CHAPTER 10

HABITAT PREFERENCE AND STATUS OF THE SUNI IN TEMBE ELEPHANT PARK, SOUTH AFRICA

INTRODUCTION

The suni is a member of the family Bovidae and the tribe Neotragini or dwarf antelopes (Estes 1997). Von Dueben first described it scientifically in 1846 from a specimen collected from Chapani Islet, 3 km from Zanzibar, Tanzania (Skinner & Smithers 1990; Grubb 1993). In distribution, the suni is confined to the eastern parts of the African continent from the False Bay Park in the KwaZulu-Natal province of South Africa, north to the Marsabit area in Kenya (Skinner & Smithers 1990). Two subspecies of suni are recognised, *Neotragus moschatus livingstonianus* that occurs from north-eastern Zimbabwe northwards, and *Neotragus moschatus zuluensis* that occurs in the Sand Forests of the northern parts of the KwaZulu-Natal province of South Africa, southern Mozambique and the south-eastern parts of Zimbabwe (Friedmann & Daly 2004). Other members of this tribe occurring in southern Africa are the klipspringer *Oreotragus oreotragus*, Damara dik-dik *Madoqua kirkii*, oribi *Ourebia ourebi*, steenbok *Raphicerus campestris*, grysbok *Raphicerus melanotis* and Sharpe's grysbok *Raphicerus sharpei* (Skinner & Smithers 1990; Grubb 1993).

The majority of sightings of the suni are of solitary animals, although they do occur in pairs or family groups consisting of a male and female with her offspring. Male and female suni share a territory but live relatively independent within that area. Males are, however, mutually exclusive in terms of range use and will actively defend their range. While the territories of males have well defined borders with very little overlap, those of females are usually situated entirely within the territory of a male. Both male and female suni show a tendency to undertake exploratory trips to neighbouring territories, presumably for breeding or to investigate the presence or absence of neighbouring animals. The suni make use of communal middens on which both male and female animals deposit their dung. Counts of these middens can be used in order to give a crude estimate of the relative density of suni in different areas. Glandular secretions from facial glands are sometimes used to demarcate territories by being deposited as a black, tarry substance on small twigs within the territory (Lawson 1986; Skinner & Smithers 1990).

The suni is generally associated with Sand Forest, coastal lowland and dune forest, pallid sand bushveld, and closed canopy woodland with a high stem density of shrubs in the understory and a low ground cover (Friedmann & Daly 2004). It is independent of drinking water and obtains its moisture requirements from the food consumed (Skinner & Smithers 1990). Based on its diet, the suni is classified as a browser, being an animal with a diet that includes > 70% dicotyledonous plant material (Gagnon & Chew 2000). It is partial to freshly fallen leaves, and when captive animals were given a choice between leaf litter and fresh browse, a distinct preference was shown towards the former (Lawson 1986).

Knowledge of the habitat preference, ecological requirements and conservation status of large herbivores is basic to any management programme for a reserve and a pre-requisite to determine stocking densities and possible translocations (Dekker *et al*. 1996). In conservation areas, one of the primary objectives is to maintain viable populations of all the animal species present. The fact that most species are linked to major vegetation types help in understanding their distribution patterns (Pienaar 1974). In the KwaZulu-Natal province of South Africa, the suni has disappeared outside formally protected areas due to the destruction of its habitat and excessive hunting. Within protected areas, where poaching and excessive hunting is low, numbers are, however, also decreasing (Lawson 1986). Based on its restricted distribution range, decline in habitat area and quality and the declining population numbers, the suni is currently classified as Vulnerable in the South African Red Data Book, implying that it is considered to be facing a high risk of extinction in the wild (Friedmann & Daly 2004).

In the present study, we tested the hypothesis that the suni responded to the variables in its physical habitat in proportion to its availability within the Tembe Elephant Park. If the suni showed a preference of use for certain vegetation types, then the suitability of different areas could be determined for the suni by evaluating the physical characteristics of the preferred vegetation types. The objective of the present study was therefore to gather information on the habitat preference and conservation status of the suni within the park. This information is crucial for the effective management of the population within the park and neighbouring areas.

