



The Rufford Foundation

Final Report

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

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. 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. 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	Sebastián Augusto Ballari
Project title	Interaction between non-native ecosystem engineers: the case of wild boar (<i>Sus scrofa</i>) and cattle (<i>Bos taurus</i>) in the Nahuel Huapi National Park, Argentina
RSG reference	15915-2
Reporting period	Final report - September 2016
Amount of grant	£4912
Your email address	sebastianballari@gmail.com
Date of this report	10/03/2016

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
Provide information about interactions between wild boar and cattle.			X	This was the first study in this area that included the impact evaluation of two invasive mammals. We found some evidence that shows that there are synergistic and antagonistic relationships between these animals.
Provide information about the impacts of both species on native ecosystems.			X	The results of assessing the impacts were very interesting. The presence of cow adversely affect native ecosystems, reducing vegetation cover, especially native species and increasing the percentage of bare soil. The presence of wild boar also increases bare soil coverage and the number of species exotic plants. The coexistence of both species decreases biomass, richness of plants, reduces the number of native species and alter soil compaction.
Provide basic information that could be applied to better manage non-native herbivores in protected areas.			X	The information obtained in this project is extremely valuable for the protected area, and for many areas that host these species. Fundamentally, the national park should focus and prioritise efforts to control the handling of cows in places where they are alone or with wild boar.
Create an starting point for further research involving other non-native species		X		The focus of this study received a very good acceptance in the region, and there is interest in conducting research along with Nahuel Huapi NP including the study of two or more exotic species (plants and animals) and their interactions, in order to minimise negative impacts native ecosystems.

Report the main results and conclusions of this project and to raise awareness about the impacts of non-native species assemblage and their interactions.			X	The findings and conclusions of this project were disseminated in a regional outreach journal and in an international scientific meeting. Also, I'm writing a full article to be published in a peer-reviewed journal.
Train undergraduate and postgraduate students during the course of this research.		X		During this project involved field assistants were prepared to fulfil the programmed sampling, including a student from the Northern Arizona University (USA) who actively participated in the study. Also, the park rangers participated in the project received information and training on sampling in the field.

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

Some difficulties appeared in the points 6), 7) and 8) of the methodology. In 6) we cannot find a representative sample of earthworms to evaluated difference between treatments, some specialist argue that the last 2 years were more dry and earthworm abundance was affected for this phenomenon. In 7) we prepared with successfully the experiment with enclosures to evaluate the richness and diversity of non-native and native plant seedlings in rooting and non-rooting sites, however, we need to wait more time to see differences. So in the current spring-summer (November 2016 - January 2017) we will get the final results of this experiment to include more information in the peer-review article. In 8) we evaluate the seed dispersal potential of non-native plants by wild boar and cattle by collecting dung and germinating in a greenhouse. The experiment did not work as expected and there was very few germination from faeces.

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

1. INTERACTIONS - The results of this project indicate that two of the biggest and most widely distributed exotic mammals in Argentina, have interactions that could be threat native ecosystems. Wild boar and cattle experiment synergistic (the effects are multiplied) and antagonistic (the effects are counteracted) interactions, that have direct and indirect consequences on native and other exotic species.

2. IMPACTS - In combination, the impacts of both species produced a decreasing of vegetation cover and the number of native plants. In contrast, interference in their impacts occur with the quantity plant biomass. These both interactions and impacts have serious conservation implications for Nahuel Huapi NP.

3. MANAGEMENT - The information obtained in this study suggest that the control of cattle populations should be prioritised both when alone and in coexistence with wild boar. The management of introduced mammals in the NHNP represents an extraordinary challenge that requires a multidisciplinary approach to adaptive management of these populations without missing the essential objective of preserving the native ecosystem

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

Nahuel Huapi National Park (NHNP) hosts a large number of introduced species including large mammals such as wild boar and cattle. Both species are widely distributed in the park and represent a socio-cultural value as a game hunting species (wild boar) and as livestock (cattle). The results found in this study have socio-ecological implications, because cattle represent the main livestock animal for the rural residents in this area. Also, wild boar is hunted for the rural residents besides game hunters. The management and study of these species implicate joint efforts of park rangers, decision-makers, researchers and rural residents that participated in this project collaborating with logistic, information about boar and cattle populations and help in the field sample. The interdisciplinary interest is key for the successfully of this projects

