

THE CAPTURE OF BLACK RHINOCEROS IN HLUHLUWE GAME RESERVE AND THEIR TRANSLOCATION TO THE KRUGER NATIONAL PARK

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INTRODUCTION

The black rhinoceros *Diceros bicornis* Linn., was formerly widespread throughout the Republic of South Africa (Sclater 1900, Roberts 1951). The earliest reference to this species is from the diary of Van Riebeeck written in 1652 (Bosman 1952, Thom 1958 in du Plessis 1969), who reported their occurrence on the slopes of Table Mountain in South Africa.

The presence of rhinos, as well as of other indigenous animals, was incompatible with European settlement, resulting in their systematic extermination through hunting, and no doubt, through the destruction of the natural habitat. The last black rhinoceros was shot by 1842 in the Orange Free State and by 1853 in the Cape Province (Fitzsimons 1920, Shortridge 1934, Brand 1964). Sclater (1900) was of the opinion that the species was only to be found in the Lydenburg district of the Transvaal at the end of the 19th century. Stevenson-Hamilton (1947) and Pienaar (1963) report that in 1936 a single animal, an old female, was seen in the Kruger National Park. Isaacs (Herman, 1936 in du Plessis, 1969) described that in Natal between 1825 and 1832, the rhinoceros (species undetermined) was easily hunted and killed owing to its bulkiness and inability to move at speed.

The present distribution of the black rhinoceros is thus a poor reflection of the past. At the present time the last stronghold of this species in the Republic of South Africa is in the Zululand game reserves. The largest population is to be found in the Hluhluwe/Corridor/Umfolozi complex where recent census figures have revealed approximately 300 animals. A further 40 animals occur in the Mkuzi Game Reserve, and 15 were moved to Ndumu Game Reserve between 1962 and 1970, and now number 22 animals. In addition to Natal, 7 animals were re-introduced from Kenya, by the National Parks Board of Trustees, to the Addo Elephant National Park in the Cape Province in 1962 (Penzhorn, 1971).

Parts of Hluhluwe Game Reserve support probably the highest density of black rhino in Africa. The National Parks Board of Trustees were most anxious to re-introduce black rhinoceros to the Kruger National Park in the Transvaal, and the Natal Parks, Game and Fish Preservation Board were equally anxious to relieve this local high density as well as to re-establish a breeding population in another area within the species' former range. In 1971, after negotiations between the two departments, it was finally decided to re-introduce 10 pairs to the Kruger National Park.

CAPTURE AND TRANSPORT

Certain members of the Natal Parks Board staff have had previous experience capturing black rhinos by darting with immobilizing drugs either on foot or from an open motor vehicle (Keep *et al* 1969). Fifteen animals were successfully captured and relocated in the Ndumu Game Reserve as well as others captured outside the game reserves and released within them. The methods used were adapted from the highly successful square-lipped rhino *Ceratotherium simum* Burchell, translocation operations (Harthoorn 1962, Wallach 1966, Player 1967 and Keep 1971).

Many black rhino have been captured prior to 1965 by game dealers, without the use of drugs, but often with heavy losses. King and Carter (1965) described the capture and translocation of 5 animals using Etorphine hydrochloride in the drug mixture. Both Ebedes (1966) and Jones (1966) described the use of the drug in the capture of this species. Roth (1967) documented the capture and aquatic transport of black rhinos during 'Operation Noah' at Kariba; and both King (1969) and Denney (1969) published the results of most successful operations in Kenya and Tanzania. The Rhodesians have recently moved rhinos from threatened areas outside game reserves to the Gona-re-Zhou game reserve in the southern part of Rhodesia (Anon, 1971). In addition, the South West Africa administration are at present moving individuals from endangered areas into the Etosha Pan Game Reserve (Hofmeyr, in press).

Materials and methods

For the capture and transportation of the rhino from Hluhluwe Game Reserve to holding pens, hereafter referred to as the bomas, in Umfolozi Game Reserve, the following motorised equipment was used: Bell G5 helicopter, Landrover stripped of all unnecessary fittings and fixtures, tractor and trailer and two lorries with specially constructed hydraulic-operated tip decks fitted with 5t winches.