METHODS

The methods presented below are restricted to the broad outlines of the methods employed. For a more detailed description of the methods, please refer to the general methods in chapter 3.

Habitat preference

Road counts of the spatial distribution of the suni were done in Tembe from December 2002 to November 2003. The study area was surveyed four times per month for a full year. All the observations were documented on a field form and the closest coordinates of the position of an observed suni was determined by using geographic positioning equipment (GPS). All the data were captured on a computer database for further analysis.

A measure of habitat preference for the suni was obtained by comparing patterns of habitat use with habitat availability within the study area. The Index of Jacobs (1974) was then used to calculate a preference index of use (*P*) for each vegetation type. The preference index only provided a ratio of habitat use to habitat availability and was not based on a statistical test. This was overcome by performing a Chi-square goodness-of-fit test. When a significant difference in use versus availability was detected, a Bonferroni *Z*-statistic was used to determine which vegetation types were used more or less often than expected by constructing 95% simultaneous confidence intervals around the proportion of the suni recorded in each vegetation type (Beyers *et al*. 1984; Allredge & Ratti 1992; Pienaar *et al*. 1992).

Population status

An aerial survey that was done in October 2003 was used to determine the current population status of the suni in Tembe. The overall aim of the survey was to derive trends and estimates of the large herbivore populations in Tembe that would be useful for management decisions and would stand as a record of abundance for future trend analyses. Total aerial counts and transect distance sampling counts were used to estimate the number of suni in Tembe and to calculate trends in the population from 1993 to 2003 (Matthews 2004).

RESULTS

Habitat preference

A total of 69 observations were recorded during the study period. The suni was most often found in Sand Forest/Grassland Mosaic (40.4% of observations), Closed Woodland/Thicket Mosaic on sand (24.6%) and Closed Woodland on clay (23.2%%) and less often in Open Woodland (11.6%). The suni was never recorded in *Acacia borleae* Shrubland/Bush Clump Mosaic on clay, Hygrophilous Grassland, the Muzi Swamp, Old Lands or Sparse Woodland (Table 16). The Chi-square goodness-of-fit test for the overall data set showed a significant difference (χ^2= 195.183; $p \leq 0.05$; df = 8) in use versus availability for the different vegetation types in Tembe. The preference index of use of vegetation types by the suni in Tembe indicated vegetation type 3 as being preferred for use, vegetation types 1, 4, 5, 6, 7 and 9 as not being preferred and vegetation types 2 and 8 as being used in the same ratio as its proportional occurrence (Table 17).

Population status

During the total aerial count, 23 suni were recorded in 19 groups. Due to the small sample size, no distance sample estimate could be made for the suni population in Tembe (Matthews 2004). Actual trends do, however, appear to indicate an increase in the suni population from a total aerial count of 2 individuals in 1993 to the 23 in 2003 (Figure 17).

DISCUSSION

Habitat preference

In Tembe the suni showed a preference of use for the Closed Woodland on clay. No observations of the suni were ever recorded in the *Acacia borleae* Shrubland/Bush Clump Mosaic on clay, Hygrophilous Grassland, Muzi Swamp, Old Lands or Sparse Woodland and these vegetation types were clearly not being used. The Open Woodland was also not being used often and no preference of use was thus indicated towards this vegetation type. The Closed Woodland/Thicket Mosaic on sand and the Sand Forest/Grassland Mosaic was used by the suni in proportion to its availability within Tembe.

Table 16. Vegetation types in Tembe Elephant Park, South Africa, their respective sizes (km²), proportion of the available habitat, proportion of use by the suni and preference index of use by the suni from December 2002 to November 2003.

