

# The Black Rhino Sanctuaries of Kenya

R.A. Brett

The purpose of this article is to show that the policy adopted by Kenya in 1984 of creating rhino sanctuaries has been a success over the last four years. This is qualified by the fact that the areas showing the largest increases in rhino numbers, Nairobi National Park and Solio Ranch Game Reserve, were stocked in the late 1960s and early 1970s long before the term 'rhino sanctuary' had been coined. As mentioned in a previous *Pachyderm*, the established rhino sanctuaries are now beginning to show the population growth which it was hoped they would promote, in addition to providing security from poaching either by fencing, alarms, armed patrols or a combination of these.<sup>1</sup>

## Sanctuaries and Rhinos

The total number of black rhinos remaining in Kenya is between 370 and 400 animals. The majority of these animals are located in 11 well protected areas which come under the general heading of rhino sanctuaries. None of these areas has more than 60 rhinos and of the areas concerned, six are ring fenced, three are partly fenced and two are open. Data from these 11 major protected rhino populations are shown in Table I. Two sanctuaries are at an early stage of stocking and development; the completed 93 km<sup>2</sup> OI Pejeta Ranch Game Reserve has received only 4 males so far and the Tsavo Ngulia sanctuary, being extended this year to 73 km<sup>2</sup>, has been stocked with six females and one male. Each of these sanctuaries eventually should be stocked with at least 20 rhinos in more balanced sex ratios.

In addition to the total of 285 black rhino in sanctuaries, a WWF-funded census has produced an estimated number of 85-100 rhinos living outside these areas. There still exist significant breeding populations of 20 in the Ngeng Valley and 12 in the Loita Hills. Other animals are widely separated and include rhinos still remaining in areas which have been heavily poached, such as Tsavo National Park outside the Ngulia sanctuary. Many of these 'outlier' rhinos are isolated and non-breeding individuals living in remote and largely unprotected areas. Although several have been captured since 1984, in particular to stock the Lewa Downs and Tsavo Ngulia rhino sanctuaries, the remaining outliers, almost by definition, are very difficult to locate and capture and hence costly to translocate.

## Management of Sanctuaries

Apart from protection, the aim of the sanctuaries is to build up the number of rhinos as quickly as possible. In the absence of an adaptive management system which would maintain a defined balance of age structure and sex ratio, a fixed stocking rate approach is appropriate, particularly in the relatively small ring-fenced sanctuaries which range in area from 40 to 142 km<sup>2</sup> with an average of 55 km<sup>2</sup>.<sup>2</sup> Initial estimates of the carrying capacities of the rhino sanctuaries have been calculated and are shown in Table 2. For each of the ring-fenced sanctuaries and Nairobi National Park the Ecological Carrying Capacity (ECC) was estimated and three-quarters of this figure was taken as the

**Table I**  
**The Black Rhinoceros in Kenya: Population Statistics as at the End of 1988**

SANCTUARY: TYPE and Name	Males				Females				Unknown sex				TOTAL
	Adults >6yr	Sub- adult 4-6yr	Calves <4yr	Sub- Total	Adults >6yr	Sub- Adult 4-6yr	Calves <4yr	Sub- Total	Adults >6yr	Sub- Adult 4-6yr	Calves <4yr	Sub total ?	
<b>RING-FENCED</b>													
Nakuru NP	8	3	0	11	5	2	0	7	0	0	2	2	20
Ngulia RS	1	0	0	1	5	1	0	6	0	0	2	2	9
Solio GR*	16	2	8	26	19	5	6	30	0	0	2	2	58
Lewa Downs RS*	1	1	1	3	5	1	4	10	0	0	0	0	13
OI Jogi GR*	1	3	1	5	3	1	0	4	0	0	1	1	10
OI Pejeta GR*	2	2	0	4	0	0	0	0	0	0	0	0	4
	29	11	10	50	37	10	10	57	0	0	7	7	114
<b>PART-FENCED</b>													
Nairobi NP	15	9	3	27	18	6	5	29	0	0	1	1	57
Aberdare NP <sup>s</sup>	7	1	2	10	9	3	31	5	?	?	?	12	37
Laikipia R	19	3	1	23	10	4	1	15	3	0	2	5	43
	41	13	6	60	39	13	9	59	3	0	3	18	137
<b>UNFENCED</b>													
Masai Mara GR	5	1	3	9	11	1	2	14	1	0	1	2	25
Amboseli NP	4	1	0	5	2	1	0	31	0	0	1	1	9
	9	2	3	14	13	2	2	17	1	0	2	3	34
<b>TOTALS</b>	<b>79</b>	<b>26</b>	<b>19</b>	<b>124</b>	<b>89</b>	<b>25</b>	<b>21</b>	<b>33</b>	<b>4</b>	<b>0</b>	<b>12</b>	<b>28</b>	<b>285</b>

