

Grazing Impact on Plant Seed Production in Southern Mongolia

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Abstract

Nomadic livestock husbandry practices have a long history in Mongolia and still represent the main form of land use. Because of increasing livestock numbers, the danger of overgrazing and steppe degradation is on the rise. Nevertheless, studies on the influence of herbivores are rather rare in southern Mongolia and existing studies focus mainly on biomass production rather than on the consequences to reproduction of key steppe plants. We tested the effect of grazing by livestock and small mammals on the production and related seed abundance of three of the most dominant steppe plant species of the Mongolian desert steppes: *Agropyron cristatum*, *Stipa krylovii* and *Artemisia frigida*. The fieldwork took place in summer 2006 in the Gobi Gurvan Saykhan National Park, during which we estimated the extent of granivory and compared the abundance of inflorescences on grazed/ungrazed sites and the harvesting preferences of small mammals. Herbivory has a tremendous impact on flower and, subsequently, seed production of the three studied species. Flowers and fruits are browsed at levels of up to 100%. However, grazing pressure is plant-specific; both livestock and small mammals have feeding preferences, and pikas (*Ochotona pallasii*) prefer taxa such as *Stipa* spp. Granivory, in contrast does not seem to play any role for the three studied species growing in the southern Mongolian steppes.

Key words: *Agropyron cristatum*, *Artemisia frigida*, grazing, livestock, Mongolia, *Ochotona pallasii*, *Stipa krylovii*

Introduction

In natural grasslands herbivores play a key role because of their impact on the structural and functional elements of the ecosystem (McNaughton, 1985; Whicker & Detling, 1988). Large populations of livestock, such as bison in North America or zebras on the African savannas (Frank *et al.*, 1998), consume more than 50% of the aboveground phytomass. A second important mammal group in the world's drylands is the small mammals (Kinlaw, 1999). In Mongolia, rodents and lagomorphs (mainly *Ochotona* spp.) are widespread in all types of steppe. Their impact on the vegetation is pronounced, as their burrowing activity affects large areas (Zielinski, 1982; Samjaa *et al.*, 2000; Wesche *et al.*, 2007) making them important ecosystem engineers (Jones *et al.*, 1994). Small mammals have largely similar food requirements as larger ungulates and compete with livestock for fodder sources (Retzer, 2007).

In central Asia, some studies analyzed grazing effects by means of assessing the loss of biomass (Zhao *et al.*, 2004; van Staalduinen, 2005), the

development of new plant communities (Li *et al.*, 2006), or the change of soil parameters (Su *et al.*, 2003; Schneider *et al.*, 2005; Stumpp *et al.*, 2005; Pei *et al.*, 2006). The impact of herbivores on plant reproductive cycles has hardly been studied, and effects on flowers and seeds are largely unknown. We analyzed the influence of livestock and small mammals on the three dominant desert steppe species, *Agropyron cristatum*, *Stipa krylovii* and *Artemisia frigida*. Specifically, we addressed the following questions:

- How is seed production influenced by grazing?
- Do small mammals favour certain plant species?
- Do herbivores harvest seeds of the three studied species as a fodder source?

Material and Methods

Study area and selected species. The field experiments were performed in the Gobi Gurvan Saykhan National Park in southern Mongolia in 2006. This park was designated in the 1990's,