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	Rodrigo S. Rios
Project title	Understanding the consequences of overgrazing on arid plant communities of Coquimbo, Chile: Assessing change for local conservation and management strategies
RSG reference	10015-1
Reporting period	07/01/2011 - 08/31/2012 (14 months) (Project extent - 18 months)
Amount of grant	£5990
Your email address	rios.rodrigo.s@gmail.com
Date of this report	09/08/2012

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
Determine changes in diversity, cover and composition of plant communities in areas with and without goats			7	See results in section 2.
Generate a list of plant species present in the area and highlight those threatened by overgrazing			7	See results in section 2.
Quantify changes in species interactions key for community structure			7	See results in section 2.
Quantify grazing pressures to identify species vulnerable to overgrazing		7		Evaluation of this objective will end in the second season of the study (December 2012)
Encourage local stewardship to integrate social and environmental priorities			7	We worked closely with the community and setup workshops
Present results and provide guidelines for management and conservation strategies		7		They will be presented at ecological conferences and in the form of reports once all data is collected

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

The following are two unforeseen difficulties encountered thus far in the project:

a) Due to time constraints (short blooming season) we were able to establish and evaluate only 16 of the 20 plots that were initially planned. We did, however, set eight plots per treatment (with and without goats) and two more plots per treatment will be established during the second season. We preferred to allocate time and effort to sampling, collecting, identifying and measuring biodiversity attributes within each plot, then to increasing the number of plots and ending up with less information per plot. Species turnover is high and life cycles of annual herbs and grasses are short in the desert, therefore, plots need to be constantly monitored during the season (August-December) in order to capture most of the species present in the area. Sixteen plots were a reasonable number of plots that could be monitored during the season considering the size of our team.

b) Given that little is known about the flora of the area, there were some plant species that could not be determined to species level; in particular, several grasses where difficult to key out. This, however, should not affect the patterns found in the study because all undetermined specimens were classified as distinct morphospecies. Nevertheless, voucher specimens were sent to specialists and herbariums within Chile for their identification.

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

a) Objective 1: Determine changes in diversity, cover and composition of plant communities in areas with and without goats

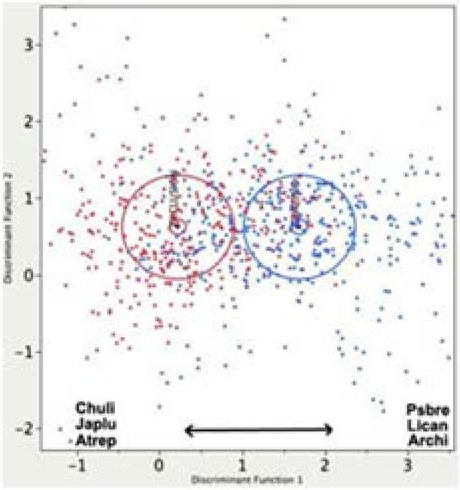
To reveal how grazing shapes and changes plant community structure, sixteen permanent plots of 0.5 ha each were established in the area; eight placed inside and eight outside the exclosures. Pairs of plots inside and outside of the fence were blocked based on similar altitude and vegetation. Within each plot, 50 30 x 30 cm quadrats were laid out along five parallel, 50 m lines. From quadrats we recorded plant species composition, estimated richness, density, frequency and vegetation cover. These biodiversity attributes help quantify vegetation changes and land degradation, which can ultimately affect ecosystem function (e.g., changes in primary productivity, resistance and resilience). Understanding the effects of overgrazing provides necessary input to assess the degree to which the use of these lands for livestock is sustainable in the region.

