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CONSERVATION AND MANAGEMENT OF BLACK RHINOCEROS IN SOUTH AFRICAN NATIONAL PARKS

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Abstract - The management (introductions, carrying capacities, monitoring, manipulation, security and translocation) of black rhinoceros *Diceros bicornis* in the national parks of South Africa is discussed in the light of "large" and "small" park scenarios. In the absence of a poaching threat large parks offer the best survival option in the long-term. However, with an increase in poaching smaller, more intensively protected parks probably offer greater short-term survival prospects for the species.

BACKGROUND

With the decline in the numbers of black rhinoceros *Diceros bicornis* in Africa over the last few decades, there has been a radical change in the manner in which many *in situ* populations are being conserved. Many of these changes have come about fortuitously, rather than as a result of critical forethought. There are essentially two basic approaches to conserving rhinos, and that is either in "large" or "small" conservation areas as described below:

A. The large conservation area (generally > 1000 km^2)

This could be either an open or fenced area of land in which the natural patterns of distribution and movement of rhino occur freely (or nearly so). The presence of rhinos grants the area no special conservation status over and above what its original designation. By virtue of the area's size, usually less intense security is provided. This is typical of large conservation areas such as Kruger or Etosha National Parks.

B. The smaller conservation areas (generally < 1000 km^2) can be subdivided depending whether they are fenced-off, and the degree of protection provided:

a. **Intensive Protection Zones (IPZs)**: A selected, smaller (up to *ca* 1000 km^2), unrestricted area (ie. no fences), within a larger conservation area in which the rhino have either been introduced or occur naturally. The area is provided with intense security measures. The selection of IPZs normally optimizes habitat suitability and potential stocking rates of rhinos. A number of IPZs have been established within Zimbabwe conservation areas.

b. **Rhino or Game Sanctuary**: A relatively small (generally <500 km^2), enclosed, and well protected area of land. It is often designed specifically for rhino protection, with Kenya offering some of the typical examples. However, smaller parks and game reserves, such as the the Addo Elephant National Park or Hluhluwe-Umfolozi Game Reserve complex could also fall in this category, although they only conserve remnants of a much larger ecosystem.

c. **Rhino Conservancy**: A relatively large fenced off area of land (up to *ca* 1000 km^2), generally encompassing a number of private properties. Security is normally provided by the landowners. The Savé and Bubiana Conservancies in Zimbabwe are good examples.

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It is within these two scenarios of large and small conservation areas, that the National Parks Board (NPB) of South Africa conserves and manages its black rhino populations. At this stage, South African parks typically fall into the "large" park and sanctuary categories.

The prime goal of all parks[4] is to: i) maintain the ecological processes and life support systems; ii) preserve genetic diversity; and iii) ensure the sustainable utilization of species and ecosystems. Thus, the conservation of rhino would theoretically become a sub-goal within this broader framework, particularly where other large, equally important herbivores and carnivores also exist. However, the demise facing the species has raised its overall importance, where specific goals of establishing "viable" populations of rhino as quickly as possible within their former ranges have been set. In reaching these specific goals, management and research collectively proceed through five stages, namely: i) repatriations (which includes the identification of their historical distribution patterns; habitat assessments prior to any introduction; determination of maximum founder population sizes (MFP) and estimated potential maximum productivity carrying capacities (EMPCC)[6]; ii) monitoring; iii) manipulation (depending upon policy and research findings); iv) security; and v) relocation.

The aim of this paper is to address these points within the "large" and "small" park scenarios, stressing the different perceptions and approaches in the light of an increasing threat of poaching on our rhino populations.

THE BLACK RHINOCEROS SUBSPECIES

Two black rhino subspecies, the south-western ecotype *D. b. bicornis* and the southern ecotype *D. b. minor*, historically occurred in South Africa[12,17] (Fig. 1). The former subspecies was exterminated from the country by 1853[26], only to survive in relatively small isolated populations in Namibia where through the efforts of conservation authorities and non-government organisations the subspecies has been saved[15]. The southern ecotype was similarly shot out throughout most of its range in South Africa, except for in the Hluhluwe-Umfolozi and Mkuzi areas of Zululand, where the work of earlier game authorities, later taken on by the Natal Parks Board, saved these small remaining populations. It is predominantly from these areas that the national parks have received their founder populations of black rhino.

The 16 national parks under the jurisdiction of the NPB cover a total area of about 32 879 km^2 (Table 1). Six of these parks are presently stocked with black rhinos, with the possibility of another four being made available in the future. These together would amount to *ca* 20760 km^2 of potential black rhino conservation land in the national parks system (Table 1) and account for about 80% of the total area available to black rhino in the country, with the Kruger National Park contributing the single largest component (76%).

