Census and marking systems for black rhinoceros *Diceros bicornis* with special reference to the Zululand game reserves.

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Individual recognition of black rhinoceros *Diceros bicornis* (Linnaeus, 1758), based on morphological peculiarities (such as the shape of the horns, features of the ear, wrinkles round the eyes) was documented by the author in great detail since 1961 to obtain data on rhinoceros movements and the life histories of mature females in the Hluhluwe Game Reserve. This method of identifying individual animals has been continued and developed over the years and has been applied to black rhinoceros in other game reserves in KwaZulu as well, resulting in a record of some 500 individually recognisable animals.

Other workers have also used the individual recognition method to monitor various aspects of black rhinoceros biology (Klingel & Klingel 1966; Goddard 1966, 1967; Hamilton & King 1969; Western & Sindiyo 1972; Hall-Martin & Penzhorn 1977; Leader-Wiliams 1985).

In addition to natural features, black rhinoceros have been marked by using ear tags (Hamilton & King 1969; Hanks 1969), ear notching, radio transmitter (Anderson & Hitchins 1971; Hitchins 1971), horn branding (Hanks 1969), and collars (Thompson 1974).

The horn, ear and tail characteristics of the black rhinoceros population in the Hluhluwe/Umfolozi game reserve complex is shown in Table 1. In the Hluhluwe Game Reserve animals were ear-marked with different materials (tags, streamers and discs). Table 2 illustrates that the 'jumbo roto tag' and Ketchum metal tags are better marking methods with an average life span of 314 and 232 days respectively.

Population estimates of black rhinoceros using fixed-wing aircraft are unreliable in wooded habitats with 12,2 percent of the population being recorded (range 4,9 to 18,1). This species is difficult to detect from the air especially in poor light and when seen against the sun. Helicopters give a far better result (44,8 percent of total population, range 9,8 to 60,0) due to the noise factor which stimulates the animals to move out of cover ahead of the approaching aircraft. An additional and extremely important advantage of using a helicopter is its manouverability enabling an observer to record the characteristics of the individual rhinoceros.

Table 1
Horn, ear and tail characteristics of the living adult black rhinoceros population in the Hluhluwe/Umfolozi game reserve complex in 1973 and 1985.

	MALES				FEMALES			
	1973		1985		1973		1985	
	N	%	N	%	N	%	N	%
HORNS: anterior longer than posterior	117	97,5	58	100,0	85	80,2	46	66,7
anterior equal to posterior	3	2,5	—	—	15	14,1	20	29,0
anterior shorter than posterior	—	—	—	—	6	5,7	3	4,3
EARS: normal	55	45,8	28	48,3	78	73,6	49	71,0
torn or nicked	57	47,5	29	50,0	28	26,4	16	23,2
mutilated or absent	8	6,7	1	1,7	—	—	4	5,8
TAIL: normal	99	82,5	55	94,8	101	95,3	65	94,2
deformed, broken	15	12,5	—	—	2	1,9	2	2,9
mutilated or absent	6	5,0	3	5,2	3	2,8	2	2,9

Table 2
Ear tag and streamer loss in the black rhinoceros in Hluhluwe game reserve.

Marking method	n	No. days before loss: Range	Average
Metal or Fibreglass discs	5	86–171	130
Jumbo roto tag	8	81–506	314
Ketchum metal tag	5	141–473	232
Ear streamer: jess knot	3	132–1987	165
Jumbo roto plus streamer	7	141–163	155
Ketchum metal tag plus plastic disc	5	28–171	90
Visotag	2	33–82	58

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The Auxiliary Game Guard System in northwestern Namibia and its role in black rhinoceros *Diceros bicornis* conservation

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In 1970, on the recommendations of the Odendaal Commission (appointed in 1962 by the South African government), the Kaokoveld and the western extension of the Etosha Game Park were deproclaimed in order to create homelands for the Herero and Damara speaking people residing in north-western Namibia. At that time, the deproclaimed area of some 16 000 km² had well in excess of 1 000 elephants *Loxodonta africana* (Blumenbach, 1797) and possibly more than 300 black rhinoceros *Diceros bicornis* (Linnaeus, 1758). In spite of assurances that measures would be taken to protect the wildlife of the region, nothing was done, and large-scale illegal hunting — including the poaching of elephant and black rhinoceros for ivory and horn — commenced during the early 1970s.

During the severe drought of 1980-82, more than 80 percent of the region's cattle, as well as large numbers of small stock succumbed having a serious effect on the pastoralist economy of the Herero, Himba and Damara people, leaving many of them destitute. The local tribesmen of Kaokoland and Damaraland now had the motivation and means to hunt big game as a means of subsistence. Towards 1981 both elephant and rhinoceros had been extirpated throughout virtually the whole of Kaokoland (Owen-Smith 1984).