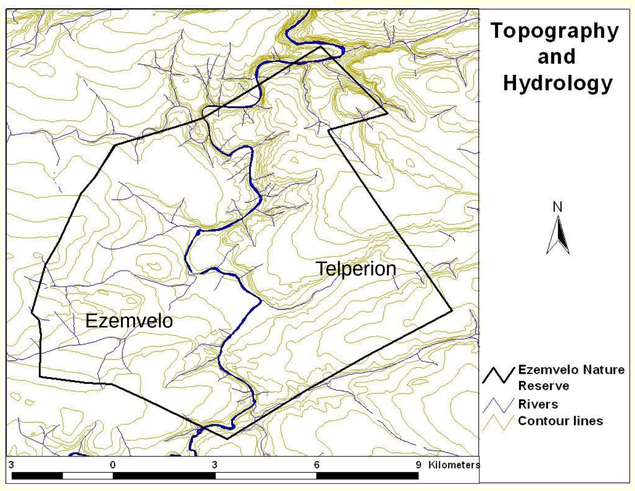
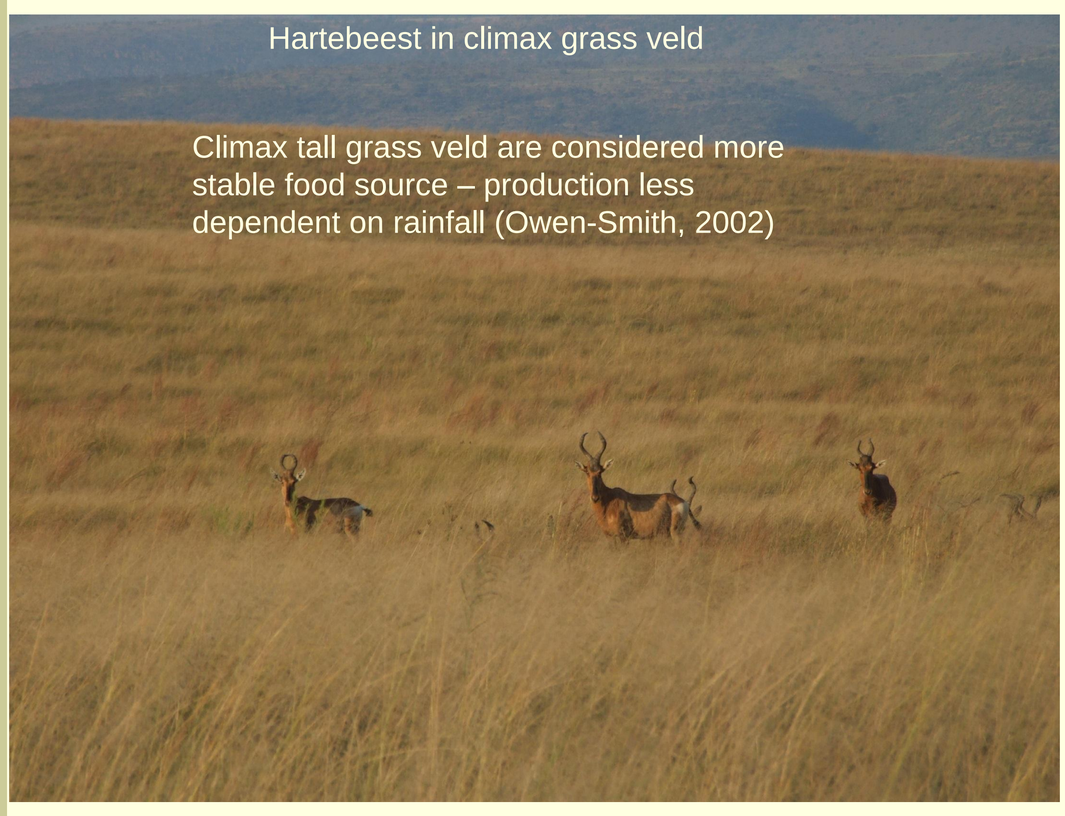
DOES COMPETITION AND FACILITATION WITHIN UNGULATE COMMUNITIES AFFECT SPECIES AT THE POPULATION LEVEL?

C.J Louw & J.P Marshall



Abstract

Basic feeding morphology dictate that grazing ungulates be divided into tall grass grazers and short grass grazers respectively (Murray & Brown, 1993). Short grass grazers such as blue wildebeest (*Connochaetes taurinus*) often numerically dominate other ungulate species in grassland ecosystems and combined with zebra are able to modify ecosystems at the expense of tall grass grazers such as red hartebeest (*Alcelaphus buselaphus*). Grazing lawns became established on old fields in Ezemvelo –Telperion Game Reserve, resulting in habitat utilization being heterogeneous on spatial as well as temporal scales. Two distinct hartebeest populations, separated by the Wilge River bisecting the reserve were differentially effected by the presence of wildebeest and zebra respectively.



