

How Does Grazing Intensity Affect Different Vegetation Types in South African Semi-Arid Rangelands?

Daniela H. Haarmeyer, Ute Schmiedel, Jürgen Dengler, Britta M. Bösing

Plant Systematics and Vegetation Ecology, Biocentre Klein Flottbek, University of Hamburg, Ohnhorststr. 18, 22609 Hamburg, Germany
daniela.haarmeyer@yahoo.de

Introduction

Aims and Research Question

After about 2000 years of transhumant small stock farming (sheep and goat) by !KhoiKhoi and about 200 years of commercial farming (15 ha/small stock unit), large parts of the Knersvlakte will now be turned into conservation area, managed by CapeNature (provincial conservation authorities). We therefore investigated the following research question:

Does grazing affect plant communities of different habitat types in terms of diversity, life strategy type and endemism?

The Knersvlakte (Study Area)

- Part of the Succulent Karoo Biome.
- Climate: semi-arid with winter rain (115 mm/a).
- Size: 500 km².
- Biodiversity hotspot: 1300 vascular plant species, >150 endemics.
- Quartz fields: azonal habitat (zonal: sandy-loamy soils).

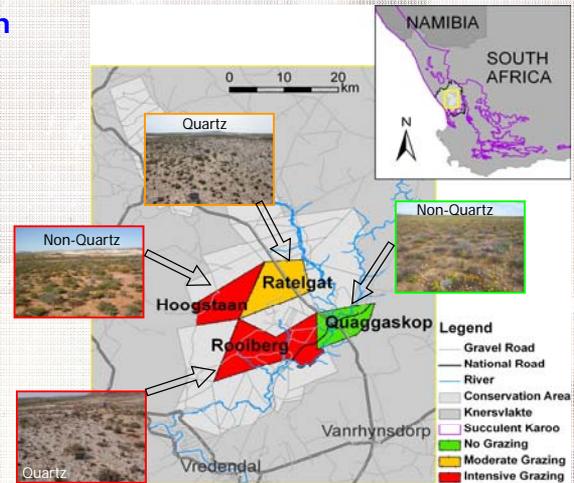


Fig. 1: Study area with the investigated farms and selected pictures of 2 quartz and 2 non-quartz plots.

Methods

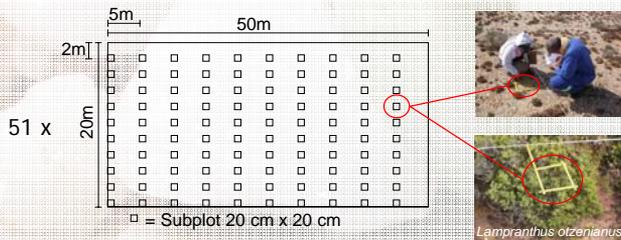


Fig. 2: Design of the 20 X 50 m plots (n=51) and pictures of 2 different subplots.

- For each of the three grazing intensities (no, moderate, high) we established 9 plots on quartz fields and 8 on non-quartz (zonal) habitats. Every plot measured 50 m x 20 m and consisted of 100 subplots, which were the actual sampling units (see Fig. 2).
- We determined all vascular plant species and their abundance rooting in the subplots and compared the grazing intensities by means of ANOVA.
- As soil salinity in quartz fields is very heterogenous, we conducted ANCOVAs with soil salinity as covariable.

Results

Abundance of Individuals (Annuals and Perennials)

- Lowest abundance of annual species was counted on moderately grazed plots (Fig. 3a+b). As this result was difficult to explain by grazing, we assume, it was biased by local variation in precipitation.
- Though the number of individuals of perennial species declined with grazing on quartz-plots (Fig. 3c), they were not affected by grazing on non-quartz plots.
- No shift towards domination of annuals in response to grazing could be detected for both habitat types.

Abundance (Endemics)

- While the vegetation on non-quartz plots did not show an effect of grazing, on quartz plots we found a negative impact of grazing on the abundance of endemic species (see Fig. 3d).

Species Richness

- Species richness did not show statistically supported effects of grazing, but there was a trend towards highest richness on ungrazed plots (Quartz p=0.282; Non-Quartz p=0.061).

Role of Soil Salinity

- ANCOVAs showed that soil salinity influenced the abundance of endemic species more than grazing.

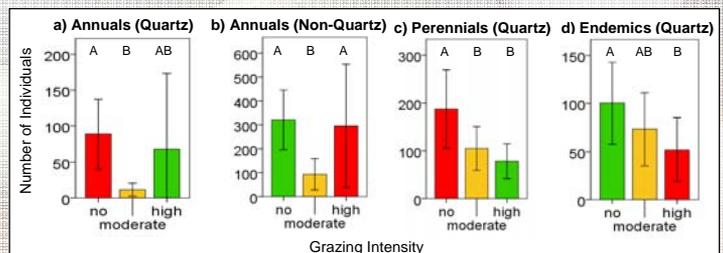


Fig. 3: Abundances of individuals of different species groups in comparison and ANOVA results.

Conclusions and Implications

- Abundance of endemic and perennial species on quartz fields is negatively affected by grazing.
- Soil properties (salinity) and precipitation have a higher impact on the vegetation than grazing.
- No effects of grazing on the measured parameters in non-quartz (zonal) habitats.

Our advise for nature conservation:

- Exclusion of domestic livestock from areas dominated by quartz fields.
- Controlled, moderate grazing on other parts of the conservation area may be permitted.