

Notes on Territory and Home Range Size of White Rhinoceros in the Southern Timbavati

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Territory size and territorial behaviour were noted and comparisons made of four territorial White Rhino bulls in a 14 780ha area straddling the Timbavati River. Individual bulls were identified primarily through physical differences such as the appearance of tail, size and shape of horns, body size and differing behaviour in the proximity of vehicles. The majority of data collected was obtained by tracking individual animals on foot. These findings are compared to those in other areas of southern Africa. Additional comments are made on the size of rhino cow home ranges.

Introduction

Prior to the removal of the fence between the Kruger National Park (KNP) and the Timbavati Private Nature Reserve (TPNR) in 1992/3, the density of White Rhino in the Timbavati can be considered to have been unnaturally high. This is apparent from the changed situation post-1993. The dropping of the fence and the inclusion of the TPNR into the Greater-KNP meant that significant numbers of White Rhino moved into formerly lower density areas in the neighbouring national park (Dr. S. Joubert, pers. comm.) The release of the pressure of overpopulation means that current White Rhino densities in the TPNR can be considered to be optimum for the respective landscapes contained within this reserve. This is so because, aside from the western perimeter fence of the TPNR (which is not a factor in the Ngala study area) and the fenced southern boundary (the effect of which is discussed below), there are no longer any artificial controls on White Rhino dispersal and movement.

Close observations of the movements and behaviour of White Rhino took place over a two year period in the Ngala study area of 14 780ha straddling the Timbavati River and encompassing areas of granitoid plains with *Colophospermum mopane* woodland, granitoid plains with *Combretum apiculatum* woodland, and gabbroic plains with *Acacia nigrescens* savannah (Gertenbach, 1983; Roche, 2000a) and form the basis of this study.

Territory Size

White Rhino bulls hold territories from which other adult territorial bulls are excluded and which are marked and patrolled on a regular basis (Owen-Smith, 1971). The aim of this study was to calculate average territory size in the study area and to compare these findings with those from areas of higher White Rhino densities such as Umfolozi in KwaZulu-Natal. Apart from direct observations, territories were calculated by following the tracks of the individual animals on foot. The various methods of territory calculation are outlined below and roughly approximate those used by Owen-Smith as the chief characteristics of territoriality, namely, range exclusiveness, ritualised encounters, confinement of oestrus cows, and scent marking (Owen-Smith, 1971).

The distinctive 'scrape marks' of territorial bulls allowed individuals to be followed for long distances and made it possible to obtain a detailed knowledge of the animals' territories, favoured paths and feeding grounds. Territorial patrols along boundaries yielded the most regular scrape marks, on average every 20-30m, very similar to findings elsewhere (Estes, 1993), and as these often followed the same paths, a clear picture of territorial delimitation was obtained (Pienaar et al 1993b, also found this a very useful method in a study using radio telemetry). Scrape marks along boundaries were not always so regular or frequent, and one sequence, for example, measured: 70m-100m-300m.

Skirmishes between bulls - witnessed or reconstructed from tracks - also gave a clear picture of territory limits (skirmishes between territorial bulls always occurred on or near boundaries, but clashes with non-territorial subordinate bulls deep within established territories also took place and included one fatality during the study period). Another very clear indication of territory limits was observations of bulls attempting to prevent cows and calves from leaving their respective territories. This is achieved by attempting to cut off the movements of the cow and calf in one obvious direction and which is accompanied by a loud 'lip-smacking', squealing noise and obvious distress in the bulls (Roche, 1999) and occasionally even overt aggression towards mature calves.

Other marking behaviour such as dung crushing in middens, urine spraying and horn rubbing can be presumed to have increased in intensity, as scrape marking did, on or near territorial boundaries, but no direct evidence of this was obtained. At least five near adult bulls were present within the territories of the four study bulls and did not display any signs of territoriality. These subordinate bulls tended to associate in pairs or even small groups of up to four animals within fairly small areas, but were occasionally found in the company of the resident bull.

Of the four territorial bulls observed over the two year study period, only one was completely confined to the study area. All other territories extended beyond the study area and hence the territory sizes shown in Table 1 are in effect only estimates of the entire area. These estimates are based on the amount of time spent by a particular rhino outside of the study area and include the premise that a territorial bull will devote an equal amount of time to the patrol of equal sized areas (this obviously does not ignore the fact that time might be spent with other members of the species encountered during patrols, and essentially an average length patrol would be used to calculate the extent of the inaccessible area).

Table 1: White Rhino bull territory sizes (square km)

	Total Territory within Study area	Total Estimated Territory
BULL A*	52,91	52,91
BULL B	17,23	37,07
BULL C	12,58	23,40
BULL D	23,99	32,15

* the size of the territory of Bull A is significantly larger than those of the other bulls due to the presence of a fence along the eastern and southern boundary of his territory, thus eliminating the need to patrol this portion as intensively against potential rivals, and allowing more time to be spent in the maintenance of the other boundaries.