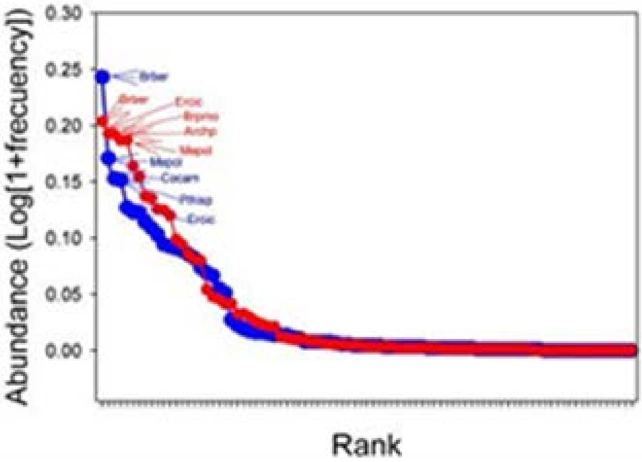
-Grazing and community structure

Our results reveal that goats are selectively changing community composition and structure. Overall quadrats from areas with goats differed significantly from quadrats assessed in areas without goats in terms of the species they harbour (multidimensional species gradient, Fig. 1). Areas without grazing tend to harbour species endemic to the region, such as, *Chuquiraga ulicina* and native grasses such as *Jarava plumosa*, which are both susceptible to grazing and are not found in areas with goats. Moreover, in areas with goats we find plants that are adapted to dried-out (wet in winter), compacted, calcareous soils like *Psilocarphus brevissimus* or, that have adaptations to herbivory such as, *Aristolochia chilensis*. This last species is rich in secondary compounds (aristolochic acids) that function as a deterrent to vertebrate herbivores. In addition, where there is grazing, we find exotic species that can potentially become invasive, such as, *Linaria canadensis* and *Avena sativa* (Fig. 1).

In terms of species dominance, that is, the fraction of the pool that is represented by the most common species, goats also alter the hierarchy. For example, the most abundant species *Bromus berteronianus* significantly reduces its abundance (in 5%) and the other dominant species either change in hierarchy or become less frequent with grazing. Native species are most affected because they either loose dominance like *Conanthera campanulata* (a native geophyte) or reduce in abundance like *Plantago hispidula.* In addition, with grazing exotic species start to dominate such as *Erodium cicutarium* and *Medicago polymorpha* (Fig. 2).

Therefore, goats seem to be acting as an ecological filter, allowing the establishment of species with characteristics that makes them more resistant to grazing and/or to environmental changes that come about with grazing (e.g., soil compaction and desiccation). Goats apparently change species composition and community structure by altering dominance (e.g., species abundance) and ultimately resource monopolisation by superior competitors, particularly in these communities that have been invaded by exotic species (Table 1). Although species composition changes drastically, the effective number of species, that is, the number of equally common species remains equivalent in areas with and without goats (Fig. 3). Therefore, overall community richness is maintained with grazing.





Left: Fig. 1. Differences in species composition due to grazing by goats. The biplot is a representation of the standardized canonical coefficient scores for two canonical functions (discriminant function analysis). The first function explains 98% of the variation and the second 2%. A species gradient is illustrated by the interrelationship between treatments (Exclusion and Grazing) and the quadrants sampled (points) along the first function. Certain species are found only in areas without goats such as Chuquiraga ulicina (Chuli), Jarava plumosa (Japlu) and Atriplex repanda (Atrep), were as, Psilocarphus brevissimus (Psbre), Linaria canadensis (Lican), and Aristolochia chilensis (Archi) are more common in areas with grazing. Color red represents quadrants in areas without goats and blue quadrants in areas with goats. Small circles represent 95% confident limit intervals of the mean value at each function for each treatment and big circles include 50% of the quadrants within each treatment. Right: Fig. 2. Rank abundance curves and the dominance hierarchy of species for areas with (red) and without goats (blue). Species dominance changes between treatments. Except for Bromus berteronianus (Brber), the rest of the dominant species change their order of dominance and species like Aristolochia chilensis and Bromus sp. (Brpmo) become important in areas with goats, whereas, species like Conanthera campanulata (Cocam) and Plantago hispidula (Plhisp) lose their dominance. Labels for the five most dominant species per treatment are shown: Erodium cicutarium (Ercic), Bromus sp. (Brpmo), Medicago polymorpha (Mepol).

