Plant Ecology **00:** 1–10, 2004.

Effect of grazing on community structure and productivity of a Uruguayan grassland

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Received 13 November 2003; accepted in revised form 25 October 2004

Key words: Biomass, Diversity, Grazing, Primary production, Rio de la Plata

Abstract

Grasslands and their grazers provide some of the most compelling examples for studying the relationship between diversity, productivity, and disturbance. In this study, we analyzed the impact of grazing-induced changes in species composition and community structure upon the productivity of a grassland in the Campos region, Uruguay. We compared three treatments: a continuously grazed area, a 9-year old exclosure to domestic herbivores, and grazing-simulated plots inside the exclosure, which were clipped so that their standing biomass resembled that of the grazed area. We studied the community composition of the grazed and ungrazed situations, and determined biomass and above-ground net primary production (ANPP) of the three treatments during 1 year. Grazed plots had higher species richness and diversity than the exclosure. Grazing resulted in the replacement of some cool-season, tussock grasses by warm-season, prostrate grasses. ANPP was 51% higher under grazing than in the exclosure, but the grazing-simulated plots inside the exclosure were the most productive treatment, 29% higher than the grazed plots. Thus, two components of grazing effect may be postulated for this grassland. The structural component resulted in higher ANPP, probably due to the elimination of standing dead biomass. The species composition component resulted in lower ANPP once the structural component was controlled, probably due to the shift to warm-season phenology and prostrate habit. Our findings contrast with a similar experiment carried out in the neighbouring Flooding Pampa region, which suggests that the relationship between grazing and community structure and function is difficult to generalize.

Introduction

Grazing is a key disturbance that shapes the structure and function of grassland communities (McNaughton 1983a, 1985). Structurally, grazing modifies the species composition, richness, vertical profiles, plant traits, and a number of other attributes of grasslands (Noy-Meir et al. 1989; McIntyre and Lavorel 2001; Rodríguez et al. 2003). Functionally, grazing alters the flow of energy and the cycling of materials, both directly, through defoliation, trampling, and dung and urine depositions, and indirectly, through modification of species composition and species interactions (Schlesinger et al. 1990; Aguiar et al. 1996; Hobbs et al. 1996).

The relationships between a structural trait, species diversity, and a functional trait, primary productivity, is at the core of a current debate within the more general, but also current