

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 | Michael Roy |
| Project title | Persistence in spite of Chytrid: A resurvey of <i>Atelopus limosus</i> in Panama |
| RSG reference | 16947-2 |
| Reporting period | May 1 st 2015 – May 1 st 2016 |
| Amount of grant | £5000 |
| Your email address | Michael@crea-panama.org |
| Date of this report | 20/5/2016 |

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 |
|--|--------------|--------------------|----------------|---|
| Determine population history | | √ | | Genetic analysis of the population at Cocobolo Nature Reserve has been undertaken at a Lab in Southern Illinois University. The analysis is inconclusive and requires more samples both within CNR and also of control populations. |
| Determine infection rates in <i>Atelopus limosus</i> | | | √ | We determined chytrid infection rates both in 2015 and in 2016. 2016 shows a decrease in infection which could be related to the strong El Niño of that year. |

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

The Hobo environmental sensors that we had previously been using to record temperature and humidity along a transect line ceased to function. In addition, we needed more sensors in order to increase the length of the transect. For these reasons it became necessary to buy more sensors. We achieved this by negotiating a reduced cost of genetic analysis and we found alternative funding for Dr Twan Leender's flight. It was also necessary to engage a field assistant during early 2016 in order to work with the hobo data and frog samples of which CREA added some emergency funding towards so to maintain data collection.

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

1. *A. limosus* populations in CNR tested positive for chytrid, however almost all had a low infection rate that was not considered to cause mortality. This suggests that this population has developed some form of survival strategy (passive or active or both) that allows it to thrive even in the face of this potentially fatal disease.

2. Disease prevalence changed between years. Prevalence rate in 2015 was measure at 50% of those tested, however in 2016 prevalence dropped to 4%. We believe that this may have been induced by the atypical hot and dry climatic effects of El Niño. If this is true it may support previous observations where chytrid prevalence is reduced in higher temperature environments. We are now testing this hypothesis by testing for chytrid prevalence among amphibians in the reserve at different altitudes and forest types. We seek to create a chytrid map that shows prevalence throughout the reserve and investigate correlation with environmental attributes. Understanding if indeed there are chytrid “free” zones and under what circumstance they exist will help us manage this population more effectively.

3. Wider breeding area discovered: Through our monitoring of the reserve outside of the known breeding pool and stream transect we discovered frogs in another watershed breeding. It is likely that this is the first time *A. limosus* has been photographed in amplexus in the wild and actively laying eggs (see photo below). This second population needs further investigation and promises to provide an opportunity for replication of our investigation.

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

Through CREA's engagement activities our work on endangered frogs has been featured several times. We have involved children in biodiversity monitoring and in particular in leaf litter surveys looking for frogs. Through these activities it is hoped that interest is generated, together with knowledge and pride in local natural history. As a result of our research, CREA hosted an international herpetological workshop for young international researchers in June 2016. A major draw being our work on *A. limosus*. We attracted 19 students from Panama, Mexico, Costa Rica and Peru.

5. Are there any plans to continue this work?

Yes. We are actively looking for collaborators and funding to carry on this important work to save this species. Cocobolo Nature Reserve has the only known wild breeding population and that is actively being studied. It is endemic to this small area in Panama and other populations are known to have disappeared. It is urgent that this project obtains further funding to continuously monitor the population for disease and to manage it through our greater understanding of its natural history and disease avoidance behaviour.

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

We have written articles in Froglog, NewScientist, blogs, twitter, Facebook and presented at national and international herpetological and conservation meetings. We have plans to present at future conferences this year and continue to write articles both for the scientific and grey literature.

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

1 year. We think this project will be continuous. We will need to monitor this population for the foreseeable future so to be able to employ adaptive management of the species as soon as conservation challenges arise.

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 |
|-------------------|-----------------|-----------------|----------------|--|
| Genetic Analysis | £2870.63 | £1146.67 | -£1723.96 | A highly discounted rate per sample was negotiated so to be able to purchase additional field equipment |
| Flights | £1009.70 | £503.84 | -£505.86 | One of two airfares budgeted was paid for using other funds. |
| Field Assistant | £950.52 | £1826.67 | £876.15 | Additional field work was necessary during the beginning of 2016. |
| Permits | £100 | £30 | -£70 | |
| Field Supplies | £70 | £0 | -£70 | |
| Hobo Env. Sensors | £0 | £1550.38 | £1550.38 | These items were not budgeted for but became essential to the project. Please see email dated Nov 13th 2015. |
| Total | £5000.85 | £5057.55 | -£56.70 | |

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

1. Surveying additional watersheds for other populations.
2. Testing hypotheses for *A. limosus* survival e.g. chytrid refuge, behavioural fever, immunity etc. this information will help us for example conserve important habitats that are used for breeding and avoiding high disease prevalence areas. CREA is seeking funds to purchase adjoining forested areas to increase the size of the reserve. We believe that lowland sites are likely to be important to *A. limosus* survival.
3. Augment the photo database for pattern recognition. We have built up a large photo library of individuals which will be used to investigate recapture statistics. We are interested to know how far individuals move, how long they live, breeding territory faithfulness and so on.
4. Mapping chytrid distribution within the reserve and change between seasons and years. This will help us understand the epidemiology and natural history limits of the disease. It will inform us how best to conserve *A. limosus* by understanding more about the disease itself.
5. Captive-bred release trials. We would like to eventually do captive-bred release trials in forest sites. Through data collected from our research we believe we will be able to design a release programme in chytrid free or low prevalence zones. Although some way off, this is an eventual goal of our research.

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

We used it on our website in relation to this project. We spoke about Rufford when explaining to funders and collaborators about our project and used it in any presentation we gave.

11. Any other comments?

This is the only population of *A. limosus* in the wild that is being investigated and continuously monitored for conservation. The opportunity to develop a highly successful conservation story from this effort is extraordinary. We have built a highly effective collaborative team from both the US and Panama and we are accumulating a wealth of longitudinal data that we are certain will become key for the conservation management of this species and others in the genus. We are

looking to secure long term funding that will allow us to understand chytrid epidemiology and *A. limosus* survival strategies.

Appendix 1