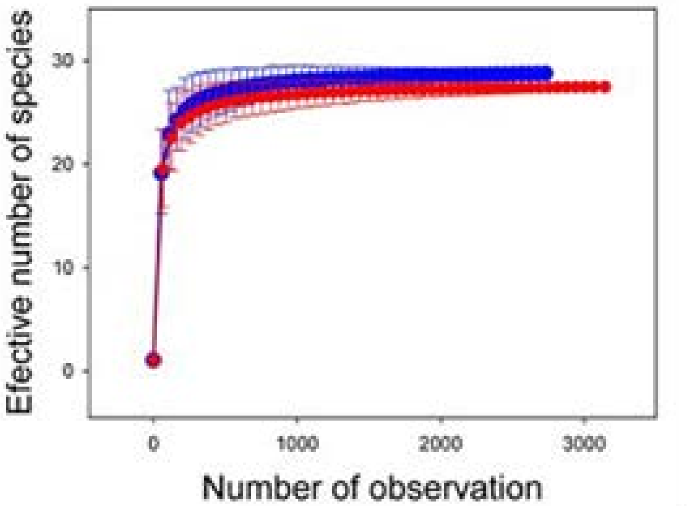


Fig. 3. Rarefaction curves for quadrats in areas with (red) and without goats (blue). The effective number of species did not differ significantly between treatments. In both cases richness increases as the number of quadrats increase (sampling effort) and then, it levels off at around 750. In the study we sampled 800 quadrats per treatment, therefore, our sample effort was adequate for capturing richness in the area.

-Grazing, life form and community structure

Although goats do not change overall community richness, at the functional group level (i.e., life form) goats do affect richness. Goats reduce the number of species for shrubs, geophytes and grasses (Fig. 4, top). The biggest group, herbs, remains the same; but given that species composition in this group changes significantly (see above), species of herbs that are lost are replaced by exotics keeping richness levels high. Moreover, grazing reduces abundance for geophytes and vines (Fig. 4, bottom). These groups of species are the most affected by grazing and are the ones that need more attention from a conservation perspective. It a group composed of several endemics such as *Pasithea coerulea*, *Phycella scarlatina*, *Rhodophiala phycelloides*, *Trichopetalum plumosum* and several species of *Leucocoryne* spp. Finally, grazing reduces vegetation cover, but mainly through an effect on shrubs (Fig. 5). Shrubs are reduced significantly and most of the remaining shrubs in the presence of goats are species with spines like *Proustia cuneifolia*, *Adesmia microphylla* and *Acacia caven* and/or contain secondary compounds like *Senna cummingii*. Therefore, grazing is highly associated with decreases in certain important functional groups. Areas with grazing experience greater herbivory of palatable species and, in turn, strongly modify species abundance in the community. This information is vital to determine the identity and number of species liable to grazing and assess regional species declines. Moreover, field observations indicate that there are effects on plant growth and reproduction as well. Individuals mainly herbs and shrubs, flower more and/or flowers a consumed less in the absence of goats (personal observation) contributing better to recruitment.