Number	Vegetation type	Size (km²)	Percentage of available habitat (*A*)	Percentage of use (*U*)	Preference index (*P*)
1	*Acacia borleae* Shrubland/Bush Clump Mosaic on clay	2.3	0.7	0.0	-1.000
2	Closed Woodland/Thicket Mosaic on sand	51.8	15.0	24.6	0.390
3	Closed Woodland on clay	8.7	2.5	23.2	0.892
4	Hygrophilous Grassland	6.7	2.0	0.0	-1.000
5	Muzi Swamp	3.4	1.0	0.0	-1.000
6	Old Lands	0.6	0.2	0.0	-1.000
7	Open Woodland	91.5	26.6	11.6	-0.564
8	Sand Forest/Grassland Mosaic	164.8	47.8	40.6	-0.152
9	Sparse Woodland	14.4	4.2	0.0	-1.000

Table 17. The preference of use of the vegetation types in Tembe Elephant Park, South Africa by the suni from December 2002 to November 2003 ($\alpha = 0.05$; $k = 9$; $Z_{1-\alpha/2k} = 2.75$)

Vegetation type*	Percentage of habitat	Chi-square contribution	Confidence interval	Habitat use
1	0.7	0.7	$0.000 \leq p_1 \leq 0.000$	Not used
2	15	6.1	$0.103 \leq p_2 \leq 0.389$	No pattern
3	2.5	171.4	$0.092 \leq p_3 \leq 0.372$	Prefer
4	2.0	2.0	$0.000 \leq p_4 \leq 0.000$	Not used
5	1.0	1.0	$0.000 \leq p_5 \leq 0.000$	Not used
6	0.2	0.2	$0.000 \leq p_6 \leq 0.000$	Not used
7	26.6	8.5	$0.010 \leq p_7 \leq 0.222$	Not used
8	47.8	1.1	$0.243 \leq p_8 \leq 0.569$	No pattern
9	4.2	4.2	$0.000 \leq p_9 \leq 0.000$	Not used
Total	100	195.2	-	-

*Vegetation type numbers correspond with Figure 5 in chapter 2, and Table 16.

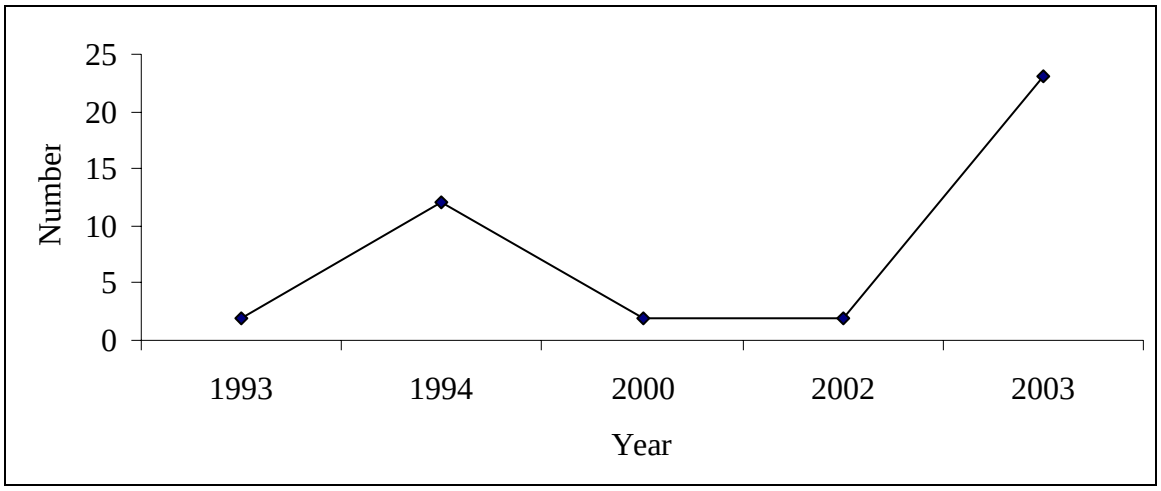

Figure 17: Aerial survey of the suni as based on total counts conducted in Tembe Elephant Park, South Africa from 1993 to 2003. Source: Matthews *et al*. (2004).

