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ADAPTIVE RESOURCE USE IN A RE-INTRODUCED BLACK RHINOCEROS POPULATION

The aim of biological management for black rhinoceros (*Diceros bicornis*) conservation is to maximise meta-population growth rates to aid species recovery. This research investigated how adaptive resource use in response to seasonal variation in resource availability could affect maximum productive habitat capacity for this critically endangered species. Analysis was based on a population of rhinos which had shown excellent annual growth rates and low inter-calving intervals since re-introduction to Tswalu Kalahari Reserve in the Northern Cape of South Africa in 1995.

Acacia haematoxylon, a semi-evergreen species, was identified as the key resource forming the majority of diet contents during the late dry season. Use of this species resulted in a low level of seasonal variation in dietary contents of energy and protein. During the data collection period, energy and protein gains of individual female rhinos were estimated to exceed maximum requirements for reproduction throughout the seasonal cycle. An experiment designed to test the compensatory growth response of *A. haematoxylon* found that clipping trees in a way that simulated rhino browsing stimulated an increased growth response in the following wet season. This response indicated potential for a facilitatory relationship in the short term. A large proportion of the available area at Tswalu was not used by black rhinos. Home range location and habitat type selection within home ranges during the dry season were positively associated with two shrubveld habitat types containing greater *A. haematoxylon* biomass than other habitat types. Results from all aspects of field data analysis emphasized the importance of *A. haematoxylon* as the key dry season resource for black rhino at Tswalu.

Field data were used to develop a conceptual model of how seasonally adaptive resource use by black rhinos could determine maximum productive habitat capacity. The crux of the model was to estimate the highest population density at which female rhinos could attain maximum energetic gains for reproduction throughout the entire seasonal cycle. The most limiting period was the nutritional bottleneck during the late dry season. The rationale behind this approach was to enable females to maintain body condition and

be capable of meeting nutritional requirements for reproduction throughout the year, thus minimizing inter-calving intervals and maximising population growth rates. Model projections indicated that female rhinos could not attain energy gains for reproduction throughout the dry season in certain habitat types due to low availability of *A. haematoxylon*. However, model outputs indicated potential for an increase in rhino density by approximately one third in the two favoured shrubveld habitat types, assuming that habitat conditions remained unchanged.

Availability of semi-evergreen *A. haematoxylon* was identified as the key vegetation component determining maximum productive habitat capacity for black rhino at Tswalu. Monitoring available biomass of this species at the end of the dry season could provide a simple plant-based indicator of how close the population is to maximum productive habitat capacity. Managing rhino densities in fenced reserves elsewhere around spatial and temporal availability of key resources may assist in achieving black rhino conservation goals of maximising metapopulation growth rates.

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