Following the policy of only introducing each subspecies into their former historical ranges[2,17], the national parks are zoned to conserve both of these ecotypes. Kruger and Marakele National Parks are identified within the *D. b. minor* range, while Augrabies, Vaalbos, Karoo, Addo, Zuurberg, Mountain Zebra, and West Coast National Parks lie in the former range of *D. b. bicornis* (Fig. 1; Table 1). At present Kruger and Marakele National Parks only account for <25% of the entire *D. b. minor* population in South Africa, with the majority of animals residing in Natal game reserves. On the other-hand, the entire *D. b. bicornis* population in the country is restricted to national parks.

THE "LARGE" PARK: KRUGER NATIONAL PARK

The last original Kruger black rhino was seen in 1936[22]. Between 1971 and 1988 a total of 82 animals were repatriated to the Southern District of the KNP from Hluhluwe-Umfolozi, Mkuzi and Ndumu Game Reserves in Natal, the Zambezi Valley in Zimbabwe, and from the Zimbabwe-Mozambique border area north of the KNP[11] (Fig. 2). The population has increased to <200 animals, making it the second largest population after Hluhluwe-Umfolozi Complex (Pienaar *pers*

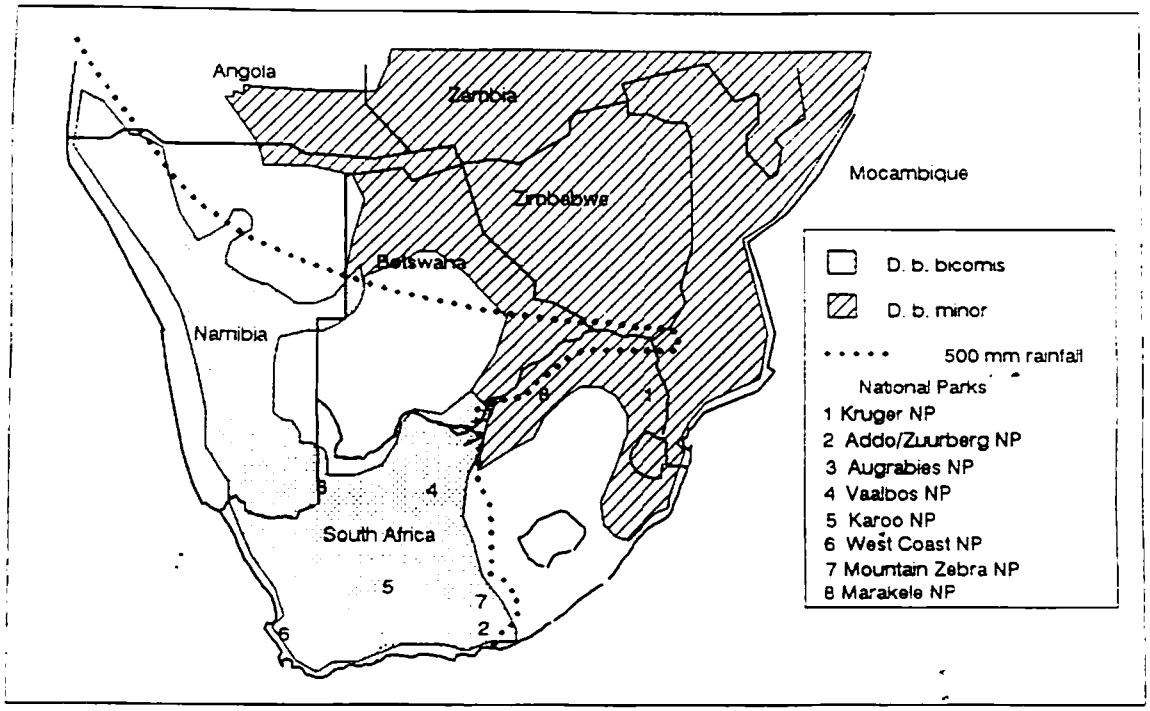

Figure 1: Historical distribution of *Diceros bicornis bicornis* and *D.b. minor* in southern Africa in relation to some national parks