Background

The coexistence of so many ungulate species in African Ecosystems have puzzled ecologists over the years. Studies relating to this issue aim to establish whether competition and facilitation plays an important role in dictating temporal dynamics of ungulate populations but proof for this is mainly limited to temperate regions with less diverse ungulate communities.

Habitat modification by key stone species such as zebra (*Equus guagga*) promote favourable conditions for short grass grazers which then maintain grass communities in an altered state. In this study we obtained annual census data from Ezemvelo Game Reserve for the two sections of the reserve respectively, with the Wilge River forming the natural boundary between the two sections. A policy of no interference has been maintained for more than a decade on the reserve and ungulate densities are perceived to have reached unsustainable levels.

Contrasting dynamics for the two populations of hartebeest suggest that landscape heterogeneity and habitat degradation is perhaps more influential than the direct effects of population densities of species on one another. Landscape heterogeneity due to past agricultural practices and habitat modification by herbivores perhaps dilute the importance species interactions at shorter spatial scales.

Key question

A. Do facilitation and competition affect species at the population level?

A_1. Is there any evidence of exchange between the two sections for any particular species?

A_2. Any evidence of density dependent growth for individual species?

A_3. Resource partitioning/competition at smaller time scales ?

Methods

The temporal dynamics of three key species were studied (zebra, wildebeest and hartebeest)

A. Linear models were fitted to census data for Ezemvelo and Telperion populations respectively, followed by regression of residuals for the two models to determine whether exchange occur between populations for the two sections

B. Standard time series analysis protocol was followed using statistical package R where we tested for autocorrelations to determine for evidence of density dependent growth.

C. Road counts were conducted in different vegetation types for wet and dry season respectively for:

1. Climax grass veld
2. Old fields
3. Recently burnt veld

to determine whether competition and facilitation occurred at shorter temporal scales.

To test for competition we fitted linear models using densities of wildebeest and zebra as explanatory variables and hartebeest growth as the response variable.

Results

A. Exchange between the two sections was found only for wildebeest

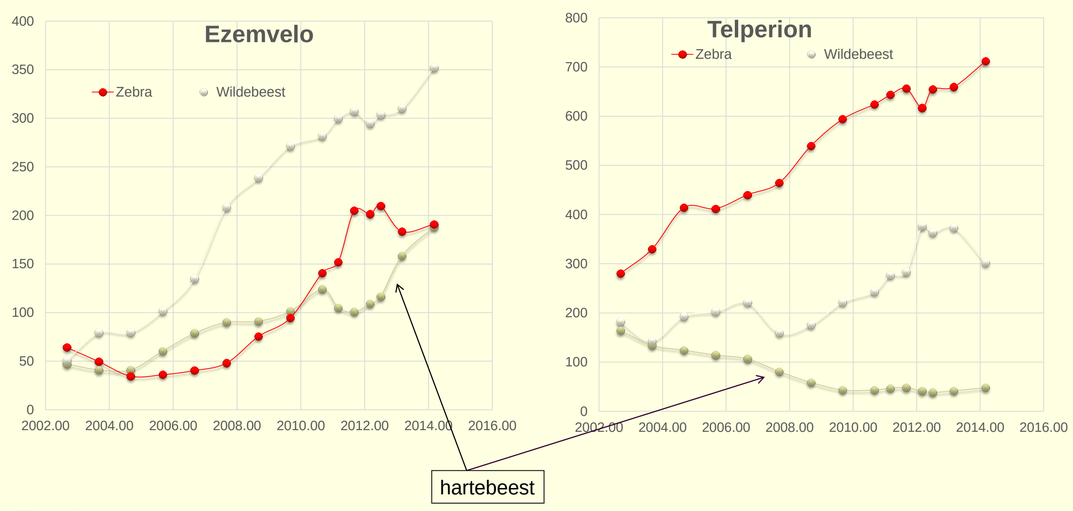
B. Density dependent growth was found only for Ezemvelo hartebeest

C. Old fields was the most heavily utilized of all vegetation types; hartebeest utilize tall grass communities year round; overlap in habitat utilisation by species increases towards the end of the dry season in tall grass communities; wildebeest remain on grazing lawns the longest into the dry season.

Results and interpretation related to key question

Temporal dynamics of species for the two sections suggest grazing lawns reduce competition between wildebeest and hartebeest, allowing hartebeest to do well on the Ezemvelo section.

Zebra maintain highest density on the more degraded Telperion side while hartebeest and wildebeest perform relatively poorly. Competition most likely explains low hartebeest densities whereas for wildebeest Ezemvelo habitat is more favourable. Simple linear models do not demonstrate any competition or facilitation effect though, possibly because habitat modification occur over longer temporal scales and most likely dilute direct effects of species density.



References

Murray & Brown, 1993. Niche separation of grazing ungulates in the Serengeti: an experimental test. Journal of Animal Ecology 81:201-213.

Owen-Smith, 2002. Adaptive Herbivore Ecology.