The Rufford Small Grants 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. 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	Alejandro Pietrek
Project title	Predicting and managing the spread of invasive beavers in the heterogeneous landscapes of Patagonia
RSG reference	8493-1
Reporting period	December 2010-June 2011
Amount of grant	£4350
Your email address	alejandro.pietrek@duke.edu
Date of this report	July 1st, 2011

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
a) Estimate the dispersal distances of beavers in different habitats.		X		Yearlings and subadults beavers usually disperse in the late Spring (October-November). We equipped eight individuals of these age classes and first results on dispersal will be obtained by the end of the year.
b) Estimate rates of survival and reproduction of beavers in different habitats.			X	We are estimating survival using telemetry. To date, we did not record loses or deaths.
c) Build a population model of the beaver invasion that includes different age classes of beavers as well as habitat heterogeneity, and assess its ability to predict the expansion of beavers in Tierra del Fuego relative to simpler, homogeneous models			X	We built an age structured integro-difference model to study the beaver invasion. In our first simulations we have parameterised the models with demographic estimates of North American populations.
d) Use the new population models to help to guide managers who are				This is a long term goal. However, we are currently working on training of park rangers and technicians at the

trying to slow the northward spread of the beaver invasion.	X			local institutes and state agencies.

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

The most difficult task was to locate individual colonies in the forest. Detectability of the colonies in the forest is greatly reduced compared with the steppe. In our forest study site, some of the colonies were located in areas of difficult access (located up to 2 hours walk) increasing the amount of time needed for the survey of the colonies and radiotracking of individuals. To address this problem we are planning to incorporate a minimum of fifteen more colonies in the forest. By the end of May we have located and defined a set of candidate colonies to be surveyed in the next fieldwork season.

Climatic conditions also affected our capture success in the forest. Some very cold days precluded us of marking more individuals in these colonies. For the next season we plan to allocate more time on beaver capture and less time on location of individual colonies (given most of them have been identified this season). Moreover, we plan to restrict beaver captures from February to April (not including May this time) to avoid adverse climatic conditions.

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

1) We marked and captured 15 beavers (five in the forest and 10 in the steppe). To date, this is the first study attempting to shed light on the ecology of beavers in the Patagonian steppe. We are currently radio-tracking these individuals to obtain estimates of survival and dispersal. Our captures included kits, yearlings, subadults and adults, potentially allowing us to get age-specific population parameters.

2) We added an interesting twist to the project. For each individual colony we are counting the individuals using repeated observations. With these data we can: a) Look at the temporal and spatial variation in the number of individuals and, more important b) count the number of kits per colony thus obtaining a habitat-specific “observed” fecundity. In the steppe, where most of the observations were made, we have found a low fecundity (two kits at the most) compared with other areas where litters of three to four kits are common.

3) Using observed speeds of invasion of the species in different habitats (Skewes et al., 2006), I built an invasion model using a set of integro-difference equations. My first results show dispersal distances in the steppe should at least double those of the forest to fit the observed speeds of invasion. This suggests habitat heterogeneity is playing an important role in the spread of the invasion. Data collected this coming spring will help to confirm our theoretical results.

SKEWES, O., GONZALEZ, F., OLAVE, R., AVILA, A., VARGAS, V., PAULSEN, P. & KONIG, H. E. 2006. Abundance and distribution of American beaver, Castor canadensis (Kuhl 1820), in Tierra del Fuego and Navarino islands, Chile. *European Journal of Wildlife Research,* 52**,** 292-296.

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

During 2010 I learned methods to capture and handle beavers using snares at the APHIS unit in North Carolina. In Tierra del Fuego, I trained three park rangers, one technician and one post-doc working at CADIC (a research institute based in Ushuaia), and one student. I also fully equipped the wildlife ecology lab at CADIC with trapping supplies, including specific lures, different types of snares and ear tags. This lab has conducted other research projects on beaver during my stay and I personally assisted them in beaver handling and trapping.

At CADIC, I also contacted another Rufford grantee working on beaver impacts on the *Nothofagus* forests, Rosina Soler. On May 4th we both presented the first results of our projects to a broad audience encompassing not only scientists but also policy makers. Furthermore, I gave a second talk at this institute on design of occupancy studies, a subject not only relevant to those studying invasive species but also to people interested in the conservation and management of local threatened species.

5. Are there any plans to continue this work?

Yes, definitely. For the next two seasons we plan to: a) Follow the radiotagged individuals and capture a minimum of 60 more beavers to obtain accurate dispersal and survival parameters; b) Monitor the abundance and kit production of the colonies we already defined; and c) Start to build new models that incorporate habitat heterogeneity and parameterise them with field data. We will mark new beavers with coloured ear tags that allow us to recognize individuals at first sight. This will complement radio transmitters particularly for the estimation of adult survival by resighting in annual surveys.

In addition to this, we plan to incorporate an additional path of research. This will be a collaboration with Mariana Fasanella (Centro Regional de estudios genómicos) and Martin Mendez (American Museum of Natural History). Using genetic tools we aim to: a) Determine the origin of the recent beaver colonisation in the steppe; and b) Infer the demography of the beaver invasion (i.e.: recent population expansion, gene flow).

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

During the project, I plan to present a minimum of 10 talks at organisations involved in the control of beavers in Patagonia, from universities and research institutes to wildlife agencies. Radio stations are among the most popular media in Tierra del Fuego. Thus, I plan to participate in radio shows in the two main two cities in Argentinian Tierra del Fuego, Rio Grande and Ushuaia, to raise awareness about the importance of controlling beaver populations. Results of my research will be submitted in at least three manuscripts to peer reviewed journals and will be presented in national and

international meetings. I will translate publications into Spanish to reach a broader audience at local and national levels in Argentina and Chile. In August 2010, I presented my first work on the use of new quantitative tools to study beaver invasion in Patagonia at the Ecoloy binational meeting held in Buenos Aires.

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

The first fieldwork season comprised the period December 2010-May 2011. Depending upon funding availability we plan to extend the next two seasons starting from October when most beavers disperse from their natal territories. Having said that, the actual length of the project remains being the same we originally planned.

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
Transportation	1500	1500	0	Distance between the two study sites is > 300 km.
Mechanical Repair	150	0	+150	
Transmitters and antenna	1650	1900	-250	We purchased more transmitters and we added an additional mortality sensor to each transmitter.
Trapping supplies	300	480	-180	Costs of shipping and handling to Tierra del Fuego increased the amount of the original budget.
Indumentary	250	285	-35	
One Field assistant	500	500	0	
Total	4350	**4665**	-315	The difference was covered with funds of Duke Biology awarded to Alejandro Pietrek

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

First, it is important to gather demographic information on beavers in Tierra del Fuego. Current policies of control have failed mainly because information needed for adequate management is lacking. Second, it is important to build local capacity by training local people in trapping methods. For instance, snaring is a high cost/effective technique to capture beavers barely used in Tierra del Fuego. Third, we need to raise public awareness on the problems beavers cause as invasive species. Beaver dams and constructions are perceived by some people as a touristic attraction, despite the enormous damage they cause to the local ecosystems.

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?

Yes, I used the RSGF logo in every talk and seminar I presented.

11. Any other comments?

Funds from the Rufford Small Grants Foundation were of paramount importance to help develop our research on invasive beavers. This is the first of a three year project, and we are working to get additional funding for our research. We thank Rufford for the support in these initial steps towards the understanding of the demography and impact of beavers in Patagonia.