NP = National Park GR = Game Reserve RS= Rhino Sanctuary R = Ranch \* = Private Land <sup>s</sup>=Aberdares National Park Salient

number of rhinos the area should normally support, i.e. a management level of 75% of ECC. Rhinos surplus to this number would have to be removed to maintain maximum breeding output and adequate food supply. Calculation of such management levels is at present inappropriate for the Aberdares Salient, Laikipia Ranch, Masai Mara Game Reserve and Amboseli National Park, where, in each case, rhinos exist in a small and relatively secure but open area contained within a much larger potential distribution range. Carrying capacity in these open areas is primarily determined by the limits of the zone of security rather than ecological bounds.

## Breeding and Possible Problems

Indicators of breeding performance over the last four years are also given in Table II. Known births and deaths show that there have been 3½ times more births than deaths over the period and an approximate 5% annual increase in numbers overall.

The limitations on breeding output in high density rhino populations require much further study: the relationship between the effect of a given density of rhino and other browsers on vegetation and the rate of population increase may be complex. For example, a very marked over-browsing of a favoured species (*Acacia drepanolobium*) by rhinos in a high density of 1-11/2 per km<sup>2</sup> on Solio Ranch Game Reserve, a small 56 km<sup>2</sup> area, as yet has had little or no deleterious influence on their very high breeding output. However, rhino populations exceeding the ECC

of large areas have clearly suffered detrimental effects. Reduced calving as density increased has been recorded in the Central Complex Reserves in Zululand.<sup>3</sup> During the late 1960s, for areas of Tsavo National Park where rhinos were in a very high density of 0.9-1.4 rhino per km<sup>2</sup>, Goddard noted reduced cow-calf ratios and lower percentages of calves compared to the values for animals living in low density areas.<sup>4</sup>

Recruitment rates recorded in the sanctuaries in recent years have varied considerably. An exceptionally high annual birthrate of 15% from 1980-1986 at Solio Ranch, where virtually every adult female had a calf at foot, compares with a low recruitment of 21/2% from 1986-89 at Laikipia Ranch, where there have been twice as many adult males as adult females and poor breeding performance from the latter. Solio Ranch has achieved a 12% net annual rate of increase while Nairobi National Park rhino population has grown at an annual rate of only 3% since stocking ceased in 1968.5 rates of recruitment for other parks and reserves and at various dates are shown in Table III.

Under present conditions the total capacity of the Kenya rhino sanctuaries is about 680 rhinos and, at a high 10% rate of recruitment, this figure could be easily bred from the present nucleus of 285 rhinos within the next ten years. By the turn of the century and certainly thereafter, the emphasis must be on restocking the large areas of former rhino distribution that remain in both highland and lowland areas of Kenya such as the Aberdares and Tsavo National Parks. Ngulia sanctuary provides

**Table II**  
**The Black Rhinoceros in Kenya: Management and Overall Breeding Performance from 1986 to 1989**

SANCTUARY: TYPE and Name RING-FENCED	Management	Breeding	Births & Deaths	Census	Rating	7
Nakuru NP						
Ngulia RS						
Solio GR*						
Lewa Downs RS*						
OI Jogi GR*						
OI Pejeta GR* 2095813104114	14273564073931135	0.130.121.040.330.140.040.10 71	5373 5556 4226	2020	1593	
70337 253 111600016	1.570.170.870.301.25-0.88	40408410067-73	10.022.227.638.520.00.024.7	221743028	0	
12 15 10 01 10	08 4 0	12 10 10 11 10 13				
PART-FENCED						
Nairobi NP	Aberdare NPS	Laikipia R*	UNFENCED	Masai Mara GR	Amboseli NPT	TOTALS
11770397584169039020803410	0.490.530.110.230.010.020.020.08	60 45 50	(50) 100 (100)210	19580		
(80) 50 (50) 130	130 679	580	12001200028	0.930.671.531.020.641.670.820.93		
5056404655505458	15.828.09.313.124.011.120.618.2	12552272959 2	50 01 23 70	12	12	
213 13 1 10 11 120 10 105						
NP = National Park	GR = Game Reserve	RS = Rhino Sanctuary	R = Ranch	*	= Private Land	S = Aberdares National
Park Salient						