5. Are there any plans to continue this work?

Yes, we want to continue this study line with focus on Patagonian wetlands and the impacts consequences of exotic mammals. This environments have a great biological importance and also represents one of the most fragile ecosystems around the world. Also our group is involved in other ideas to study other socio-ecological topics like ecosystem restoration of degraded ecosystems, and the management of urban fauna, among others.

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

All the information obtained in this project is available to any person who need it. In first step we shared the information through internal reports with the National Park

Administration of Argentina for use in protected areas. In other hand, we present the results in a regional outreach-scientific journal called MACROSCOPIA (<http://nahuelhuapi.gov.ar/multimedios/macroscopia.html>) that will be available to download in a few weeks (see file attached). Also, results were showed in an international meeting, "VI Reunión Binacional de Ecología" - "XXVII Reunión Argentina de Ecología" - "XXIII Reunión de la Sociedad de Ecología de Chile" (<http://www.binacionalecologia2016.com>) with a presentation in PowerPoint to share the main results and conclusions of this project (see photos attached). Finally we are developing an article to be publish in an international peer-review conservation journal for the dissemination our completed results.

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

The 2nd RSG was used from end of September 2015 to middle September 2016. The Rufford funding covered the cost of this year of fieldwork and the spread of results, being of vital importance for the fulfilment of the objectives.

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
Field assistant	800	800	0	
Fuel for SUV and car	540	540	0	
Fuel for boat	132	76	-56	We visit fewer field sample sites using boat
Maintenance during the fieldwork	456	506	+50	We need to use more money for field trips
Lab analysis soil	400	400	0	
Lab analysis earthworm	480	280	-200	We perform less analysis of earthworms for the low amount found
Elements of hardware store	345	445	+100	We use more money to assemble the enclosures and modify the

				greenhouse
Lab supplies	350	350	0	
Extras	289	289	0	
Fungible materials	100	100	0	
Cost of scientific publications and material for outreach purposes	200	250	+50	We use more money for the scientific meeting presentation
Notebook	390	390	0	
Dissecting microscope	275	275	0	
GPS	155	155	0	
Local bank commissions and taxes		56	+56	Bank commissions and Argentinean taxes (I.V.A.)
TOTAL	4912	4912	0	

* Based on exchange 1 £ (pound) = \$ 19, 8 (argentine pesos) average exchange between 09/2015 and 09/2016.

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

One of the next steps is to continue these studies of interaction between alien species, is to include other common exotic mammals in Patagonia (e.g. red deer, American mink, etc.) with focus in threatened environments as wetlands and springs. In other hand, we also believe that the "model" applied in this project with multidisciplinary and interagency participation of researchers, foundations, managers, park rangers, decision makers and local people, can be extrapolated to other socio-ecological relevance topics of study in the region as the ecological restoration of degraded environments and management of urban wildlife.

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

RSGF logo was included in two occasions in this year. First we included RSGF logo and acknowledgments in an outreach publication in a regional journal (<http://nahuelhuapi.gov.ar/multimedios/macroscopia.html> - see file attached) that will be publish on line during this month. Also, RSGF logo and acknowledgments were included in a presentation about this project in the VI Reunión Binacional de Ecología - XXVII Reunión Argentina de Ecología - XXIII Reunión de la Sociedad de



Ecología de Chile (<http://www.binacionalecologia2016.com> - see file and photos attached).

11. Any other comments?

I firmly believe that 1st and 2nd RSGF support were vital for perform successfully this and past projects, and sincerely without it; I could not have completed all the objectives. I consider that the support of the RSGF is very important for researchers in development countries, because the possibilities to obtain grants and supports it is sometimes limited. Your input and support for conservation is a key to realizing research projects aimed at solving problems that threaten biodiversity worldwide, so I hope to apply to RSGF again.