species received lots of attention, especially in Brazil, and it was covered by radio, blogs, social media and television. We believe that more publicity will come after concluding species description and publication.

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

I am the team leader and was responsible for making this project work – from data collection to data analysis, including planning, reporting and logistics. It was a great pleasure to work with this team!

Professor Richard Griffiths is my PhD supervisor and guided me through the development of this project since the beginning. He gave precious advice on the sampling design, species monitoring and amphibian decline. Professor Martin Ridout is my second supervisor and had a remarkable contribution on the statistical analysis of my data. Vivian Mara is the species distribution modelling expert. I developed the concept of our modelling approach and together we fitted models to predict suitable areas to find new populations of the frog. Andrew Buxton is my PhD colleague and expert on eDNA for Great Crested Newts in the UK. I collected the water samples in the field and he did most of the lab work related with eDNA.

I am looking forward to publishing all this work with this amazing group of people.

Two people joined the team during the development of this project: **Eliene Pereira da Silva** is a Brazilian undergrad student interested in biodiversity and community engagement. She helped me (before, during and after the fire) to do field work at the Itambe summit. We recently published a paper together, on the ecology of bromeligenous frogs. **Guilherme Braga Ferreira** and **Michel Becheleni** helped me during field expeditions to find new populations of frogs. Guilherme not only went to the field, but he also helped me plan and define road access to the most remote areas of the Espinhaço Range. Michel was with me during the discovery of the new species. He is a film producer in Brazil and we now plan to get funding for a short documentary about this exciting discovery.

12. Any other comments?

The Rufford Foundation certainly had a great contribution to my personal and professional development. Thank you very much for your support throughout these years – it was a great pleasure and I had an amazing time.

Thank you very much for this opportunity!