



## Original article

## Grazing impact on desert plants and soil seed banks: Implications for seed-eating animals

Rodrigo G. Pol<sup>a,\*</sup>, M. Cecilia Sagario<sup>b</sup>, Luis Marone<sup>a,c</sup><sup>a</sup> Desert Community Ecology Research Team (Ecodes), IADIZA-CONICET, Casilla de Correo 507, 5500 Mendoza, Argentina<sup>b</sup> Desert Community Ecology Research Team (Ecodes), Departamento de Ecología, Genética y Evolución, FCEyN, Universidad de Buenos Aires, Buenos Aires, Argentina<sup>c</sup> ICB, Instituto de Ciencias Básicas, Universidad Nacional de Cuyo, Mendoza, Argentina

## ARTICLE INFO

## Article history:

Received 11 March 2013

Accepted 30 November 2013

Available online 20 December 2013

## Keywords:

Cascade causality

Disturbance ecology

Livestock diet

Seed-eating animals' diet

## ABSTRACT

We assess whether the knowledge of livestock diet helps to link grazing effects with changes in plant cover and soil seed bank size, aiming at inferring the consequences of grazing on seed-eating animals. Specifically, we test whether continuous and heavy grazing reduce the cover, number of reproductive structures and seed reserves of the same grass species whose seeds are selected and preferred by granivorous animals in the central Monte desert, Argentina. Grass cover and the number of grass spikes usually diminished under grazing conditions in the two localities studied (Telteca and Ñacuñán), and soil seed bank was consistently reduced in all three years evaluated owing to a decline of perennial grass and forb seeds. In particular, the abundance of those seeds selected and preferred by birds and ants (in all cases grass species) declined 70–92% in Ñacuñán, and 52–72% in Telteca. Reduction of perennial grass cover and spike number in grazed sites reinforced the causal link between livestock grazing and the decline of grass soil seed reserves throughout failed plant reproduction. Grass seed bank depletion suggests that grazing may trigger a “cascade” of mechanisms that affect the abundance and persistence of valuable fodder species as well as the availability of seed resources for granivorous animals.

© 2013 Elsevier Masson SAS. All rights reserved.