The personnel included a helicopter pilot and engineer, biologist engaged in black rhino research, transport officer, veterinarian and an African labour force. The biologist was responsible for the selection and darting of the individual rhino from the helicopter, the veterinarian for the drugs used and the health of the animals throughout the operation, and the transport officer for the motor vehicles during capture and translocation. The terrain from which the rhino were being removed was hilly, bisected by steep-sided watercourses and covered in dense woody vegetation, hence a large labour force was required for clearing pathways to enable the motorised transport to reach the recumbent rhino.

Two standard Cap Chur (Palmer Chemical & Equipment Co., Atlanta, Ga., U.S.A.) carbon dioxide-powered gas guns were used throughout, firing 2cc capacity darts with a specially reinforced 4.5 cm hollow-pointed, barbed needle.

The drug combinations used in the darts, and the antidote, were as follows:

Etorphine hydrochloride, M99 (Reckitt), has been fully described by Harthoorn (1965). 20 mg of the powder was dissolved in 4cc of

buffered diluent supplied by Reckitt, thus 0,2 cc fluid contained 1 mg M99.

Azaperone, R 1929 (Janssen), a powerful neuroleptic, the effects of which have been dealt with by Marsboom and Mortelmans (1963). Solutions containing 200 mg/cc were prepared and used.

The antidote used was *Nalorphine hydrobromide*, 'Lethidrone' (Burrhoughs Wellcome). Solutions containing 25 mg/cc were prepared from the dry powder and the drug was always administered intravenously into a convenient ear vein.

Capture and transport to Umfolozi bomas

Generally, the capture team assembled shortly after dawn. All equipment was checked, and the darts prepared and filled with the immobilising drugs.

Nine males and 9 females, estimated body weight between 700 and 1100 kg, received 2 mg Etorphine hydrochloride and 300 mg Azaperone. One male and one female immature, estimated body weight 350 to 450 kg, received 1,5 mg Etorphine hydrochloride and 200 mg Azaperone.

A dart suitable for immobilizing an immature black rhino between 350 and 700 kg body weight was placed in one gas gun, and another suitable for one weighing from 700 to 1100 kg placed in the other. Similarly loaded spare darts, usually one of each strength, were placed in plastic containers for safe keeping in the helicopter. In addition, an emergency pack containing Nalorphine, syringe and needles was carried in the helicopter in case of accidents, or for emergency injection into a recumbent rhino before the arrival of the ground team.

Before take-off one door of the helicopter was removed to allow unobstructed use of the capture gun. The helicopter was also equipped with a two-way radio and radio contact was possible at all times with the ground party.

During warm weather, black rhino in Hluhluwe Game Reserve generally utilise hilltops and ridges as their morning resting areas. The high ground was thoroughly searched from the air for suitable rhino. If not located there, the whole capture area was systematically covered until a suitable individual was found. Depending on the locality of the animal, it was either darted immediately, or was driven out of the rugged terrain in the direction of an administrative track to facilitate early removal by the ground team after immobilization. Darts were fired into the large muscle masses of the buttocks or back, thus ensuring deep injection of the drug and maximum effect. Darting ranges varied from 4 to 15 m depending on the nature of the vegetation. Distances in excess of 15 m usually resulted in a miss, due to deflection of the dart caused by the downdraft of the main rotor.

As soon as an animal had been darted, the helicopter would gain altitude in order to observe the movement of the rhino and to notify and direct the ground team. If the darted animal moved towards rugged country or a waterway it was headed off and driven in the desired direction by the helicopter. This was only possible shortly after darting, since once the drug began to take effect it was found impossible to make the animal change direction. During this latter

period, before recumbency, black rhino usually travelled downhill.

The helicopter, if possible, landed near the recumbent rhino and awaited the arrival of the ground team.

