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THE IMPACT OF SHRUB ENCROACHMENT ON ANIMAL DIVERSITY (BIRD, REPTILES, MAMMALS) IN NAMIBIAN SAVANNA RANGELANDS

INTRODUCTION

Worldwide land use e.g. livestock grazing, game ranching and firewood cutting has altered vegetation composition and structural diversity of savannah rangelands (Sankaran *et al*., 2005). One of the most threatening forms of savannah degradation is heavy grazing induced shrub encroachment at the cost of perennial grasses and herbaceous vegetation (Skarpe, 1990). Clearly, these changes can negatively affect the economic value of rangelands but can also reduce species richness of plants and animals (Blaum *et al*., 2008). In the following we present the results from an animal diversity assessment (birds, reptiles and mammals) along a north south transect in Namibian savannah rangelands.

METHODS

Species richness of birds, reptiles and mammals was recorded from December to February 2007/2008 and 2008/2009 at three BIOTA savanna rangeland sites along a rainfall gradient from Keetmanshoop (150 mm) in the South over the central Highlands (300 mm) around Windhoek to the Okahandja (300 mm) region as the northernmost study area. For each study site, we selected three different habitat types characterized by different grazing impact and resulting vegetation composition and cover. Grazing intensity and shrub cover increased from habitat type 1 to habitat type 3 (Table 1).

Table 1. Percentage vegetation cover of shrubs, perennial grasses, annual grasses and herbs for the three vegetation states

Cover in %	Shrub cover	Perennial grass cover	Annual grass cover	Herb cover	Plant species richness
Habitat type 1	0–8	17–28	0–4	0–9	14
Habitat type 2	10–17	10–17	0–6	0–7	14
Habitat type 3	21–38	1–4	0–4	0–3	9

Habitat type 1 (low grazing pressure) and habitat type 3 (high grazing pressure) represent two most contrasting savanna rangeland habitat types (Skarpe, 1990), whereas, habitat type 2 stands for intermediate grazing pressure (Walker *et al*., 1981). To quantify the differences in vegetation composition and cover, we surveyed three transects (500 m) for each of the three habitat types and the three savannah rangeland sites. Percentage aerial cover of all plant species was estimated and species richness recorded.

Animal diversity and abundance of birds, reptiles and mammals was estimated by time and area constrained Visual Encounter Surveys along the same 500 m transects that were used for the vegetation survey. Additionally, small mammals (rodents) were captured on the same transects with Sherman live traps baited with a mixture of oats and peanut butter.

RESULTS AND DISCUSSION

Shrub encroachment affected species richness and abundance of all studied animal taxa (birds, mammals and reptiles) negatively (Figure 1). While mammal and reptile species richness and abundance decreased constantly with increasing shrub cover, bird species richness and abundance was significantly lower only in shrub dominated savannah habitats (habitat type 3). Similarly, plant species richness was significantly lower only in the shrub dominated habitats (Table 1).

The loss of reptile diversity and abundance can be explained by the reduction of prey availability in shrub dominated habitats (Seymour & Dean, 1999; Blaum *et al*., 2009). The loss of reptiles is likely to cascade up in the food chain because they are an important food source for small carnivores (Skinner & Smithers, 1990) and birds of prey (Fargallo *et al*., 2009). Indeed mammal and bird abundance decreased with shrub cover. This negative effect is aggravated by the decrease in plant diversity, perennial grass cover and in herbaceous cover in habitat type 2 and 3.

For both conservation and rangeland management, overgrazing and resulting shrub encroachment are of major concern, as the latter reduces both livestock carrying capacity and species diversity. Hence, livestock farmers and conservationist would benefit from actions that prevent shrub encroachment to ensure both economic profit and high species diversity.

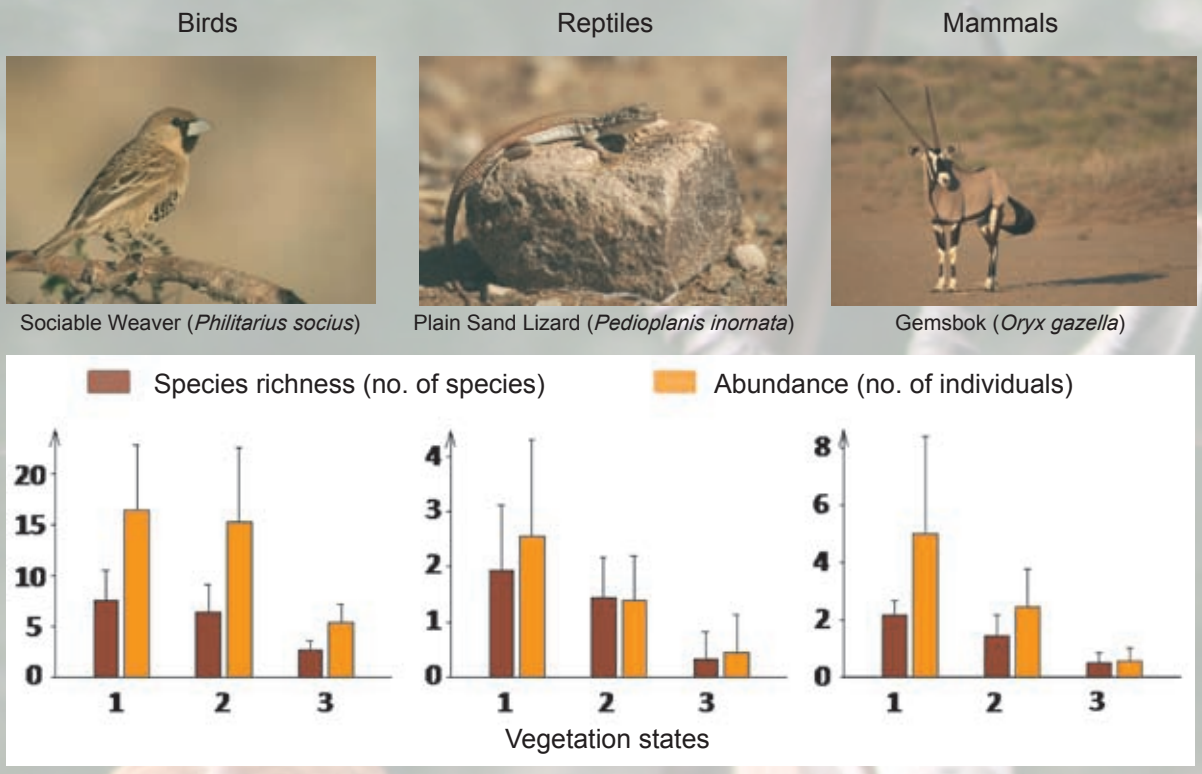

Figure 1. Species richness (no. of species) and abundance (no. of individuals) of birds, reptiles and mammals in three savannah vegetation states. Bars show mean values ± SE.

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