The Closed Woodland on clay occurs on clay-rich duplex soils that are normally associated with the bottomlands of the dunes and the edges of the Muzi Swamp. Perennial pans were also found throughout this vegetation type and it contained few grass species. The structure of the Closed Woodland on clay varied from areas of dense vegetation to thickets associated with termitaria (Matthews *et al*. 2001). The fact that the suni generally prefers a closed canopy with a high stem density of shrubs in the understory and a low ground cover was therefore probably the reason why this vegetation type was preferred for use by it (Friedmann & Daly 2004). Although this vegetation type only covered 2.5% of the surface area of Tembe, 23.2% of observations of the suni were made there.

The *Acacia borleae* Shrubland/Bush Clump Mosaic on clay occurs next to marshy areas and clay-based thickets associated with the Muzi Swamp. In structure this vegetation type varied from areas of dense vegetation to thickets that were associated with termitaria. Both the Hygrophilous Grassland and the Muzi Swamp have a grassland structure with no abundant trees or thickets present. The Muzi Swamp consists of reed beds in an extensive swamp system that crosses the eastern side of Tembe and extends northwards to Maputo Bay in Mozambique. The Sparse Woodland mainly occurs on flat areas between the dunes, but also to a lesser degree on the dune slopes and crests throughout the park. It was a type of grassland that was characterised by an abundance of shrub species that produced annual leafy and flowering shoots from a perennial, underground woody rootstock. The suni thus clearly avoids vegetation types with an open structure and a well-developed grass layer, but extensive patches of thicket vegetation with a closed canopy appears to be essential for their presence. Although some thicket vegetation does occur in the *Acacia borleae* Shrubland/Bush Clump Mosaic on clay, the small size of these patches most probably prevented them from being used by the suni.

No preference of use was shown towards the Open Woodland, which was the second largest vegetation type in Tembe and occurs on the dune crests, slopes and interdune depressions throughout the park (Matthews *et al*. 2001). This vegetation type was characterised by a good grassy layer interspersed with a few tall trees of approximately 8 to10 m in height. Although the suni was observed within this vegetation type, it was never found in the open areas but in the transitional zone towards a more closed woodland or thicket vegetation type.

The Closed Woodland/Thicket Mosaic on sand occurs on the dune crests, slopes and the interdune depressions throughout Tembe and could be distinguished based on plant density, which in most cases varied from closed to semi-closed crown gaps and a canopy that varied from approximately 8 to 12 m in height. This vegetation type covered 15% of Tembe, and 24.6% of the observations of the suni were made there.

The Sand Forest/Grassland Mosaic was the largest vegetation type in Tembe and was mostly associated with the dunes. This vegetation type was structurally classified as a forest that was interspersed with grassland (Matthews *et al*. 2001). The grasslands there were open with few to no trees and shrubs, and it gradually acquired a more open woodland character further away from the Sand Forest. Although the Sand Forest/Grassland Mosaic had the highest density (40.6% of all observations) of the suni in Tembe, its large size caused the overall density of the suni to be low.

Although the Closed Woodland/Thicket Mosaic on sand and Sand Forest/Grassland Mosaic vegetation types were not preferred for use by the suni in Tembe, both vegetation types are suitable to sustain them there. The habitat of ungulates provides them with food, water and cover and the feeding styles and need for cover of each species are therefore of primary importance in determining their preferred habitat. Dense vegetation types with a closed structure and well-developed understory were consistently selected for use by the suni in Tembe over more open vegetation types.

