

HABITAT PREFERENCE OF THE WHITE RHINO IN THE KRUGER NATIONAL PARK

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Abstract - The landscape and habitat selection by white rhinoceros in the Kruger National Park are discussed. White rhino were found to be selective in their diet in that they preferred the more palatable, shade-loving grasses. The structure of the woody vegetation played an important role in their selection of suitable habitats. The catenary sequence was important in determining white rhino activities.

INTRODUCTION

The white rhinoceros *Ceratotherium simum simum* (Burchell) became extinct in the Transvaal in 1896. In 1961 the first white rhinoceroses were re-introduced from the Umfolozi Game Reserve to the Kruger National Park (KNP)¹⁶. Over a 12-year period a total of 345 white rhinoceroses were relocated to the KNP¹². By 1993 their numbers had increased to 1 875.

A study was begun in 1988 to ascertain the landscape and habitat preferences and dispersal of the white rhinoceros in the KNP¹¹. The objective of this study was to ascertain which landscapes in the KNP white rhino select for and why they selected them.

METHODS

Details of the methods used to establish white rhinoceros landscape preference in the KNP have been described by Pienaar *et al.*¹⁴ but will be briefly outlined below.

A preference index was used to get a perception of the ratio of habitat use to habitat availability. A chi-square test was then performed to test for the goodness-of-fit of utilized habitat to available habitat types. The null hypotheses tested by the chi-square test was:

H_{01} : Usage occurs in proportion to availability, considering all habitats simultaneously, with the option of testing

H_{02} : Usage occurs in proportion to availability, considering each habitat separately.

When the chi-square test detects a significant difference in usage versus availability, a Bonferroni z-statistic is used to construct confidence intervals based on the proportion of time an animal uses each habitat type, in order to determine which habitat types are used more or less than expected. The landscape preference was determined for the summed aerial count data from 1979 to 1991.

Fifteen white rhinoceroses were tracked using radio telemetry to ascertain their activities and habitat use. The immobilization and collaring procedures are explained by Pienaar & Hall-Martin¹³. All rhinoceroses fitted with transmitters occurred in areas of high white rhinoceros density (>0,5 per km²). These high density areas were mapped using the aerial census data which are collected annually in the KNP^{6 16}. The collared rhinoceroses were regularly tracked and observed on foot and all the locations were mapped on 1:50 000 topographic maps.

When the animals were located, data for the following variables were recorded: time, number of animals, activity, landscape type, habitat type, grass cover, air temperature, grass height and

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composition and the structure of the woody vegetation. A Canonical Discriminant Analysis was performed to determine canonical variables (linear combinations of the quantitative environmental variables) that best summarised variation between activity classes.

RESULTS

Historic distribution of the white rhino

The white rhinoceros was distributed historically in the form of two discrete populations, separated by a gap of over 2 000 km. The northern white rhino *Ceratotherium simum cottoni* was found only to the west of the Nile River in northern Uganda, southern Sudan, north-eastern Zaire and westwards into the Central African Republic^{4,7}. The southern white rhino *Ceratotherium simum simum* did not occur south of the Orange River in historic times, while its southern limit in the east was the region of the present-day Umfolozi Game Reserve. The northern boundary of the range of the southern white rhino was the Zambezi River and the region of the Namibia-Angola border⁵ (Figure 1).

White rhinos were particularly abundant in eastern Botswana and adjacent parts of the western Transvaal. Harris³ reported seeing 80 in a day's march north of the Magaliesberg Range towards the upper Limpopo River. Favoured habitats seem to have been semi-arid savanna, and the species apparently never occurred on the temperate grasslands of the Transvaal Highveld, nor did it extend into the moist grasslands of Natal⁸.

