# 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** | Luz Aura de Wit |
| **Project title** | Understanding the Role of Feral Cats in the Transmission of Toxoplasmosis in Islands: a case Study from Two Mexican Islands. |
| **RSG reference** | 17448-1 |
| **Reporting period** | June 2015-June 2016 |
| **Amount of grant** | £4998 |
| **Your email address** | ldewit@ucsc.edu |
| **Date of this report** | June 21st 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 |
|---|---|---|---|---|
| To examine the contribution of feral cats as local sources of exposure to *Toxoplasma gondii* in islands. | | | | My results indicate that overall prevalence is significantly greater in Cedros Island (13.5%), an island that harbours feral cats at high densities, than in Natividad Island (2.1%), an island in which cats were eradicated. In particular, my results show a rapid rise in toxoplasmosis seroprevalence during childhood in Cedros, possibly indicating that the main source of parasite exposure is through soil contaminated by local feral cats. Additionally, I found no positive cases of children born after cat eradication took place in Natividad, possibly suggesting that eradication may be protective against *Toxoplasma gondii* infection. However, to be able to determine whether feral cats are the main source of *T. gondii* in islands, it is necessary to collect and compare data from additional islands. This will allow me to better understand the role of cat presence on the prevalence of toxoplasmosis in islands and examine whether other factors such as cat density affect the rate of exposure. |
| To create awareness in inhabitants of Cedros and Natividad islands about the conservation and public health consequences of maintaining high densities of feral cats. | | | | I visited the primary, middle and high schools as well as the fish cooperatives of each island to give informative talks about the threats that introduced cats pose on native species such as the local breeding colony of Craverri's murrelet, and the role of cats as reservoirs of diseases of public health concern. |
| To inform public health authorities about the role of feral cats as sources | | | | I am currently working on the statistical analysis of the epidemiological data I collected. I plan to write a report directed to the Secretaries of Health of |

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| of toxoplasmosis in Cedros Island. | | | | the States of Baja California and Baja California Sur. This report is intended to highlight the differences in overall and age-specific prevalence of toxoplasmosis in Cedros and Natividad. In this report, I will also emphasise the potential to apply cat eradication as a tool to mitigate toxoplasmosis in Cedros Island. |

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

My initial goal was to use saliva samples to determine seroprevalence of toxoplasmosis. However, because the use of saliva in serological testing has not been fully standardised and saliva samples are susceptible to degradation, I ran a pilot study at the Experimental Immunology Lab of the National Institute of Paediatrics (INP) in Mexico City, a lab specialised in the diagnosis of toxoplasmosis. There I simulated the storage conditions in the islands, and compared the results to results from a gold standard (reference) test. Results from this pilot study showed a high rate of false positives in saliva samples.

I decided to modify the proposed sampling scheme and collect blood samples through the fingerpick method. This change in sampling scheme prompted me to apply for a protocol amendment to the Ethics Committees of Baja California, Baja California Sur, and of the University of California Santa Cruz, which they approved. Additionally, the fingerpick method requires the use of specific filter paper to collect blood samples, and a specialised diagnostic lab for analysis. As a consequence, I had to adjust my budget and find a diagnostic lab that could help me analyse my samples. I presented my study proposal to the INP, and they agreed to collaborate with me without charging me for the diagnosis.

Furthermore, although the fingerpick method is less invasive than collecting blood through venipuncture, it is more invasive than saliva collection. Under those circumstances, one of my major concerns was that people would be less likely to participate. With the hope that people would be more open to participate in the study if they clearly understood the purpose of the study and the long term benefits they would receive if they control the population of feral cats, I organised informative talks at schools and at the main working offices (fish cooperatives) of the islands. The rate participation in both islands was impressively high: I obtained a total of 383 samples in Natividad (total population 1,300 inhabitants), and 114 from Natividad (total population 400 inhabitants).

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

The following are the three most important outcomes of my project:

1) I was able to talk with people of all age classes about the conservation and public health importance of controlling populations of introduced cats. Specifically addressing school children was crucial not only because this demographic group is particularly vulnerable to *T. gondii* infection, but also because they are the future generation of Cedros and Natividad islands, and creating awareness early in age can greatly impact the future of their islands.

2) My results confirm my hypotheses: seroprevalence of toxoplasmosis is greater in Cedros island (an island that harbours introduced cats) than in Natividad island (island in which cats were eradicated). Moreover, I found complete absence of *T. gondii* exposure in children born after eradication took place in Natividad Island. These results can potentially support the premise that absence of cats protects people from *T. gondii* exposure.