## 1. Introduction

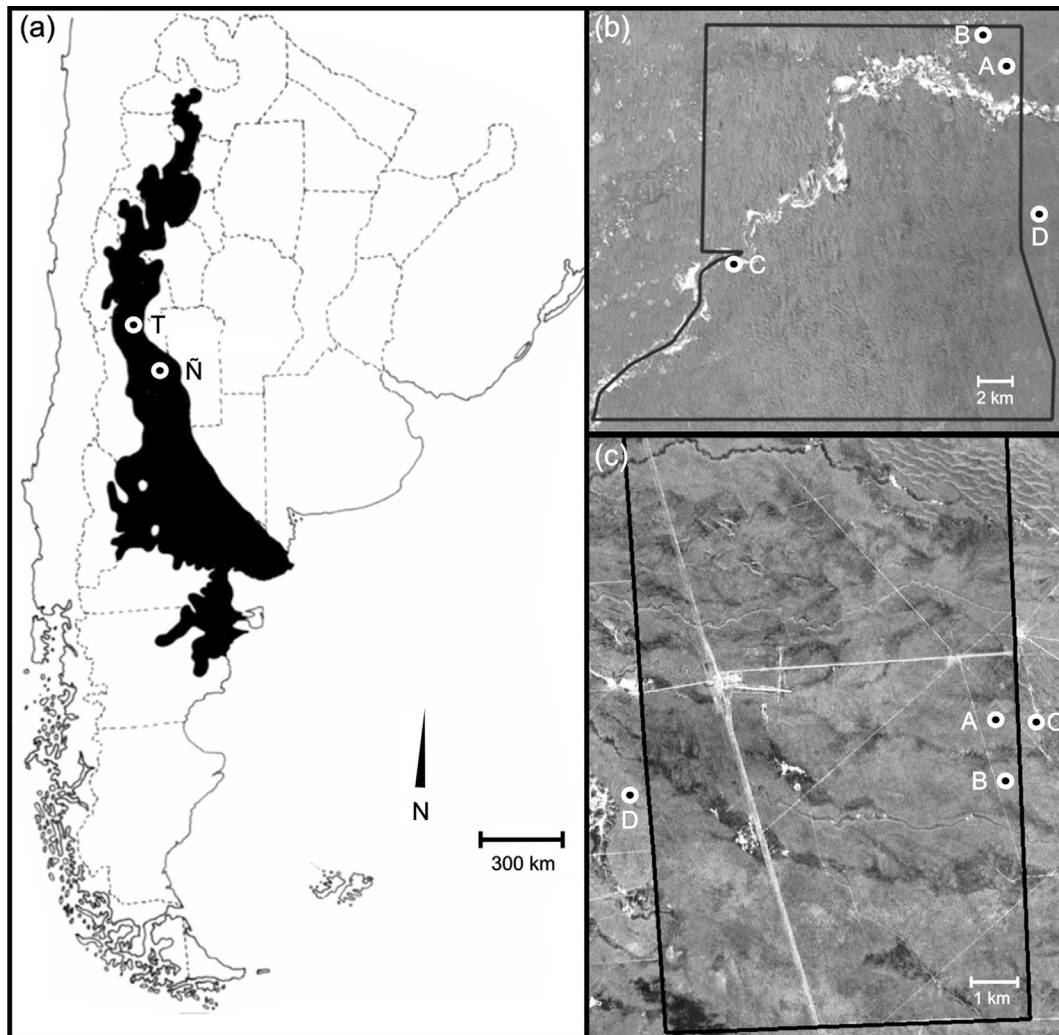
Grazing by domestic animals is the most globally widespread land use, and a major driver of global vegetation change (Díaz et al., 2007; Steinfeld et al., 2006). The impact of grazing differs among plant communities (Oesterheld and Semmartin, 2011), although some response patterns appear to be reasonably consistent for arid and semiarid vegetation. The most common reaction of woody plants and forbs is a neutral response (Díaz et al., 2007), but intense livestock grazing reduces the cover and abundance of tall perennial grass species with tussock architecture (Bisigato and Bertiller, 1997; Díaz et al., 2007; Dreber and Esler, 2011; Gonnet, 2001; Jones, 2000; Milesi et al., 2002; Tessema et al., 2012). Intense grazing decreases the allocation to reproductive structures by diminishing photosynthetic surfaces and reproductive tillers, or removing rudimentary or well formed inflorescences (Butler and Briske, 1988;

Gutman et al., 2001; Noy-Meir and Briske, 1996). A decline in seed production can lead to reduced soil seed banks (Dreber and Esler, 2011; O'Connor and Pickett, 1992; Sternberg et al., 2003), especially under continuous grazing during flowering and seed-set periods (Sternberg et al., 2003).

Soil seed bank is an essential part of arid and semiarid communities (e.g., Gutiérrez and Meserve, 2003; Marone et al., 2000a), where seeds are the only means of dispersal and access to new regions for many plant species (Kemp, 1989), and the main food for granivorous animals like ants, birds and rodents (Kelt et al., 2004; Marone et al., 2000b). Several bird species in the central Monte desert (*Zonotrichia capensis*, *Diuca diuca*, *Saltatricula multicolor*, *Poospiza torquata*, *Poospiza ornata*, *Phrygilus carbonarius*) consume and select medium-sized to large seeds (0.2–1.0 mg) of several perennial grasses like *Setaria leucopila*, *Pappaphorum* spp., *Trichloris crinita*, *Digitaria californica*, *Diplachne dubia* and *Aristida* spp. all year round but, especially, in autumn and winter (Marone et al., 1998b, 2008). Birds also prefer grass seeds to forb seeds of similar size (Cueto et al., 2001, 2006) and, although they eat a lot of the tiny *Sporobolus cryptandrus* seeds (0.07 mg) in the field, laboratory trials have shown that these seeds are a less-preferred food item (Cueto et al., 2006). The specialized granivorous Monte ants

\* Corresponding author. Present address: Desert Community Ecology Research Team (Ecodes), Argentine Institute for Arid Zones Research (IADIZA), Casilla de Correo 507, 5500 Mendoza, Argentina. Tel./fax: +54 261 5244116.

