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	Diana Paola Ochoa Castro
Project title	Biological Validation of Faecal Cortisol Metabolites in the Gal[apagos Sea Lion (*Zalophus wollebaeki*)
RSG reference	18605-1
Reporting period	Final
Amount of grant	£4041
Your email address	dianaochoac@googlemail.com
Date of this report	21 January 2017

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
To gather greater understanding of the stress response of the Galapagos Sea Lion -GSC				• Better understanding was gathered about the physiological and behavioural stress response in the GSL • Basal concentrations of glucorticoid - GC values were determined for two populations of this species • Comparison analysis between isolated and exposed populations indicated possible attenuation to stress in populations living amongst humans • Physiological analysis and data not previously carried out in this species
To observe if human activity has an effect in wildlife population fitness				• Wildlife response to human-induced stress events is evident • Attenuation to stress in this species supported by behavioural (Fietz 2012) and immunological (Brock et al. 2012) research • Collaborative publication for the Journal of Coastal Management in progress
Biological Validation of Faecal Cortisol *Metabolites* in the GSL				• Biological validation not possible at population-wide scale • GC peak concentration not observable population-wide despite sharing a strong stress event • Intraspecific variation explains why response wasn't observable at population-wide level • Logistical solvency in following a few wild individuals remains a challenge to be solved
Methodology: Faecal GC Analysis				• Non-invasive methodology valid for basal GC concentration comparison • Biological validation requires intervening directly with a few wild individuals and this presents difficulties in sample collection
Research results influencing education and conservation policy				• The Association of Natural Guides of the Galapagos Islands requested I join in conversation with them and

applicable to entire archipelago				the local authorities to move to a ban of firework displays in the Galapagos Islands • Information about the effects of fireworks on wildlife also requested by local educators i– currently In use by more than one school • Congress participation allowed for direct interaction with the community, many of whom feel distressed by these types of events too • New Year's Eve 2016-17 had campaigns to inform people of the negative effects of these events on wildlife • New Year's Eve 2016-17 firework display reported to be lessened to previous years • Results have reached beyond the local community – invitation to speak to UNC students about the research and implications in the Galapagos Islands

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

Throughout the time of this research, there were no major unexpected difficulties in the field or in the lab. There were some issues (confusion more like) in regard to travel permits for my samples. Easily solved issues that required my personal signature and for this reason I had to return to the islands in June 2016 for one week.

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

1. There has been a definite and positive move towards a ban on firework displays in the Galápagos Islands
2. Participation in local science symposium and promotion of interactive educational programmes allowed me to engage and understand the needs and queries of the local people
3. Strengthening collaboration between international and national, academic and governmental institutions to promote scientific based conservation

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

1. The local community has moved to urge the local government towards a reduction and eventual ban on firework displays in San Cristóbal, but projected to be expanded to the entire archipelago. Many inhabitants said they have expressed concern over the effects of fireworks on domestic and

wild animals for a number of years. A local assistant to this research with a local natural guide were key promoters and an effective channel between community, the authorities and the researchers.

2. Thanks to opportunities shared with the community, we could teach the children and adults about the negative impacts these events have on wildlife. It profoundly raised awareness and consciousness in the local people, especially in children and young adults.
3. At the symposium I had the opportunity to engage closely with the local community. Many farmers, fishermen, tourism employees, business owners, park rangers and public servants. As a researcher, this allowed me to understand the impact of research. There is infinite interest in the local community to understand the science better and be an active part of scientific based conservation policy.

5. Are there any plans to continue this work?

Currently, due to the logistical issues in following a few wild and highly agile amphibious GSL individuals, validation remains a challenge to be solved. However, thanks to the strong international institutional support and relationships, other students and researchers can expand this line of research in other species and in other sites. The methodology and collaborations are currently helping USFQ students to study the pygmy marmoset (*Cebuella pygmea*) and permits are being drafted to begin work with giant tortoises in Galápagos (*Chelonoidis nigra chathamensis*).

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

As the results suggested possible attenuation to stress hormones in the GSL, we are now working in collaboration with Judith Denkinger PhD. from USFQ, Katherine Fietz MSc. from the University of Hamburg and Paddy Brock PhD. from the University of Glasgow. Respectively their research on GSL population fitness, behaviour and immunology indicated reduced fitness and possible attenuation to stress. Together we are producing a joint publication into the implications of wildlife management in a fragile ecosystem for the Journal of Coastal Management. Paper is currently under development and manuscript is to be submitted by April/May 2017.

