

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. 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	Andrea Marino
Project title	Environmental variability and population regulation in guanaco populations from Patagonia, Argentina
RSG reference	9072-2
Reporting period	January 2011-January 2012
Amount of grant	2900
Your email address	marino@cenpat.edu.ar
Date of this report	February 2012

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
1. Describe how annual rainfall affects forage availability and herbivore carrying capacity			X	Annual primary productivity was indexed from 765 EVI satellite images, assembling a 12 year-long data series. A preliminary field calibration was done using enclosures data (50 enclosures and 50 controls). Rainfall time series were obtained from local ranchers and airports. Relevant relationships between these variables and guanaco numbers were assessed.
2. Describe how forage availability and winter temperature affect guanaco recruitment and survival rates within protected areas.		X		The analysis of the relationships between recruitment rates and environmental variables was completed. The analysis of the relationships between survival rates and environmental variables will be completed once teeth samples are entirely processed.
3. Construct a set of mathematical models, accounting for age structure, in order to describe guanaco population dynamics, including environmental stochasticity and density-dependence.			X	A preliminary set of models was constructed. However, final models will be selected during the final stage of the project (February-June 2012).
4. Conduct sensitivity analyses on model parameters to improve field sampling protocols		X		Sensitivity analysis will be finished during the final stage of the project (February-June 2012).
5. Continue and improve data collection to assemblage proper time series of guanaco abundance and relevant environmental variables			X	The entire fieldwork was successfully completed. Recruitment and abundance time series from study locations were extended two years, covering 7 years of data. These series are still short but are one of the best data sets for guanacos and the only one available for Chubut Province. Vegetation enclosures have provided the first insights in annual forage production and consumption rates by wild herbivores.

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

There were no significant difficulties during this first stage of the project other than a delay in teeth-samples processing. This delay has occurred partially due to the success of the fieldwork that has led to an overwhelming amount of samples and data to analyse, and which have kept the entire team more busy than expected. However, samples are being processed at the moment thus mortality results will be available soon.

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

1. One of the most important findings so far is the non-linear relationship between annual rainfall and primary productivity surrogates, as opposed to the linear relationship usually considered to simulate large-herbivore dynamics. This result implies that annual forage availability can be overestimated in population models that include an estimate of primary productivity derived linearly from rainfall. In addition, the great between-year variability in primary productivity indicates that consider a constant carrying capacity is inappropriate for this ecosystem.
2. Another relevant result is the strong relationship found between the number of offspring per female at the end of the reproductive season and primary productivity surrogates. This relationship, as well as the observed recruitment variability, suggests that consider an average recruitment rate in projection models will not be enough to reproduce real dynamics of guanaco populations. In addition, estimates of recruitment rates are far lower than the estimates that have been used by local authorities in preliminary harvest models for private ranches. Overestimating reproductive rates might lead to overestimate the rate of sustainable harvest therefore these results may help to develop more realistic models and to reduce overharvest risk.
3. Preliminary results from vegetation enclosures suggest that guanacos can consume a significantly higher percentage of grass biomass than livestock, without producing signs of overgrazing. These results support the hypothesis that guanacos are less damaging than livestock, given that they have co-evolved with native plant communities. Consumption rates obtained from this experiment will help to improve estimations of herbivore carrying capacity in this ecosystem.

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

During last year, the Dirección de Fauna de la Provincia de Chubut (local authority in charge of management of wildlife outside protected areas) has been planning a guanaco harvest programme for private ranches in the same region that this RSG project is carried out, with the objective of minimizing guanaco-frames conflict. Local authorities have asked us for advice repeatedly about crucial issues that need to be account for when modelling herbivore dynamics. Even though only few of our comments were included in the preliminary version of the harvest model, our results have been very useful to fill the gap in information about guanaco ecology needed to model population dynamics, and will be critical to improve future management initiatives.

5. Are there any plans to continue this work?

This short-term project was the first stage of a long-term plan intended to identify the driving factors of guanaco population dynamics and their relationships with plant communities. In the long term,

our aim is to construct a spatially structured model in which to combine guanaco dynamics in protected areas and private ranches, in order to allow for assessing different management options within a regional scale.

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

Our plan is to show how management recommendations might differ if the relationships found here are included or not when modelling guanaco population dynamics. We also plan to highlight guanaco merits as native part of the ecosystem in order to improve people perception about them. We plan to write technical reports directed towards local authorities, papers in scientific journals and presentations in scientific meetings, and non-technical publications. In addition, all produced material will be exposed in the annual meeting (CENPAT Abierto) in which our institute invite the entire community to see our work. Last year (2011) two posters showing preliminary results from enclosures data were presented in Cenpat Abierto and Jornadas Patagónicas de Biología by two undergraduate students of our team, Laura Lamuedra and Gimena Rajnoch .

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

The RSG was used over a period of 12 months of fieldwork. The entire project was planned for an 18 month period. Data taken during the first year (field work) were pooled with data taken during previous years, including data taken during a previous RSG. The second stage of the project will be 6 months of intense data analysis and modelling. This short project is included in long term plan intended to understand guanaco population dynamics and the factors affecting it, not only within protected areas but in private ranches, which hold more that 95% of the remaining guanaco population.

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
Food and subsistence in the field	1453.1	1342.3	110.8	
Fuel	349.5	413.4	-63.9	
Transport (tickets-canon)	470.9	238.3	232.6	Canon expenses were reduced using my own vehicle when possible
Insurance/ Lab and office supplies	647.2	876.9	-229.7	Lab supplies and other sample-processing related costs increased during 2011 but were covered with savings from other items.
TOTAL	2900	2870	49.86	

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

After finishing data analysis and modelling, it will be crucial expand time series of the variables considered to reduce parameters uncertainty and improve model outcomes. In this regard, new

protocols derived from the results obtained here will help to optimize field sampling efforts. In addition, current results will serve as a baseline to start studying population dynamics within private lands, which hold most of the remaining guanaco populations. Understanding population dynamics within private ranches (implying interspecific competition with sheep and an extra source of mortality due to hunting) will be a prerequisite to model guanaco dynamics at a larger scale.

An important challenge for the future is to address guanaco's movement among management units (i.e. private ranches, reserves, public lands). Even though this movement is usually assumed as null when modelling ungulate dynamics, there is enough evidence that guanacos move between protected areas and private lands. This movement might be a critical part of their spatial dynamic and might increase model uncertainty due to an unaccounted source of variation in population numbers at a local scale. As guanacos lack natural marks that allow identifying individuals, it is not possible to assess directly migration rates among management units. Therefore, a tagging programme or a creative method to indirectly assess migration rates will be needed to achieve an entirely realistic approach to guanaco population dynamics.

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?

All printed material show the RSGF logo in a prominent position. The RSGF has been acknowledged in every paper and report published, and every presentation related to both current and previous RSG projects.

11. Any other comments?

A complete technical report showing detailed findings will be presented by July 2012.