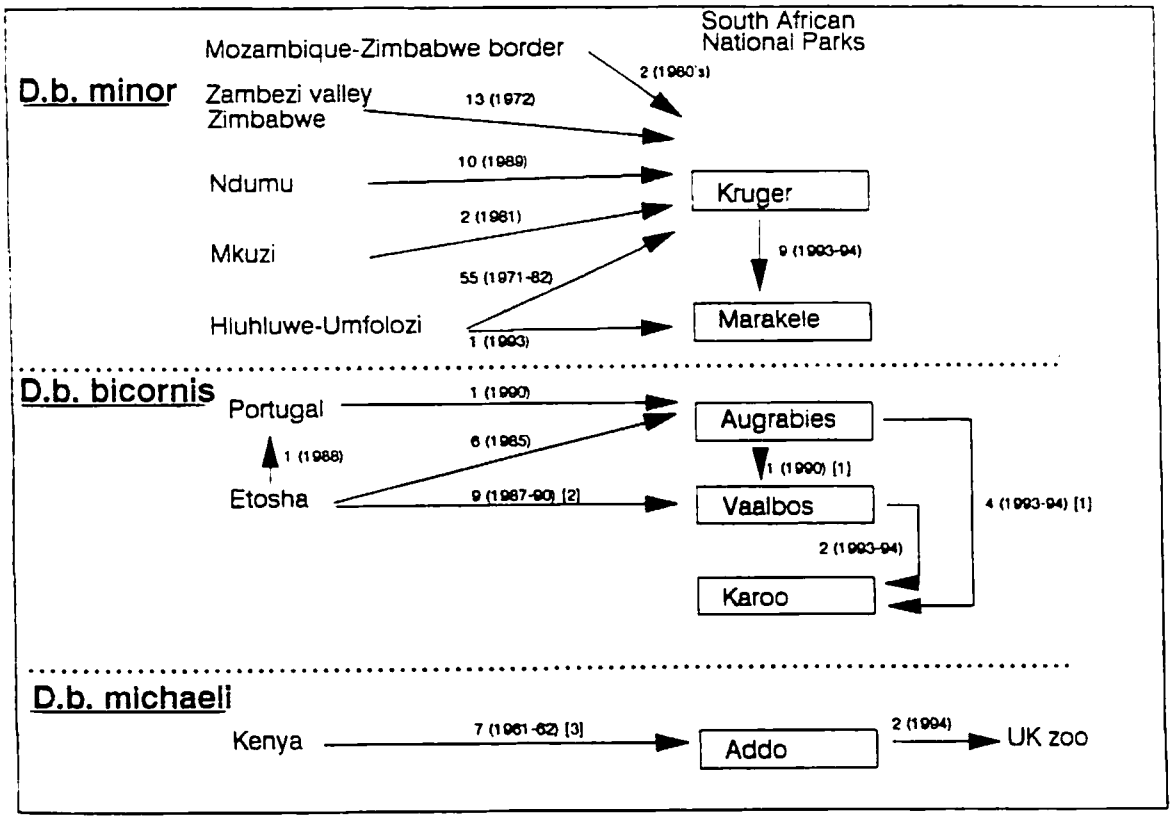

Figure 2: *History of black rhino repatriations into national parks. Numbers in square brackets refer to capture-related deaths of Diceros b. bicornis and D.b. michaeli populations.*

The population has increased at a rate of 5 % per annum to reach a total of 20 animals. Although one unsuccessful exchange between the two parks has been done, five unrelated individuals from both parks have been used to establish a third population in the Karoo National Park in the last two years (Fig. 2). The incorporation of the later park makes the possibility of increasing the maximum founder population (MFP) for the three parks to about 20 animals, thus maximizing their reproductive potential.

The proposals to remove the *D. b. michaeli* from Addo and to make the productive habitat available for the conservation of the locally more important and rarer *D. b. bicornis*, would further the conservation effort of this subspecies[13]. The NPB's policy change concerning the *D. b. michaeli* population stems from a desire to conserve only indigenous taxa in each park. Furthermore, the fact that the Kenyan populations are on the increase[1]), and that there is increasing danger to the Namibian populations has strengthened the argument to remove the Addo population. The proposed selling of the Addo rhino is designed to cover costs associated with capture and transport, purchase of extra *D. b. bicornis* from Namibia, fencing and the purchase of further land in the Addo vicinity to house the incoming rhinos. Thus the money would go directly back into rhino conservation, an added advantage and incentive in any wildlife programme, made possible with the NPB's financial independence arising from their statutory status.

With the later possible inclusion of West Coast, Zuurberg and Mountain Zebra National Parks into the rhino programme, the Southern Parks as a whole have the potential to conserve a total of 140 *D. b. bicornis*. In the event that another 20 founders could be added to the present population, it would take about 25 years to reach this goal.