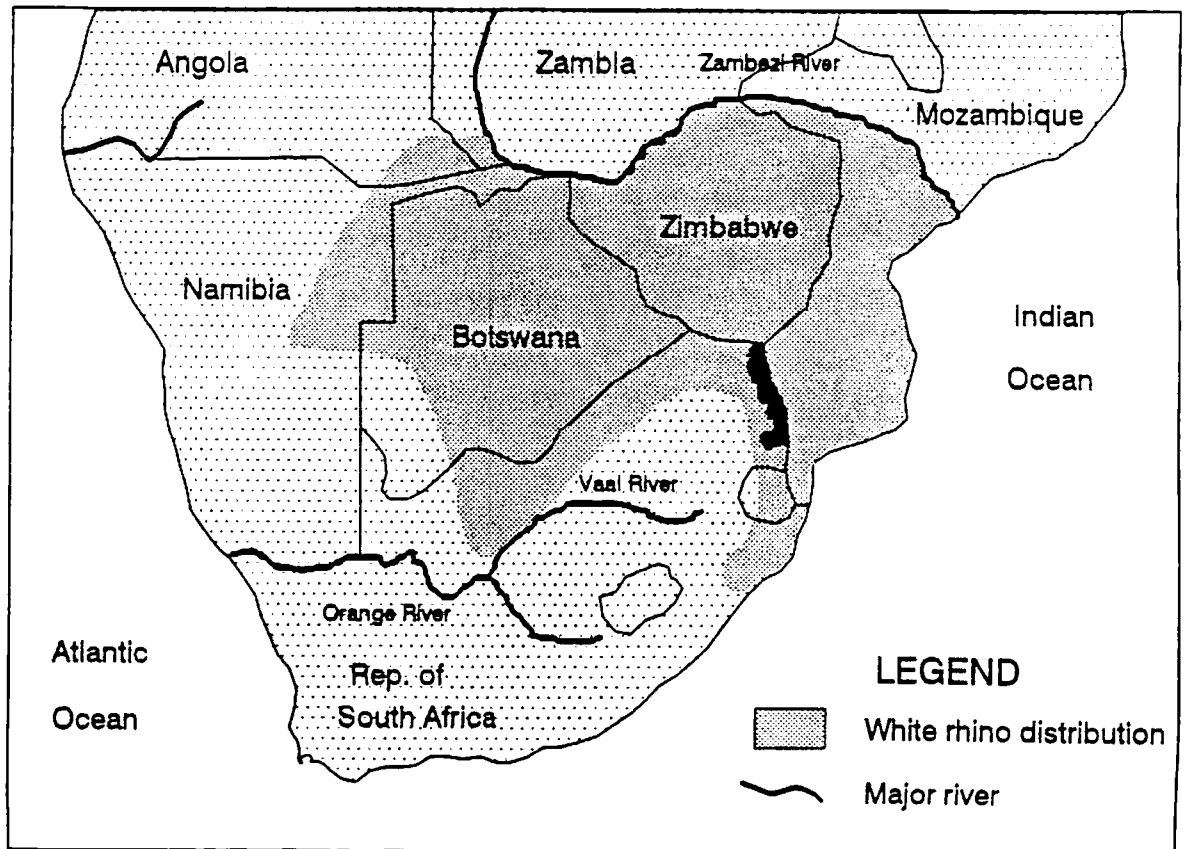


Figure 1: Historic distribution of white rhino in Southern Africa⁵

Landscape preference

The southern KNP is zoned into nine landscapes. A landscape is an area with a specific geomorphology, macroclimate, soil and vegetation pattern and associated fauna^{1,2}.

In the present study the moderately undulating granitoid plains with *Combretum* woodland, is clearly the most preferred landscape of the white rhinoceros in the southern KNP on a long-term basis. It is also the principal landscape according to white rhinoceros distribution. The *Combretum* woodland landscape has an undulating topography with distinct bottomlands where accumulation of clay and minerals take place. The low shrub stratum is open and the field layer is moderate to dense and usually less than 1m in height¹. Field observations have shown that in the mornings white rhinoceros feed by preference on the shade-loving grasses such as *Panicum maximum* that grow on the riverbanks. When it gets warm they utilize the watersheds to rest in the shade. White rhinoceroses are also very partial to wallowing in the mud-holes that form on the clayey soil on the bottom-lands. It seems thus that the *Combretum* woodland landscapes fulfil most of the white rhinoceros's needs.

Landscapes avoided by the white rhinoceros on the long term were the granitoid mountain bushveld and the granitoid lowland *Acacia* thickets.