3) Protected Areas (CONANP) in this project. CONANP is currently in the process of deciding whether to designate Cedros Island as an "Area of Protection of Flora and Fauna". I believe their involvement in this project is three-fold: 1) results from this study can provide technical and financial resources for the new designation, which may involve eradication or control of the feral cat population to protect the local breeding colony of Craverri's murrelet and the endemic populations of brush rabbit and cactus mouse; 2) support from a governmental institution can provide leverage for future communications with the State Secretaries of Health; and 3) working alongside people from CONANP in Cedros and Natividad can instil in local inhabitants the relation between introduced cats and native fauna.

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

The school community and fish cooperatives from both islands were particularly responsive and interested in the study. I gave informative talks and handed pamphlets with basic information about the threats that introduced cats pose to native wildlife and human health.

**5. Are there any plans to continue this work?**

Yes. There are four islands in the Pacific coast of Mexico that are permanently inhabited, that also harbour populations of feral cats and endemic species susceptible to feral cat predation. These islands are Guadalupe, Santa Margarita, San Marcos and Maria Madre. The inhabitants of these islands have similar socioeconomic backgrounds to those of Cedros and Natividad, allowing for a comparative prospective study. In particular, I am interested in quantifying sources of exposure in a larger sample of islands and determine whether toxoplasmosis responds directly to changes in cat density or if seroprevalence is affected by proximity to mainland.

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

I plan to publish the results of this study in a peer-reviewed journal that shares the vision of the one-health approach, which is that human health is interconnected with animal and environmental health.

I also plan to write a report directed to the Secretaries of Health of the States of Baja California and Baja California Sur. This report is intended to highlight the differences in overall and age specific seroprevalence of toxoplasmosis in Cedros and Natividad. In this report, I will also emphasise the potential to apply cat eradication as a tool to mitigate toxoplasmosis in Cedros Island.

Lastly, I plan to return to Cedros and Natividad islands to communicate the results and the importance of control of introduced species on islands. I plan to do so through small workshops and public talks.

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

I used the Rufford Foundation grant during December and March of 2016 for buying sampling material, per diem and traveling to Cedros and Natividad islands. This follows the expected timing of use of the grant.

**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 |
|---|---|---|---|---|
| Transport | | 2,025 | +2,025 | I was originally expecting this item to be covered by the UCMEXUS Small Grant, but unfortunately did not receive that grant. Additionally, because of security reasons, I decided to travel with a research assistant. Therefore, I had to cover his costs of transportation from Mexico City to Cedros and Natividad islands. |
| Round-trip: Santa Cruz, CA – Mexico City (1 person) | | 526 | | |
| Round-trip: Mexico City-Ensenada (2 people) | | 1133 | | |
| Round-trip: Ensenada-Cedros Island (2 people) | | 291 | | |
| Round-trip: Cedros Island-Natividad Island (2 people) | | 75 | | |
| Lodging | | 333 | +333 | I was originally expecting this item to |
| Ensenada (2 nights) | | 92 | | |

| | | | | |
|---|---|---|---|---|
| Cedros (17 nights) | | 159 | | be covered by the UCMEXUS Small Grant, but unfortunately did not receive that grant. |
| Natividad (11 nights) | | 82 | | |
| Per diem | 461 | 971 | +510 | |
| For two people, 2 days in Ensenada | | 60 | | |
| For two people, 28 days in Cedros and Natividad islands. | | 630 | | |
| For one person, 15 days in Mexico City | | 281 | | |
| Sampling material | 267 | 532 | +265 | |
| Saliva collection material for preliminary study | | 123 | | |
| Blood collection material | | 314 | | |
| Communication material (pamphlets) | | 7 | | |
| Printed questionnaires | | 88 | | |
| Compensation | 670 | 953 | +283 | Includes a lunchbox for 479 participants (1.98 £ sterling per participant) |
| Sample analysis<br>1) Dot-ELISA IgG test kit<br>2) Dot-ELISA IgM test kit | 3600 | | -3600 | The National Institute of Paediatrics of Mexico City (INP) agreed to cover the costs of sample analysis. |
| **Total** | **4998** | **4814** | **184** | I plan to use what remains from the grant (184) in combination with a grant I will apply for from UCSC to visit Cedros and Natividad islands to communicate the results. |

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

The most important next steps are to communicate my results to the island inhabitants of Cedros and Natividad, to an academic audience, and to the Mexican authorities in public health. Secondly, to support my results with sound statistical analysis, I need to replicate this study in the remaining inhabited islands of the Mexican Pacific.

**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?**

Yes, in the pamphlets I handed to the inhabitants of Cedros and Natividad islands and in a public talk I gave at the University of California Santa Cruz.

**11. Any other comments?**

I am very grateful to the Rufford Foundation for supporting this study. I believe there are important opportunities ahead to further research in this subject in additional islands. This would provide a better understanding of the impact of introduced cats on human health, and if (and how) it varies across different islands. No doubt the Rufford Foundation could play a fundamental role in facilitating the integration of one-health interventions at the level of islands.