Population status

No estimate for the population of the suni in Tembe could be made from the total aerial count (Matthews *et al*. 2001). Although total aerial counts from a helicopter are generally an acceptable option, there is no single comprehensive counting technique that is suitable for counting all animal species. Knowledge of the habitat requirements of the animals to be counted is essential before any count should be attempted (Bothma 2002). Due to the secretive nature of the suni and the fact that it is only found in dense vegetation types, it is recommended that road strip counts be used to supplement the counts for the suni in Tembe so as to get a more reliable estimate of its conservation status. Lawson (1986) also recommended doing a simple midden count index at intervals of five years in order to assess the suni population. The nature of the vegetation in Tembe, as well as the presence of dangerous wildlife does, however, limit the use of this technique within the park. In Tembe, 22 530 ha of suitable habitat for the

suni (vegetation types 2, 3 and 8) are available, although only the Sand Forest areas in vegetation type 8 is used by them at present. By doing a simple midden count index in each of the suitable habitat types, a reliable first estimate will, however, be obtained for the suni population in Tembe.

Despite the limits of the counting technique used, population trends appear to indicate an increase in the number of suni in Tembe from 1993 to 2003. Monitoring of changes in the structure of vegetation within the suitable habitat is, however, important for the conservation of the suni in Tembe. The population numbers of competitive herbivores like the nyala should also be kept sufficiently low in order not to have a negative influence on the vegetation and thus the survival of the suni.

REFERENCES

ALLREDGE, J.R. & RATTI, J.T. 1992. Further comparison of some statistical techniques for analysis of resource selection. *Journal of Wildlife Management* 56: 1-9.

BEYERS, G.R., STEINHORST, R.K. & KRAUSMAN, P.R. 1984. Clarification of a technique for analysis of utilization-availability data. *Journal of Wildlife Management* 48: 1050-1053.

BOTHMA, J. du P. 2002. Harvesting wild animals. In: J. du P. Bothma (Ed.), Game Ranch Management, Fourth edition (pp. 358 – 381). Van Schaik, Pretoria.

DEKKER, B., VAN ROOYEN, N. & BOTHMA, J. du P. 1996. Habitat partitioning by ungulates on a game ranch in the Mopani veld. *South African Journal of Wildlife Research* 26: 117-122.

ESTES, R.D. 1997. The Behavior Guide to African Mammals. Halfway House: Russel Friedman Books.

FRIEDMANN, Y. & DALY, B. (Eds) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. South Africa: CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust.

GAGNON, M. & CHEW, A.E. 2000. Dietary preferences in extant African Bovidae. *Journal of Mammalogy* 81: 490-511.

GAUGRIS, J.Y., MATTHEWS, W.S., VAN ROOYEN, M.W. & BOTHMA, J. du P. 2004. The vegetation of Tshanini Game Reserve and a comparison with equivalent units in the Tembe Elephant Park in Maputaland, South Africa. *Koedoe* 47: 9-29.

GRUBB, P. 1993. Order Perissodactyla. In: D.E. Wilson & D.M. Reeder (Eds), Mammal Species of the World: A Taxonomic and Geographic Reference, Second edition (pp. 403). Smithsonian Institution Press, Washington DC.

JACOBS, J. 1974. Quantitative measurement of food selection. *Oecologia* 14: 413-417.

LAWSON, D. 1986. The ecology and conservation of suni in Natal. PhD thesis, University of Natal, Pietermaritzburg.

MATTHEWS, W.S. 2004. Large herbivore population estimates for Tembe Elephant Park: October 2003. Unpublished report, KwaZulu-Natal Nature Conservation Services.

MATTHEWS, W.S., VAN WYK, A.E., VAN ROOYEN, N. & BOTHA, G.A. 2001.Vegetation of the Tembe Elephant Park, Maputaland, South Africa. *South African Journal of Botany* 67: 573-594.

PIENAAR, D.J., BOTHMA, J. du P. & THERON, G.K.1992. Landscape preference of the white rhinoceros in the southern Kruger National Park. *Koedoe* 35: 1-7.

PIENAAR, U de V. 1974. Habitat-preference in South African antelope species and its significance in natural and artificial distribution patterns. *Koedoe* 17: 185-195.

SKINNER, J.D. & SMITHERS, R.H.N. 1990. The Mammals of the Southern African Subregion. University of Pretoria, South Africa.