The granitoid lowland *Acacia* thickets landscape is the largest landscape in the southern Kruger National Park but the white rhino density is low. This landscape is characterised by a dense woody vegetation with a particularly dense low shrub stratum. The grass layer in this landscape is sparse¹. Field observations have shown that white rhinoceros are not partial to areas with a dense low shrub stratum such as occurring in this landscape. The more open, brackish areas along riverbanks are the only areas used to some extent by white rhinoceroses. Other landscapes such as the Karoo Sediment plains with *Acacia welwitschii* thickets, also have a dense woody vegetation but the low shrub stratum is open, and hence white rhinoceros do not avoid those landscape.

The granitoid mountain bushveld landscape is characterised by steep slopes with shallow leached soils and bush-savanna vegetation¹. The avoidance by white rhino is probably related to poor grass quality, a species composition that consists mainly of unpalatable grasses as well as to the topography.

Water Requirements

White rhinos are dependant on regular access to surface water and will drink daily or twice daily during the wet season when water is abundantly available. During the dry season some animals are forced to make a journey to longer-lasting waterholes and drinking frequency was reduced to 2-4 day intervals.

Wallowing also took place at waterholes. White rhino either rolled in muddy hollows to secure a thick coating of mud or they lay down in pools of water for periods of up to several hours. Following a mud wallow, white rhino rubbed themselves against stumps or rocks in the vicinity. Ticks that had been rubbed off with the mud could be seen.

Diet composition

White rhino are selective grazers; no browsing was observed in the KNP or in the Umfolozi Game Reserve⁹. Forbs were also avoided and white rhino even avoided favoured grass patches that contained plenty of forbs.

In the Umfolozi Game Reserve Owen-Smith⁹ noticed that during the wet months white rhino concentrated their grazing on short grass grasslands. As the dry season advanced and the short grass grasslands were depleted, they shifted their grazing to areas of medium-tall *Themeda* grassland. By the end of the dry season white rhinos moved up into hillslopes to graze remaining reserves of taller grassland⁹.

In the KNP white rhino also sought out short grass species such as *Sporobolus nitens*, *Dactyloctenium aegyptium*, *Panicum coloratum*, *Urochloa mosambicensis* and *Digitaria* spp. White rhinos were very partial to shade grasses, in particular *Panicum maximum* and actively sought out these grasses along the riverbanks. *Themeda triandra* was only grazed after a burn when it was freshly sprouting. White rhino were very partial to freshly burnt areas and on a number of occasions they were observed to feed on the burnt stubble the day after a block had burnt. As the dry season advanced the white rhino continued to select the more palatable grasses and did not shift their diet towards the taller stands of *Themeda*. In the late dry season white rhino would extend their feeding activities into the midslope areas where they would walk from tree to tree and feed on *Panicum maximum* growing in the shade.

In the granitic Pretoriuskop area of the KNP rainfall is high, the soils are deep and sandy and the footslopes are not well developed¹⁰. In these areas termite mounds are important feeding sites for white rhino.

Habitat use

The catenary sequence (Figure 2) in the *Combretum* landscapes in the KNP affects the habits of white rhino. During the early morning white rhino typically feed on the bottomlands, riverbanks and brackish areas adjacent to the water courses. The soils on the footslopes and valley bottom have a high clay component and small pans form here during the rainy season. White rhino are very fond of wallowing or lying in these pans.