Seven adults, 4 males and 3 females became recumbent 7 to 15 minutes after darting, without any interference whatsoever. A further 4 adult males were restrained by means of a rope attached to a hind leg, 8 to 16 minutes after darting. Two adult females walked into vegetation which arrested them 15 and 22 minutes after darting. In addition, 3 adult females and 1 adult male became recumbent without interference, 12 to 22 minutes after darting, but rose and went down again one or more times before crating. The reason for this behaviour was not clear, but was probably due to the drugs not being injected deep into muscle masses. The 2 immatures (male and female) became recumbent 9 and 5 minutes respectively following darting. The twentieth rhino, an adult female, was darted in the tail and became recumbent after a protracted period, and even then was not deeply narcotised.

Dart wounds were dressed with an antibiotic ointment and a precautionary intramuscular injection of penicillin and streptomycin administered. Respiratory rates and body temperatures were checked periodically. About 10 minutes before the anticipated time of loading a further intramuscular injection of Azaperone was given.

The crate was off-loaded by tipping it from the lorry, and positioned in front of the rhino with the door open. The crating of the rhino was accomplished by securing a nylon rope around the animal's head, under the chin and behind the posterior horn, and pulling the other end of the rope into the crate and through a hole at the other end. The antidote (Nalorphine) was administered into an ear-vein, and within about one minute the animal rose to its feet. By pulling on the rope the animal was guided into the crate and the door closed. The crate was then loaded directly onto the transport vehicle by winching it over rollers up the slightly-raised tip deck.

Table 1 presents the times between recumbency and entry into the crate together with particulars of the additional tranquilliser and antidote given.

The 100 mg of additional tranquilliser used on rhino number 1 to 5 was increased to 200 mg after number 9 was caught, resulting in an improved behaviour in the crate. The dose given to the two calves was low because of their low body weight. Number 6, 7, 8 and 9 had none, or variable doses, because of their behaviour while recumbent. The time elapsed between recumbency and injection of the additional tranquilliser did not influence the dose given. The considerable variation in time between recumbency and entry into the crate did not appear to influence the behaviour during transport to the bomas.

If black rhinos are insufficiently tranquil in the crate they may become violent and damage it, or themselves. In addition they continually push forward into a corner of the crate and "paddle", primarily with their forelegs, and to a lesser extent with the hindlegs. They then collapse onto their sternum from exhaustion, rest for a short period, rise again and repeat the performance. Finally, terminal exhaustion occurs, followed by heart failure and death. The additional dose of

TABLE 1. Times between recumbency and entry into the crate with particulars of additional tranquilisers and antidotes in the capture of the black rhinoceros.

Rhino No.	Age	Sex	Additional Tranquilliser i/m - Azaperone		Antidote i/v - Nalorphine		Time in minutes of entry into crate after first recumbency
			Time injected after first recumbency - minutes	Dose mg	Time injected after first recumbency - minutes	Dose mg	
1	Adult	M	38	100	45	250	47
2	"	F	45	100	49	250	50
3	"	M	26	100	29	250	30
4	"	M	29	100	34	250	36
5	"	M	25	100	32	250	33
6	"	F	-	Nil	37	250	38
7	"	F	-	Nil	76	250	77
8	"	M	24	200	32	250	35
9	"	M	41	100	45	250	44
10	"	M	74	200	79	250	80
11	"	F	70	200	84	250	85
12	Calf	M	71	120	82 (i/m)	150	81
13	Adult	F	46	200	56	250	57
14	"	F	72	200	79	250	88**
15	"	F	55	200	62	250	63
16	"	M	22	200	24	250	20
17	Calf	F	26	100	31	150	32
18	Adult	M	60	200	65	250	66
19*	"	F	101	200	111	250	117**
20	"	F	24	200	41	250	43

i/m = intra muscular i/v = intra venous

**walked to awaiting crate

*started into base of tail - abnormal behaviour

the tranquilliser, Azaperone, given prior to the antidote resulted in perfect behaviour in the crate for periods varying from 1½ to 5¼ hours. The distance from the loading point to the bomas varied between 35 and 53 km, and the time taken 1½ to 2¼ hours.