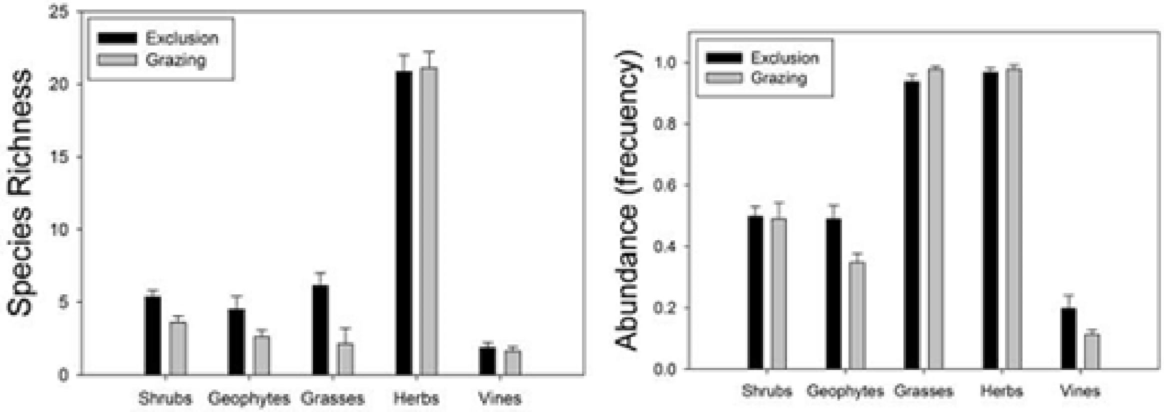


Fig. 4. Species richness (top) and abundance (bottom) according to life form in areas with and without grazing. Richness decreases with grazing for shrubs, geophytes and grasses. Richness for the most speciose group (Herbs) remains unchanged. Finally, Grasses and herbs are the most abundant groups but grazing affects geophytes and vines reducing their abundance.

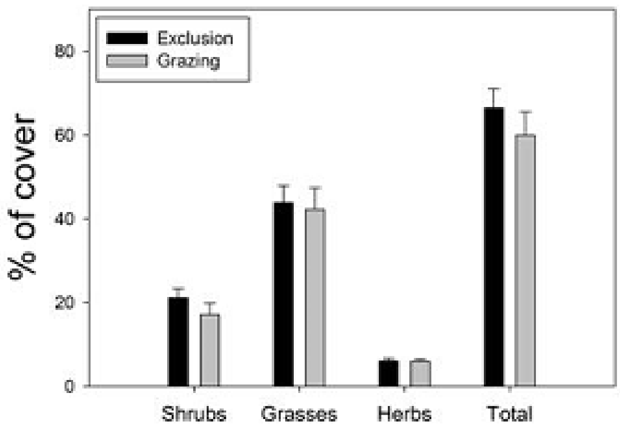


Fig. 5. Plant cover according to life form in areas with and without grazing. Total cover is reduced mainly by the effect through loss of shrub cover in the presence of goats.

b) Objective 2: Generate a list of plant species present in the area and highlight those threatened by overgrazing

Sampling of plots revealed a total of 99 plant species thus far. Sampling will continue this coming flowering season and we expect to include at least 30 species more to the list. With these species records we not only assess the impact of grazing on plant community but also provide a preliminary status of the area in terms of vulnerable species and introductions of exotics. Thus far, we have identified 20 introduced species (~20% of the species pool), mostly herbs (15 species, ~15%) followed by grasses (five species, ~5%). This is a huge proportion of the total species pool and careful monitoring should be considered on some of them, given their high abundance and potential to become invasive (e.g., *Erodium cicutarium* and *Medicago polymorpha*).

The list also reveals an important group of species, geophytes. This group is composed of at least 10 species, all native and mostly endemic to the region. There is great lack of information on all of these species despite being restricted to the region. With this study, we have provided information on the impact of grazing on this group of species. All geophytes, except for *Conanthera campanulata* are absent or rare in areas with goats. This group is highly sensitive to trampling, herbivory, soil compaction and desiccation.

Table 1. Preliminary list of plant species presents in the study area. For each species taxomic status, origin and conservation status is shown. WR = without risk, VU = Vulnerable, LI = least information. In red are exotic species.