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Home Range Size

White Rhino cows are not territorial, but do make use of a 'home range' (Owen-Smith, 1971). These home ranges are individual and are independent of other cows, they are, however, fairly social animals and a large degree of overlap between home range exists.

It is around the basic unit of the cow-calf association that the activities of the territorial bulls are centred. Access to, and provision for, potential mates is probably the overriding reason for territoriality in White Rhino bulls and this in turn has a significant impact on the movements of cows. As discussed above, cows in oestrus or pro-oestrus are prevented from leaving the confines of a particular territory by the resident bull, but once confined within that territory have free access to the resources within it, the bull leaving the cow and calf for regular patrols, but always managing to relocate the pair. If the cow manages to escape the attentions of that particular bull and move into the neighbouring territory the same situation will apply, and in this way she is able to expand her home range. Home range in cows is therefore dynamic and may change significantly over the years. One cow monitored in the study period, for example, doubled her known home range in the period of a year. Known only to frequent the territories of three different bulls, over the first year of study, this cow started to be seen in the territories of another two bulls. Once within the territory of the first 'new' bull, she moved to areas much further east from where she had previously been seen and ultimately into the territory of the fifth bull. The natural tendency of a cow would presumably be to return to areas which had been recently frequented, but with this direction blocked off by a possessive bull, the extent of that bull's territory would then be utilised. It is therefore argued that the extent of a rhino cow's range is to a large extent dependent on the activities of the resident territorial bulls and that being 'abducted' by a territorial bull essentially allows a cow to expand her home range.

Some groups of cows form very stable units of up to four adult females and their dependent young. These animals are far more sedentary than the likes of the cow mentioned above and although they might leave the territory of the bull within which they reside for the majority of the time, they seem to return to this area. One particular group, for example, utilised only the territory of one bull over the study period and only left this area twice, both times at the end of the dry season and both times only for a short period of less than three days. The area covered in both cases was the same and probably indicates an area of the home range previously occupied, but for some reason not used during the study period. The reason is likely to be the territorial bull, which, in effect, had successfully confined the group to his territory (in the second of the above mentioned instances, the bull left his territory two days after the cows and followed the exact route they had taken for a distance of at least 3km outside the territory. This left no doubt as to what he was looking for, nor the extent to which he was prepared to go, and also highlights the importance of olfactory communication in white rhino).

The home ranges of cows are influenced by grazing and water, as is evident from the time of year - the end of the dry season - when cows undertake the most significant movements, but not to be underestimated is the influence that territorial bulls have on the size of home range, both in limiting it, as well as expanding it. The home ranges of two of the cows discussed above are shown in Table 2.

Table 2: White Rhino Cow Home Range Size (square km)

	Total Home Range within Study area	Total Estimated Home Range
COW A	58,57	68,34
COW B	60,83	61,83

Cow A was typically seen accompanied only by her calf or by a bull, very rarely in the company of other cows. Cow B and her calf in contrast, were always in the company of at least one other cow and calf, and usually three cows and their calves.)

Discussion

The findings of the study as outlined above are compared to those in other areas of southern Africa. The sizes of territory and home range are vastly different from area to area as can be seen in Table 3, and are to a large extent dependent on the density of the White Rhino population in any particular area. Territory in White Rhino bulls is governed by a need for access to water and grazing, both of which could be achieved through the existence of a home range and not a territory, and more importantly access to breeding females. Home range in cows is also governed by a need for access to water and grazing and, as discussed above, is also impacted on by the activities of bulls. Therefore, in an area of naturally high White Rhino density all the requirements of territory are met in a relatively small area and although there is less land available for territory, less land is necessary and territories are therefore smaller. The same would apply to home range size in cows.

Table 3: Comparison of White Rhino density (animals per square km), bull territory sizes (square km) and cow home range sizes (square km) in five protected areas in southern Africa (adapted from Pienaar et al 1993b)

Area	Density	Bull Territory	Cow Home Range
South-western Kruger NP	0,5-1,4	6,2-13,8	7,23-45,23
Kyle National Park	0,7	5-11	3-20
Ndumo Game Reserve	0,6-1,8	2,5-13,9	4,7-22,9
Umfolozi Game Reserve	3-5,7	0,75-2,6	8,9-20,5
Southern Timbavati PNR	0,12-0,18	23,40-52,91	61,83-68,34

It is apparent from the above table that the higher the density of White Rhino, the smaller the territory and home range size of bulls and cows respectively. Density is likely to be directly related to the availability of water and grazing and as such will be determined by habitat or landscape type.

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