**Table III**  
**Annual Recruitment Rates of Black Rhinoceros Populations**

Area	Recruitment rate %	Authority
Olduvai Gorge	7.2	Goddard <sup>8</sup>
Ngorongoro Crater	7.0	Goddard <sup>8</sup>
Tsavo National Park	10.9	Goddard <sup>9</sup>
	8.2	Western and Sindiyo <sup>10</sup> (from Goddard <sup>9</sup> data)
Amboseli National Park	6.8	Western and Sindiyo <sup>10</sup>
Kruger National Park	9.0	Hall-Martin <sup>11</sup>
Hluhluwe Game Reserve	5.3	Hitchins and Anderson <sup>12</sup>
Umfoloji Game Reserve	11.0	Hitchins and Anderson <sup>12</sup>
Addo Elephant National Park	9.6	Hall-Martin <sup>13</sup>
Ndumu Game Reserve	8-9	Conway and Goodman <sup>14</sup>
Solio Ranch Game Reserve	15.0	Brett <sup>15</sup>

an example of a possible management approach. It is located deep inside Tsavo and has a fence designed purely to contain rhino for breeding while anti-poaching patrols maintain a zone of security extending far beyond the sanctuary area: surplus rhinos can simply be released to restock the surrounds and breed with the 'wild' population.

## Managing a Metapopulation

Apart from the necessities of continuing to protect rhinos within sanctuaries and ensuring the integrity and security of future dispersal areas, other long-term management guidelines have already been recommended for maintaining demographic stability and genetic variability in rhino populations. These recommendations include ensuring that 15-20 unrelated breeding animals are gathered together to found a new population, that the habitat is capable of carrying at least 200 rhinos, and that one or two unrelated adults are moved into each population every generation or 6 to 15 years. The latter will involve the movement of animals between the Kenya sanctuaries as well as the capture and translocation of outliers.



*A 3rd generation three year-old female black rhino born in Solio Ranch Game Reserve*

However, there are a number of practical difficulties involved with moving rhinos between populations and some are enumerated below: the list should not be considered exhaustive:

1. In an area with a high rhino density there is often aggression between introduced rhinos and residents. When confined in small, ring-fenced sanctuaries, dominant males may be very aggressive and this behaviour is not confined only to males.<sup>16</sup> In Nakuru National Park a sub-adult female introduced from Solio Ranch in 1987 was so repeatedly attacked by an unknown rhino assailant that she had to be

translocated. High levels of aggression, predominantly between adult males, has been recorded in artificially high density populations such as that in Addo Elephant National Park where there were 2 to 5 rhinos per km<sup>2</sup>.<sup>17</sup>

2. The degree of success in breeding to be expected of rhinos brought into an area is unknown, particularly for males introduced to confined areas where mating is exclusive to one or a few dominant males.
3. The suitability of a particular rhino for immobilization varies and often relates to age and sex: females may be heavily pregnant or have small calves at foot. The home range of the animal is also a factor in deciding whether to capture: areas close to rivers or swamps make successful darting problematic.
4. The availability of animals of the required sex is limited: females are in great demand for improving breeding in all rhino areas.

5. There will be differences in habitat between donor and recipient areas: the browse species available, diseases such as trypanosomiasis, minerals, heat, disturbance, etc. all can influence the success of a translocation.<sup>18</sup>

6. There are many difficulties with the 'rescue'-type capture of outlier rhinos. The remoteness and inaccessibility of the animals and the typically unsuitable terrain make capture operations very expensive, if they are feasible at all.

7. There is risk of mortality during immobilization and translocation. Capture related death rates have been close to 5% in Kenya since 1984.

8. After release, the rhino may wander or stray into unprotected areas.

9. Owners of sanctuaries on private land have personal preferences and often form an attachment to particular animals.

The first three of these difficulties might be overcome by appropriate 'predictive' management, for example by moving young animals between sanctuaries in the hope they will eventually breed, or introducing rhinos only into low density populations. Young animals, particularly sub-adults, are the 'easiest' animals for translocation in any case. 'Swops' of breeding males between small sanctuaries where single males dominate and breed may also be feasible, but have not been attempted yet in Kenya. When stocking rhino sanctuaries, choosing unoccupied ranges as release points for new inhabitants may also relieve subsequent conflict. Solio Ranch Game Reserve was stocked with 23 rhinos over a ten year period, with animals released in many locations; only one sub-adult male was subsequently killed in fighting.