Species	Genus	Family	Life form	Origin	Conservation status
Conanthera campanulata	Conanthera	Tecophilaeaceae	Geophyte	Native	WR
Gethyum cuspidatum	Gethyum	Amaryllidaceae	Geophyte	Native	VU
Leucocoryne spp	Leucocoryne	Amaryllidaceae	Geophyte	Native	WR
Olsynium junceum	Olsynium	Iridaceae	Geophyte	Native	WR
Oziroe biflora	Oziroe	Asparagaceae	Geophyte	Native	WR
Pasithea caerulea	Pasithea	Liliaceae	Geophyte	Native	WR
Phycella scarlatina	Phycella	Amaryllidaceae	Geophyte	Native	WR
Rhodophiala phycelloides	Rhodophiala	Amaryllidaceae	Geophyte	Native	WR
Tecophilaea violiflora	Tecophilaea	Tecophilaeaceae	Geophyte	Native	WR
Trichopetalum plumosum	Trichopetalum	Laxmanniaceae	Geophyte	Native	WR
Aristida adscensionis	Aristida	Poaceae	Grass	Native	WR
Avena barbata	Avena	Poaceae	Grass	Alien	
Avena sativa	Avena	Poaceae	Grass	Alien	
Bromus berteroanus	Bromus	Poaceae	Grass	Native	WR
Jarava plumosa	Jarava	Poaceae	Grass	Native	WR
Lamarckia aurea	Lamarckia	Poaceae	Grass	Alien	
Rostraria cristata	Rostraria	Poaceae	Grass	Alien	
Vulpia myuros	Vulpia	Poaceae	Grass	Alien	
Adesmia filifolia	Adesmia	Fabaceae	Herb	Native	WR
Adesmia tenella	Adesmia	Fabaceae	Herb	Native	WR
Calendula tripterocarpa	Calendula	Asteraceae	Herb	Alien	
Camissonia dentata	Camissonia	Onagraceae	Herb	Native	WR

Cardionema ramosissimum	Cardionema	Caryophyllaceae	Herb	Native	WR
Chaetanthera linearis	Chaetanthera	Asteraceae	Herb	Native	WR
Chaetanthera glabrata	Chaetanthera	Asteraceae	Herb	Native	WR
Chiropetalum berterianum	Chiropetalum	Euphorbiaceae	Herb	Native	WR
Cistanthe sp	Cistanthe	Portulacaceae	Herb	Native	LI
Clarkia tenella	Clarkia	Onagraceae	Herb	Native	WR
Corrigiola squamosa	Corrigiola	Caryophyllaceae	Herb	Native	WR
Crassula closiana	Crassula	Crassulaceae	Herb	Native	VU
Cryptantha glomerata	Cryptantha	Boraginaceae	Herb	Native	WR
Cryptantha linearis	Cryptantha	Boraginaceae	Herb	Native	VU
Cyclospermum laciniatum	Cyclospermum	Apiaceae	Herb	Native	WR
Erodium cicutarium	Erodium	Geraniaceae	Herb	Alien	
Eryngium coquimbanum	Eryngium	Apiaceae	Herb	Native	WR
Fumaria parviflora	Fumaria	Papaveraceae	Herb	Alien	
Galenia pubescens	Galenia	Aizoaceae	Herb	Alien	
Galium aparine	Galium	Rubiaceae	Herb	Alien	
Gamochaeta sp1	Gamochaeta	Asteraceae	Herb	Native	VU
Gamochaeta sp2	Gamochaeta	Asteraceae	Herb	Native	VU
Gamochaeta suffruticosa	Gamochaeta	Asteraceae	Herb	Native	VU
Gilia laciniata	Gilia	Polemoniaceae	Herb	Native	WR
Glandularia sulphurea	Glandularia	Verbenaceae	Herb	Native	WR
Helenium urmenetae	Helenium	Asteraceae	Herb	Native	WR
Herniaria cinerea	Herniaria	Caryophyllaceae	Herb	Alien	
Krameria cistoidea	Krameria	Krameriaceae	Herb	Native	WR
Lastarriaea chilensis	Lastarriaea	Polygonaceae	Herb	Native	WR
Linaria canadensis	Linaria	Scrophulariaceae	Herb	Alien	
Madia sativa	Madia	Asteraceae	Herb	Native	WR
Malesherbia humilis	Malesherbia	Passifloraceae	Herb	Native	WR
Malva parviflora	Malva	Malvaceae	Herb	Alien	
Medicago polymorpha	Medicago	Fabaceae	Herb	Alien	
Microsteris gracilis	Microsteris	Polemoniaceae	Herb	Native	WR
Montiopsis trifida	Montiopsis	Portulacaceae	Herb	Native	WR
Moscharia pinnatifida	Moscharia	Asteraceae	Herb	Native	WR
Oxalis micrantha	Oxalis	Oxalidaceae	Herb	Native	WR
Oxalis rosea	Oxalis	Oxalidaceae	Herb	Native	WR
Pectocarya dimorpha	Pectocarya	Boraginaceae	Herb	Native	WR
Plagiobothrys collinus	Plagiobothrys	Boraginaceae	Herb	Native	VU
Plantago hispidula	Plantago	Plantaginaceae	Herb	Native	WR
Pleurophora pusilla	Pleurophora	Lythraceae	Herb	Native	WR
Psilocarphus brevissimus	Psilocarphus	Asteraceae	Herb	Native	WR
Quinchamalium chilense	Quinchamalium	Schoepfiaceae	Herb	Native	WR