Managing rhino in relatively small areas has its inherent small population problems[3]. Their demography and impact on the vegetation need to be closely monitored to gauge whether the EMPCC for the park is correct and needs adjustment. Although the EMPCC's[5] of rhino for a number of the parks, such as Augrabies, Mountain Zebra and Vaalbos, are in themselves not considered as viable, these figures must be considered as minimum values given the parks present sizes and the plans to expand them. Furthermore, the policy of managing black rhino populations in different parks as a single metapopulation and exchanging animals between parks reduces the genetic problems associated with small, isolation populations[7]. This active mangement of transferring animals also has its disadvantages as it is both costly and potentially dangerous to the animals. However, it has led to important experience being gained in capture, holding, transport anc husbandry of rhinos[23].

With respect to animal security the smaller parks have yet to be tested. Although in general they have higher levels of security, they have the advantge of being in a number of different socio-political settings (absence of adjacent low-income communal rural communities, no internationa borders) which bodes well for them[16] (Table 2). Although, as mentioned earlier, the conservatior of rhino in smaller conservation areas is financially more expensive than in larger conservatior areas[19], they may offer the better short-term security option for rhino.

CONCLUSION

The management requirements for black rhino populations in "large" or "small" national parks ar very different. In the absence of a poaching threat, large areas offer the most viable anc sustainable breeding opportunities for the species, as well as lower financial obligations. However as the threat of poaching increases the smaller conservation areas offer a better short-term, ye financially more costly solution for the populations survival requirements. As the threat of poachin is on the increase in South Africa, different, long-term methods of securing the population surviv are required. This would entail increasing the monetary value of rhino, and particularly thei importance to those people most threatening them, namely the poorer communities neighbourin our parks. Programmes whereby the communities can potentially benefit from the animals in rational and co-ordinated way, based on sound neighbour relations, is really the only way to go[2 This is being tackled as a matter of urgency by the NPB.

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Table 1. Estimated Maximum Productivity Carrying Capacities (EMPCC) and prese population sizes of black rhino in South African national parks.

Park	Size (km^2)	% park available	Present pop. size	EMPCC (#/km^2)	Total number
Parks with rhinos					
Kruger	19000	70	*ca* 200	0,25	3500
Addo	100	80	35▲	0,50	40
Augrabies	120	80	6	0,08	8
Karoo	370	70	3	0,10	23
Marakele -lowland	57	80	11	0,15	7
-upland	328	50	--	0,10	16
Vaalbos	180	50	11	0,14	13
Potential rhino parks					
West Coast	270	90	--	0,09	22
Mountain Zebra	65	70	--	0,10	5
Zuurberg	270	40	--	0,25	27
Subtotal				(Avg)	
D. b. bicornis	1375		20	0,10	138
D. b. minor	19385		*ca* 210	0,16	*ca* 3520
Non-rhino parks•					
KGNP, GGNP, TNP, TKNP, K-WLNP, BNP, RNP	12119				
TOTAL	32879				

▲ *D. b. michaeli* at present.

• Other national parks: KGNP = Kalahari Gemsbok; TNP = Tsitsikama; TKNP = Tanqua; K WLNP = Wilderness Lakes; BNP = Bontebok; RNP = Richtersveld.

Table 2. The surrounding land practices and preceived potential threat to present and future rhino populations, with the level of security for present rhino parks.

Park	# of personnel.*	Man-hrs/ day	km²/man	Surrounding land use	Perceived poaching threat▲
Addo	2 (8)	25,7	21	stock farming, township	low-moderate
Augrabies	0 (6)	26,2	17	communal lands, irrigation, stock farming	moderate
Karoo	1 (3)	4,0	167	stock farming, township	low
Kruger	154 (Entire ranging staff)	3696,0	27	stock farming, game ranching, communal, int. borders, mining	moderate-high
Marakele	6 (1)	16,8	13	stock farming, game ranching	low
Vaalbos	0 (14)	28,2	36	communal,irrigation, stock farming, game ranching	low-moderate
Possible new populations					
West-Coast				stock farming, township ranching	low
Zuurberg				forestry, stock farming, game ranching	low
Mountain Zebra				stock farming	low

* Refers to full-time security staff members, while numbers in parentheses refer to 'part-time' staff undertaking security work as apart of their daily routines.

** Based on an average salary of R1000-00/month.

▲ Information from wardens and in the case of the KNP from K Maggs[6].

▲ Subjective three point scale: low; moderate; high. Based upon the close proximity of lower income communities, international borders and past poaching record.

[6] Mr K Maggs, Security Officer, Kruger National Park.