It has become clear that in the short term, demographic problems of age and sex bias in small populations can quickly limit their breeding performance. The pronounced preponderance of males in the indigenous Laikipia Ranch population has severely limited the number of calves born in recent years and, as part of a 'swop' of breeding males with Ol Jogi, the removal of the dominant male from Lewa Downs has resulted in there being no matings in this sanctuary for at least two years through lack of a capable successor.

## Information and Research

With the largely anecdotal nature of many of the important past events in different rhino sanctuaries, it could be rewarding if the AERSG would serve as a focus for such limited information as is available since it strongly influences management decisions. The data would provide a basis for decision rules in management and, in addition, criteria for the selection of sanctuary areas. Given limited funds, sound assessment of the genetic value of translocations, which each cost approximately US\$ 10,000 in Kenya in 1989, will become increasingly important as will a dispassionate appraisal of the effectiveness, in breeding terms, of rescuing outliers as opposed to moving others between sanctuaries.

## References

1. C.G. Gakahu, "Sanctuaries offer future for black rhinos in Kenya", *Pachyderm*, (1989), No 11, p 32.
2. P.M. Brooks, (compiler), Conservation Plan for the black rhinoceros *Diceros bicornis* in South Africa, the TVBC states and SWA/Namibia. A policy statement and working document for conservation agencies managing black rhino, Rhino Management Group, unpublished Ma, 1988, 29 pp.
3. P.M. Brooks, A. Whateley and J.L. Anderson, "The population composition of the black rhinoceros in the central complex in 1980, with implications for the long-term viability of the population if densities are not reduced", National Parks Board, unpublished report, 1980, 6 pp.
4. J. Goddard, "Age criteria and vital statistics of a black rhinoceros population", *East African Wildlife Journal*, (1970), No 8, pp 105-121.
5. P.H. Hamilton and J.M. King, "The fate of black rhinoceros released in Nairobi National Park", *East African Wildlife Journal* (1969), No 7, pp 73-83.
6. R.A. Brett "Carrying Capacities of Rhino Sanctuaries and Future Breeding of Black Rhino in Kenya", unpublished, Kenya Rhino Project Report 17 pp.
7. R.F. Du Toit, "Suggested procedure for priority ranking of black rhino populations", *Pachyderm*, (1989), No 11, pp 7-10.
8. J. Goddard, "Home range, behaviour and recruitment rates of two black rhinoceros populations", *East African Wildlife Journal*, (1967), No 5, pp 133-150.
9. Goddard, "Age criteria"
10. D. Western and D.M. Sindiyo, The status of the Amboseli rhino population", *East African Wildlife Journal*, (1972), No 10, pp 43-57.
11. A.J. Hall-Martin, "The translocation of black rhino to the Kruger National Park", Second Progress Report, December 1982, unpublished report, National Parks Board, South Africa, 1982.
12. P.M. Hitchins and J.L. Anderson, "Reproduction, population characteristics and management of the black rhino (*Diceros bicornis minor*) in the H/C/U game reserve complex", *South African Journal Wildlife Res.*, (1983), No 13(3), pp 78-85.
13. A.J. Hall-Martin, "Recruitment to a small black rhinoceros population", *Pachyderm*, (1986), No 7, pp 6-8.
14. A.J. Conway and P.S. Goodman, "Population characteristics and management of black rhinoceros (*Diceros bicornis*) and white rhinoceros (*Ceratotherium simum simum*) in Ndumu Game Reserve, South Africa", *Biological Conservation*, (1989), No 47, pp 109-122.
15. Brett, "Carrying capacities of rhino sanctuaries" (1989).
16. J.M. Hofmeyr, H. Ebedes, R.E.M. Fryer and J.R. De Bruine, "The capture and translocation of the black rhinoceros *Diceros bicornis* Linn in South West Africa", *Madoqua*, (1975), 9(2), pp 35-44.
17. A.J. Hall-Martin and L. Penzhorn, "Behaviour and recruitment of translocated black rhino", *Koedoe*, (1977), No 20, pp 147-162.
18. J.F. Jonyo, "Doctoring rhinos: diseases seen in Kenya", *Pachyderm*, (1989), No 12, pp 22-23.
19. N. Leader-Williams, Luangwa rhinos: "Big is best, small is feasible", *Pachyderm*, (1989), No 12, pp 27-28; and "Black rhinos and African elephants: lessons for conservation funding", *Oryx*, (1990), No 24, pp 23-29.