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

The original timescale of this grant had to be modified from the beginning as the grant was awarded on the 14th January 2016, after the originally anticipated stress event: New Year's Eve 2015. Another two, almost consecutive, stress events (firework displays) on the 12th and 18th of February 2016 allowed for the research to continue at a delayed timescale. Samples were collected only for the first firework display event (from the 6th to the 18th of February 2016). Extracts were processed at the Galapagos Science Center - GSC.

2016 was predicted to be a strong 'El Niño' year and exploring other reproductive sites became an important issue. Two assistants travelled with me, one had to return

to continental Ecuador due to family issues and for the rest of the research, local assistants were favoured over bringing assistants from the continent. This also favoured sample collection from other sites and with community engagement. We attempted sample collection on Floreana and Isabela Islands on late February and early March 2016, but populations were too scarce (also a very worrying but unreported finding).

Finally, the permits required for FCM extracts to be exported to Vienna, emitted by the Directorate of the Galápagos National Park, required my personal signature and that off the Institution that would receive them. This led to a two-month delay in sending the samples and an additional flight to San Cristóbal in June 2016 to solve this. Analysis was successfully carried out in the indicated time scale (one week over July 2016). Analysis completed and my part of the joint publication has been completed.

When results were ready to report, we began communications with the fellow collaborators in the expected publication. This was not originally expected in the budget or in the timescale. The collaboration however has been very positive and the results (before any publication) have been significant with the community.

The actual compared to the original timescale presents a rather significant difference but this hasn't affected the results or publication potential of this research.

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
Flights	£1,148	£718.84	£429.16	The highest cost estimates were initially considered. Unexpected flight (June 2016) cost included.
Accommodation	£400	£673.74	-£273.74	Other sites, more than the only one originally budgeted for, were visited in an attempt to gather more information on other reproductive sites in regard to temperature.
Food	£950	£990.98	£144.33	Many meals cooked at home allowed for savings, some treat meals provided for field and lab assistants
Transport Between Islands	£1000	£512.20	£487.80	Despite visiting more islands than previously thought, the original plan would have required hiring a

				boat. The other sites visited were less costly to visit by charter plane or charter boat. Flying to Isabella was favoured over charter boat to reduce possible degradation of samples.
Assistants	£100	£357.72	-£257.72	As other sites were visited, local assistants were rewarded on Floreana and Isabela islands. Some fishermen who assisted us on Isabela
Laboratory	£200	£280.49	-£80.49	Elevated costs due to increase in national taxes and increased costs to ship materials to the islands
Materials	£93	£173.96	-£80.96	As with laboratory, the cost of materials was an estimate provided prior to new shipment regulations set shortly before my arrival
Shipping	£150	£115.07	£34.93	
Galapagos Excess	-	£386.89	-£386.89	These are costs that arose unexpectedly but were also considered more costly to solve due to the extra cost of obtaining goods and services in the Galapagos Islands. One assistant also had a suspected broken finger, doctor + treatment were another unexpected cost.
Publication	-	£325.20	-£325.20	The cost of publication was not considered in initial budget. This money is a safeguard for unexpected costs and it is money that has not been spent.
Total	£4041	£4333.89	-£292.89	There is a £292.89 surplus to be refunded to the Rufford Foundation

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

There are a number of very exciting steps ahead. As mentioned, the physiological research is set to continue for the foreseeable future in other species. The challenge of validation will continue by the School of Veterinary Medicine at USFQ.

One of the most significant findings of this investigation was not necessarily linked to the physiological analysis, but more to the community that lives with this endangered species. The people who inhabit the Galapagos Islands are misinformed or completely lack knowledge of any research activities, progress and benefits. Social inclusion and community engagement is a must. There were very many positive attitudes on behalf of the community and many projects risen from their own concern and conservation initiative.

Currently as communications coordinator for the Galapagos Science Center, we are launching one of the most ambitious projects to date. A long term communication and community engagement programme designed to divulge scientific information and promote community participation in research and science. Specifically focused to inform the people of the Galapagos but also as a global platform.

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?

The Rufford Foundation Logo was used twice in two separate presentations held over the last 12 months. Once at a Symposium held by the Galapagos Science Center in March 2016 and another time at a chat I was invited to give to the next generation of students heading out to the Galapagos at UNC-Chappel Hill in September 2016. RSGF did not receive any publicity during this time.

11. Any other comments?

I am eternally grateful that the Rufford Foundation gave me the opportunity to be a part of conservation initiatives in the Galapagos. To be part of a community that works tirelessly to protect, educate and promote a more conscious world. For being able to be close to nature. Thank you.