Schizanthus litoralis	Schizanthus	Solanaceae	Herb	Native	WR
Silene gallica	Silene	Caryophyllaceae	Herb	Alien	
Solanum gaudichaudii	Solanum	Solanaceae	Herb	Native	VU
Sonchus asper	Sonchus	Asteraceae	Herb	Alien	
Sonchus oleraceus	Sonchus	Asteraceae	Herb	Alien	
Spergularia media	Spergularia	Caryophyllaceae	Herb	Alien	
Sphaeralcea obtusiloba	Sphaeralcea	Malvaceae	Herb	Native	WR
Stachys truncata	Stachys	Lamiaceae	Herb	Native	WR
Stellaria media	Stellaria	Caryophyllaceae	Herb	Alien	
Taraxacum oficinalis	Taraxacum	Asteraceae	Herb	Alien	
Triptilium gibbosum	Triptilium	Asteraceae	Herb	Native	LI
Viola pusilla	Viola	Violaceae	Herb	Native	WR
Acacia caven	Acacia	Fabaceae	Shrub	Native	WR
Adesmia microphylla	Adesmia	Fabaceae	Shrub	Native	WR
Anisomeria littoralis	Anisomeria	Phytolaccaceae	Shrub	Native	WR
Atriplex repanda	Atriplex	Amaranthaceae	Shrub	Native	WR
Baccharis paniculata	Baccharis	Asteraceae	Shrub	Native	WR
Baccharis pingraea	Baccharis	Asteraceae	Shrub	Native	WR
Bridgesia incisifolia	Bridgesia	Sapindaceae	Shrub	Native	VU
Caesalpinia angulata	Caesalpinia	Fabaceae	Shrub	Native	VU
Chuquiraga ulicina	Chuquiraga	Asteraceae	Shrub	Native	WR
Colliguaja odorifera	Colliguaja	Euphorbiaceae	Shrub	Native	WR
Ephedra chilensis	Ephedra	Ephedraceae	Shrub	Native	WR
Ephedra gracilis	Ephedra	Ephedraceae	Shrub	Native	VU
Flourensia thurifera	Flourensia	Asteraceae	Shrub	Native	WR
Gutierrezia resinosa	Gutierrezia	Asteraceae	Shrub	Native	WR
Haplopappus cerberoanus	Haplopappus	Asteraceae	Shrub	Native	WR
Heliotropium stenophyllum	Heliotropium	Boraginaceae	Shrub	Native	WR
Lithrea caustica	Lithrea	Anacardiaceae	Shrub	Native	WR
Proustia cuneifolia	Proustia	Asteraceae	Shrub	Native	WR
Senna cummingii	Senna	Fabaceae	Shrub	Native	WR
Aristolochia chilensis	Aristolochia	Aristolochiaceae	Vine	Native	WR
Dioscorea humifusa	Dioscorea	Dioscoreaceae	Vine	Native	WR
Diplolepis boerhaviifolium	Diplolepis	Apocynaceae	Vine	Native	VU
Muehlenbeckia hastulata	Muehlenbeckia	Polygonaceae	Vine	Native	WR
Sicyos baderoa	Sicyos	Cucurbitaceae	Vine	Native	WR

c) Objective 3: Quantify changes in species interactions key for community structure

We described how overgrazing modifies species interaction patterns based on changes in species co-occurrence between areas with and without goats. Goats can change the vegetation, but nothing was known, before this study, about how grazing alters species interactions important for structuring communities (i.e., facilitation and competition). Interactions are a dominant driver of community dynamics and structure, and therefore, unravelling their prevalence under different grazing regimes was key for management actions and conservation.