The journey from the capture area to the bomas was interrupted, two or three times to check the condition and behaviour of the animals. Upon arrival they were released in a partially tranquillised state. Some made a few half-hearted attempts to push over the poles of the boma walls or to force their horns between them, but most either stood quietly or walked slowly around the inside of the barrier.

Umfoloji boma, structure and management

The Umfolozi bomas were constructed of treated and untreated gum poles, 2,3 m in length and between 15 and 16,5 cm in diameter. The layout of one of the bomas, constructed in series, is shown in Fig. 1. The corner poles were embedded in 1 m of concrete, as is every fifth and sixth pole; the intermediate poles were embedded in soil 1 m deep. The corner poles were fully treated with creosote whilst all the others were treated for 1,1 m from their bases. Untreated poles were placed horizontally 2 m from the ground around the outside of the boma and bolted to the vertical poles.

The floor of the main covered boma was made of a 10 cm thick layer of concrete covered with 10 to 15 cm of river sand. A concrete water trough was constructed in a corner of the boma, its upper edge 25 cm from the ground to prevent fouling of the water by the occupants of the boma.

All the gates were closed by placing untreated poles one above the other across the opening.

Water was always available. Natural browse was gathered in the surrounding areas of the game reserve and fed to the animals twice daily in the early morning and late afternoon. The natural food plants were fed generally as a mixture of *Spirostachys africanus*, *Acacia* spp. and *Ziziphus mucronata*. Lucerne *Medicago sativa* was also added to the mixture. The food was placed in the front of a crate which was permanently attached to the boma. The rhino therefore had to walk into the crate to feed, and in this way became accustomed to walking in and out of the crate from the boma.

Black rhino become 'tame' very quickly when confined, and in fact often commence feeding within twelve hours of being captured. We considered that the animals should be kept for a minimum of 2 weeks in these bomas before transportation to the Kruger National Park.

TRANSLOCATION TO KRUGER NATIONAL PARK

Loading

The translocation from the Umfolozi bomas to those in the Kruger National Park was commenced at first light on 17 May, 1971. Food had been withheld from the rhinos for 24 hours so that on the morning of translocation when food was placed in the crate the rhino would readily enter, and the door could be closed behind it. Tranquilliser

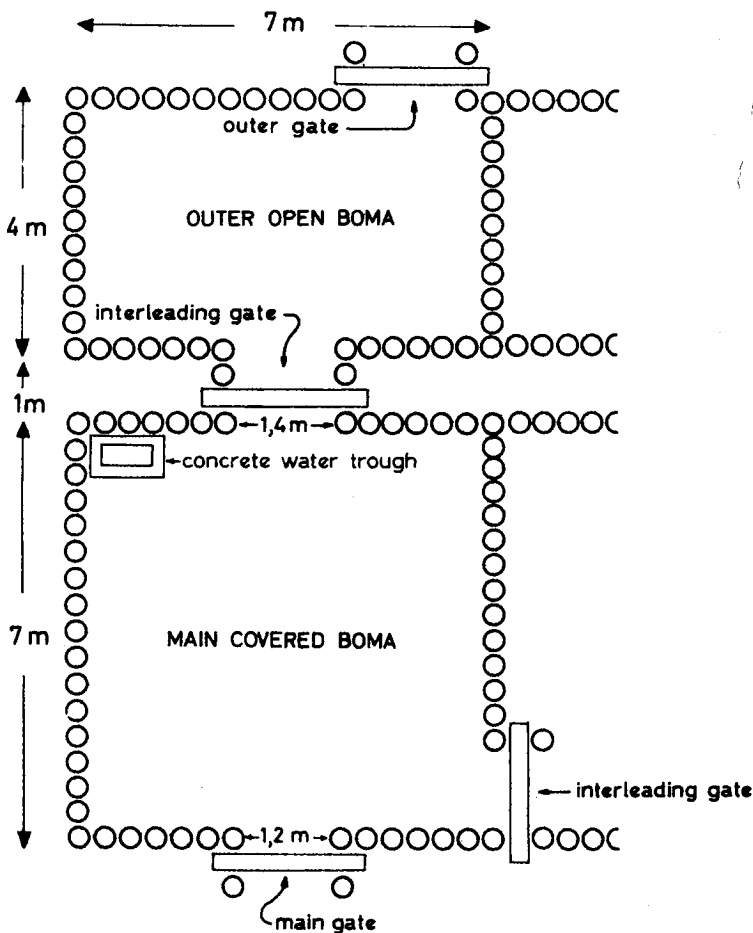


Figure 1.
Plan of one boma in a series of six (Umfolozzi Game Reserve).