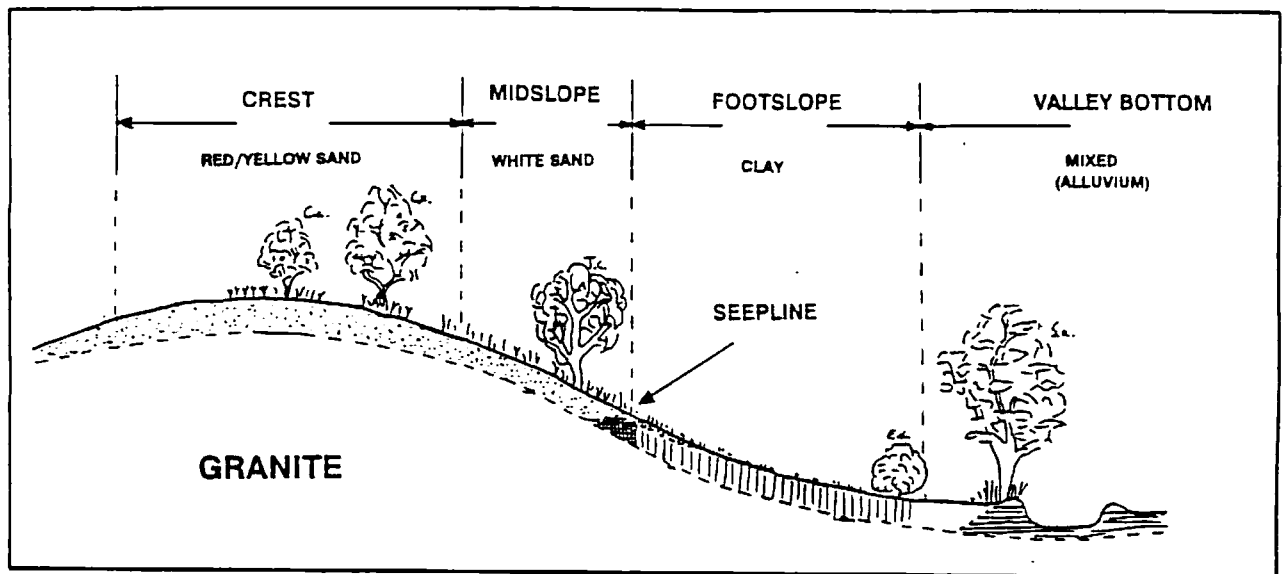


Figure 2: Catena sequence in the *Combretum* veld in the Kruger National Park

When it starts to heat up during mid morning the white rhinos begin to move upwards to the midslopes and ridgecrests. During the midday heat white rhinos sought out suitably shady trees. Favoured sites were usually a bare sandy patch located in the shade on a breezy ridgecrest. Temperature readings confirmed that ridgecrests were always about 2°C cooler than low-lying valley bottoms. On cold, windy days, white rhinos can normally be found in low-lying areas of woodland or thicket.

In the late afternoon when it cools down white rhinos moved down from the high ground to drink and to commence feeding on the footslopes again. Feeding continues at intervals throughout the night⁸.

Structure of the woody vegetation

The structure of the woody vegetation plays an important role in the habitat choice of white rhino. Very open plains with sparse tree cover are not good white rhino habitat. Such areas do not have adequate shade for the animals to rest in. Conversely, areas with a very dense low shrub strata (<2m) are also not favoured by white rhino. White rhino have a broad, sensitive upper lip that they use to pluck grass off and where the low shrub strata is dense they can not get to the grass. Knee high shrubs that grow between the grass also inhibit their feeding activities.

The most favoured woody vegetation structure consists of an open low shrub (<2m) stratum, and a moderate high shrub (2-4m) and tree (>4m) strata. Habitats with such a woody vegetation structure usually contain a moderate to dense grass cover with a high proportion of palatable grass species. These features are consistent with the drier types of woodland savanna.

DISCUSSION

The relocation of white rhino should be approached with caution as they are very specific in their habitat requirements. The recipient area should be inspected beforehand to assess if the necessary habitat is available. White rhino relocation to areas outside their historical distribution should be cautiously considered before implementation. The distribution of white rhino in the west of their historic range seems to coincide with the 400 mm rainfall isohyet. Consequently, white rhino should not be moved to areas where annual rainfall is less than 400 mm.

White rhino are dependant on regular access to surface water although they can go for 3 days without drinking. The occurrence of mud wallows will increase the appeal of an area for white rhino.

White rhino select for the more palatable grasses when grazing and they will not prosper in sour grassveld areas. The structure of the woody vegetation is very important in deciding if an area is suitable for white rhino. White rhino will avoid areas if the low shrub (<2m) stratum is very thick or if the habitat consists of open plains with no shade. Similarly will mountainous areas with poor, leached soils not be suitable white rhino habitat.

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