Changes in species interactions were analyzed via null models based on a co-occurrence index (checkerboard score, C-score) and presence-absence matrices obtained from plots. This index measures how often the different pairs of species appear in the same quadrats. Results were compared between areas with and without goats based on a standardized effect size (SES), which detects changes from less co-occurrence than expected by chance (competition) given by positive values, to greater co-occurrence (facilitation) given by negative values. Less co-occurrence is indicative of competition (SES values greater than 2), while more co-occurrence is of facilitation (SES values less than -2).

Our results indicate that grazing by goats are altering species co-occurrence patterns and, therefore, modifying the way species are interacting to structure communities. In the presence of goat's plant species tend to co-occur more than expected by chance (SES = -2.47, p = 0.0078), which indicates that facilitation is an important mechanism. Facilitation reduces the negative impacts of a stressful environment and promotes seed germination and survival by alleviating stressful environmental conditions, in this case grazing by goats. These patterns are common in arid environments. When goats are excluded, however, co-occurrence patterns change significantly. In areas without grazing, species tend to co-occur randomly as indicated by the SES calculated from the C-scores (SES = 0.61, p = 0.7274). This effect can potentially alter community dynamics and change community structure in the long run. There are species, mainly herbs and vines, that under stress by herbivory need to be facilitated in order to establish and maintain viable populations. Unfortunately, in areas with grazing, *Gutierrezia resinosa* is the dominant shrub. This species is not palatable because it produces a toxic resin, and is therefore, avoided by goats. This shrub, however, serves poorly as a nurse plant because it is small, has a small canopy cover and is rarely associated with other species. Goats tend to target shrubs that are better nurse plants when grazing and remove a considerable amount of shrub biomass (e.g., *Flourensia thurifera*, *Bridgesia incisifolia* and *Haplopappus cerberoanus*). Consequently, quantifying these changes helps identify the loss of keystone plant species important for community structure and dynamics (e.g., nurse plants).

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

We had free access to the area and all the support of the community in terms of logistics, access and information. Our team was responsible of collecting the data in the field, however. The project allowed the establishment of permanent plots that can be used in the future for long-term monitoring of the vegetation by community members. We also conducted an initial workshop with community members to identify areas where plots should be established and before the study concludes, another workshop will be organized to present results and provide guidelines for management and conservation strategies of the area.

5. Are there any plans to continue this work?

Yes, in addition to long-term monitoring of the vegetation, we plan to continue monitoring established plots for new species to constantly update our plant list given that not all plant species bloom or emerge every year (e.g., annual herbs). The list will be further used to generate phylogenetic relations and identify changes in phylogenetic diversity between areas with and without grazing. It is well established that in natural community's species diversity does not necessarily reflect phylogenetic diversity (i.e., evolutionary history) or vice versa. Thus, it has become important to explicitly incorporate species differences in evolutionary history, rather than just species numbers, into conservation prioritization and to yield insights into the structuring of ecological communities by threatening factors such as grazing by goats.

We are currently measuring plant traits related to grazing (i.e., life history, functional traits and geographic origin) for abundant species. There is a lack of empirical tests of several hypotheses linking plant traits with grazing and given that plant functional type classifications and response rules need to be specific to regions with different climate and herbivory history, this is an important first step for the Coquimbo region.