E-mail address: [rgpolo@yahoo.com.ar](mailto:rgpolo@yahoo.com.ar) (R.G. Pol).



**Fig. 1.** Map showing study localities: Telteca Natural Reserve (T) and Biosphere Reserve of Ñacuñán (Ñ) in the Monte desert of Argentina (black area; a). A detailed view of study localities (Telteca, b; Ñacuñán, c) based on high-resolution Google Earth imagery indicates the location of study sites that have been subjected to nil or low (A and B) and high (C and D) grazing pressure. The boundary of Telteca and Ñacuñán reserves are indicated with black lines.

*Pogonomyrmex rastratus*, *Pogonomyrmex mendozanus* and *Pogonomyrmex inermis* consume >90% of grass seeds in summer and autumn (Pirk et al., 2009b). Most of them are medium-sized to large seeds of *Aristida* spp., *T. crinita*, *Pappaphorum* spp., *D. californica*, and *S. leucopila*, whereas the smaller seeds of *Stipa ichu* and *S. cryptandrus* are infrequent in diets of those ants (Pirk et al., 2009b). Choice experiments confirmed that *P. rastratus*, *P. mendozanus* and *P. inermis* prefer grass seeds (e.g., *Aristida* spp., *Pappaphorum* spp. and *S. leucopila*) to both forb and shrub seeds (Pirk and Lopez de Casenave, 2011), and medium-sized and large grass seeds to smaller seeds (Pirk and Lopez de Casenave, 2010). Other ant species like *Pheidole spininodis* have a very similar diet to that of the three sympatric *Pogonomyrmex* species (Pirk et al., 2009a).

Diet of granivorous animals widely depends on grass species that are heavily consumed by domestic livestock in the central Monte desert, where cattle and goat grazing is the most widespread land use, with an average stocking rate of 28 ha per large stock unit, year-long (Guevara et al., 1997). Cow's diet in the full rainy season in summer (i.e., when most grasses are setting seeds; Pol et al., 2010) includes 10% shrubs, 84% grasses and 6% forbs, while in the dry winter season these proportions average 49%, 45% and 6%, respectively. Perennial grass species in cow's summer diet include

*Panicum urvilleanum*, *S. cryptandrus*, *Chloris castilloniana*, *Pappaphorum philippianum*, *D. californica*, *S. leucopila*, *Aristida* spp., together with the annual short grass *Bouteloua aristidoides* (Guevara et al., 1997). Although Guevara et al. (1997) do not mention the perennial *T. crinita* in cow's diet, this species is one of the most important forage grasses in several arid and semiarid areas of Argentina, including the Monte (Greco and Cavagnaro, 2002; Quiroga et al., 2010). Goats in the central Monte desert and neighboring regions mainly consume shrubs and trees, which together represent >60% of the annual diet (Allegretti et al., 2012; Dayenoff et al., 1997). Goat's diet, notwithstanding, also includes grasses which can constitute >30% of summer diet in some regions (Dayenoff et al., 1997; Gründwaldt et al., 1994). The prevalent grass species in goat's diet are *P. urvilleanum*, *Pappaphorum* spp., *T. crinita*, *Setaria* spp. and *Aristida* spp. (Allegretti et al., 2012; Dayenoff et al., 1997; Gründwaldt et al. 1994).

Given the patterns of plant consumption by cows and goats in the central Monte desert, a general effect (e.g., consumption of leaves, tillers, panicles and seeds) of livestock grazing on grass soil seed bank and ultimately their consumers is expected. We test the response of tall perennial grass plants and their seeds to grazing, and assess whether the knowledge of livestock diet helps to link such responses with the plausible mechanisms underpinning them

Download English Version:

<https://daneshyari.com/en/article/4380750>

Download Persian Version:

<https://daneshyari.com/article/4380750>

[Daneshyari.com](https://daneshyari.com)