

# Habitat selection by large herbivores in relation to fire at the Bontebok National Park (1974–2009): the effects of management changes

T Kraaij\* and PA Novellie<sup>2</sup>

<sup>1</sup> Scientific Services, South African National Parks, PO Box 176, Sedgefield 6573, South Africa

<sup>2</sup> Conservation Services Division, South African National Parks, PO Box 787, Pretoria 0001, South Africa

\* Corresponding author, e-mail: TinekeK@sanparks.org

Received 23 July 2009, accepted 15 January 2010

The Bontebok National Park has long been faced with the dilemma of reconciling the need for short-interval fires, which promote grazing for bontebok, with that for longer-interval fires to maintain plant diversity. We explored habitat selection by various large herbivores in relation to veld age (time since fire), different management regimes, and vegetation type. Taller grass grazers (Cape mountain zebra and red hartebeest) were introduced in the 1980s to prolong the usefulness of older veld to bontebok through a grazing succession. We found that all herbivores favoured young veld and largely avoided veld >5 years old. Zebra and hartebeest competed with bontebok in utilising young veld rather than grazing facilitation occurring. In 2004, the fire rotation was prolonged to favour plant diversity, resulting in reduced availability of young veld. In compensation, the bontebok stocking rate was reduced. Bontebok densities subsequently declined proportionally across veld ages, thereby averting high animal densities on the smaller area of young veld. Fire significantly influenced bontebok habitat use equally during the old and new burning regimes. Herbivores did not distinguish between the two predominant vegetation types at Bontebok National Park. However, previously disturbed areas with *Cynodon dactylon* lawns were favoured by most herbivores despite not being burnt.

**Keywords:** Cape mountain zebra, fynbos, grazing succession, red hartebeest, renosterveld

## Introduction

The preference of herbivores for young veld/growth is a well-known phenomenon (Grunow 1980, Beukes 1987, Luyt 2005, Watson et al. 2005). Accordingly, burning is commonly applied as a management practice to enhance the quality of forage for herbivores, both in protected areas and on private rangelands (Parr and Chown 2003). However, fire and herbivory, as well as the interaction between these two factors, can significantly influence vegetation composition and structure (Madany and West 1983, Belsky 1992, Archibald et al. 2005, Kraaij and Ward 2006), and in turn the capacity of an ecosystem to sustain herbivores.

The Bontebok National Park (BNP) is a small (3 435 ha) protected area aiming to conserve a population of the Vulnerable (Friedmann and Daly 2004) bontebok (*Damaliscus pygargus pygargus*), the least common antelope in the southern African subregion (Skinner and Smithers 1990), within an Endangered type of lowland vegetation called Swellendam Silcrete Fynbos (Rebello et al. 2006). Bontebok are concentrate grazers with a preference for feeding on short grass (Beukes et al. 1989, Skinner and Smithers 1990). On the other hand, the capacity of fynbos to sustain large herbivores is low due to its poor nutrient status (Cody et al. 1983, Radloff 2008). The main disturbance agent in fynbos is fire; not only does fynbos depend on fire for regeneration, it is also very sensitive to the frequency and season of fire (Kruger and Bigalke 1984, van Wilgen et al. 1992). Fire

return intervals should allow for sufficient flowering of the slowest-maturing obligatory reseeding plant species (usually the Proteaceae) but should not exceed the lifespan of these plants. Ecologically appropriate fire cycles indicated for fynbos range between eight and 30 years (van Wilgen et al. 1992).

The specific type of fynbos present at BNP exhibits floristic features of both fynbos and renosterveld, the latter being fire-prone asteraceous shrublands on shales, with a high diversity of geophytes. Renosterveld is more readily utilised by large herbivores than fynbos due to the presence of an understorey of grasses and richer substrate (Cody et al. 1983, Rebello et al. 2006, Radloff 2008). Fire and grazing are key determinants in renosterveld ecosystems (Boucher 1995, McDowell 1995). Rebello et al. (2006) accordingly note that Swellendam Silcrete Fynbos may be converted to graminoid fynbos by overgrazing on northern slopes and to a species-poor renosterveld elsewhere, whereas it appears to be easily converted to pasture by frequent burning and liming. Fire and grazing interact in their effects on the relative abundance of grasses versus shrubs in renosterveld. Fire has been suggested as a management tool to promote grassiness, while regular burning followed by intense grazing is thought to lead to the destruction of the grass sward and a thickening up of shrubs (Cowling et al. 1986, Novellie 1987, Rebello 1995, Archibald et al. 2005, Raitt 2005, Radloff 2008). The combination of lower fire frequencies