Finally, during fieldwork we have identified a native fossorial herbivore rodent (*Spalacopus cyanus*) whose foraging activities and subterranean tunnel construction cause significant soil disturbances resulting in the deposition of soil mounds. These soil disturbances significantly increase seedling emergence and establishment. Native herb and geophyte richness and abundance is significantly greater near soil mounds compared to open areas. Moreover, dominant grasses (e.g., *Bromus berteronianus*) are less abundant which allows the establishment of less competitive species and; thus, increases richness of native species. Therefore, *S. cyanus* is a keystone species functioning as an ecosystem engineer and influencing community structure. Rodent mounds, however, are far less common in areas with goats due to soil compaction, trampling and stamping. Thus, in addition to their direct influence on plants, goats seem to be changing community structure through an effect over other animal species important for the maintenance of natural communities. In the near future we plan to evaluate this indirect effect over plant community structure.

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

Results from this study will be presented at the tri-national ecological conference to be held in Chile in 2013. In addition, we are preparing a manuscript to be submitted to the journal *Community Ecology* describing the effects of grazing by goats on plant community structure. We will also work on submitting a manuscript describing the effects of grazing on community level species interaction to the *Journal of Arid Environments*. Finally, we are preparing a report to be handed to the local community, and the Herbarium at Universidad de la Serena suggesting guidelines for land management and a preliminary list of plant species with information showing the identity and number of species liable to grazing.

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

Funding from the RSG has been used so far for 14 months. The initial project timescale, however, was planned for an 18-month period. During this time period we planned to include two field seasons, each running from September to December. Numerous plant species emerge and bloom right after the winter season, that is, after rain pulses have occurred; thus, sampling and collecting was restricted to these months. Currently, we are starting the second field season and the project is intended to finalise in January of 2013.

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
4x4 vehicle	4160	4065.6	94.4	Purchase of a vehicle was cheaper than using a rental. The vehicle will remain for the long-term component of the project and maintenance will be provided by Universidad de La Serena (ULS).
Fuel	560	560	0	We originally anticipated to spend a total of 1600£ on fuel. We used all £560 provided by RSG plus £295.4 provided by ULS. The remaining costs on fuel needed for the second field season will be covered by ULS.
Field guides	100	80.5	19.5	We purchased two field guides and costs were lower than anticipated.
Food expenses for fieldwork	600	556.4	43.6	We originally anticipated to spend a total of 800£ on food. So far, we used £556.4. The remaining costs needed for the second field season will be covered by the difference (£43.6) plus funds provided by ULS.
Field equipment (e.g., flagging tape, Plant press, field books, measuring tape, clippers, frames, stakes, etc.)	470	442.5	27.5	We purchased all the needed equipment and costs were lower than anticipated.
Shipping and handling fees	100	32	68	We used part of these funds to cover shipping and handling fees of the equipment requested. The remaining amount will be used to cover publication costs.
Total	**5990**	**5737**	**253**	**The difference will be used for the second field season for fuel and food. Exchange rate: 1 £ sterling = 762.5 Chilean Pesos (September 1, 2012)**

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

We are going to continue with fieldwork this year until December to expand our plant list in both areas with and without goats and estimate grazing pressure. Once we have a good idea of the differences in biodiversity patterns generated by goats and their relative impact, a key next step is to incorporate a historical component to the project. It is well known that grazing can function as an ecological filter where plant communities influenced by herbivores are composed mainly of species that are less palatable. If plant communities filtered by goats are closely related phylogenetically, that is, they share the same evolutionary history, then goats will not only be modifying biodiversity patterns, but also reducing phylogenetic diversity. This highlights the fact that we should not only protect the greatest number of species possible, but also protect sets of species that are most taxonomically distinct or that represent the greatest possible variety of biological features.

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?

We have constantly acknowledged RSG as the source of our funding at any informal meeting, presentation or workshop we attended or organized. Thus far, however, we have not had the opportunity to use the RSG logo given that we are still collecting data. We do plan to use the logo in every talk in which we present our results. We will also attach it to the reports and plant checklists that we put together for the community and the herbarium at ULS. Finally, we will include the logo on the lab webpage where we describe the project and show the main findings of the study. In addition, RSG will be acknowledged in every scientific publication that is produced with the information generated by the project.