was then injected intramuscularly using an ordinary hypodermic syringe and a 5 cm long, 14 gauge needle. The injections were difficult to administer as the rhino, on being confined to the crate, struggled continuously. The first two animals were treated in this manner, but subsequently each rhino was first darted in the boma using the Cap Chur gun. A few minutes later food was placed in the crate, and when the animal entered the door was closed, by which time the tranquilliser had commenced its effect. The crate was then detached from the boma and loaded onto a 5 t lorry using the tip deck, winch and rollers.

All rhinos were injected with a tranquilliser mixture containing Azaperone and acetylpromazine. From previous experience we found

that the addition of a small amount of acetylpromazine produced a superior tranquillity to that achieved with Azaperone alone.

Transport

On the first trip to Kruger National Park two rhino were transported, each housed in a crate on two 5 t lorries. For transporting the last 18 rhino from Natal to the Kruger National Park an International Horse with a 10 m trailer was used. Fitted to the trailer were 2 swivelling crates constructed of steel and insulated on the outside with plyboard, positioned fore and aft. Each swivelling crate was divided into two compartments, the one wider than the other, their internal dimensions being 4,0 m x 1,4 m and 4,0 m x 1 m respectively; both were 2,0 m high. Loading was facilitated through a sliding door common to both compartments, and off-loading via individual sloping doors at the opposite ends of the crates, which also served to prevent horn damage to the rhino during transit (Fig. 2). Two hatches over each compartment were used for ventilation, and examination and treatment of the rhinos during transit.



Figure 2.

Long distance transport vehicle with swivel crates in the travelling position.

Loading the rhino into the specially designed transport vehicle presented no difficulties. The rhino crates were loaded in the usual manner onto the 5 t lorries which in turn were reversed opposite the crate entrance on the transport vehicle. The rhino crate was designed in such a manner that when the doors were opened a base plate bridged

the gap between the vehicles, the doors were locked in position forming a passageway.

The total distance between the Umfolozi and the Kruger National Park bomas was 560 km and the time taken to cover the distance varied between 9½ and 11 hours. Stops were made periodically to check the condition of the animals, to give injections when necessary and to pass through international border posts. A light motor vehicle accompanied the heavy transport vehicle to assist in the case of breakdowns and emergencies. This vehicle was equipped with a two-way radio in contact with the Kruger National Park officials.

Table 2 presents the times taken, and the tranquillisers given, during the transportation of the rhinos from Umfolozi Game Reserve to the Kruger National Park.

TABLE 2. Times and tranquillisers given during the transportation of black rhino from the Umfolozi Game Reserve to the Kruger National Park.

Rhino No.	Tranquilliser at U.G.R.		Tranquillisers during the journey		Total time taken between first tranquilliser and release at K.N.P.
	Acetylpromazine	Azaperone	Time after first tranquilliser	Dose Azaperone	
	mg.	mg.	hr. min.	mg	
1	20	600	10 20	200	12 35
2	10	800	07 10	120	11 07
3	20	600	00 58 and 06 35	200 + 300	12 30
4	15	800	07 49	200	16 37
5	10	800	07 28	200	11 36
6	10	800	— —	Nil	10 36
7	20	600	08 05	120	11 20
8	15	800	08 07	200	16 55
9	10	800	08 03	160	11 29
10	10	800	— —	Nil	11 10
11	10	800	— —	Nil	11 07
12	10	500	— —	Nil	10 45
13	10	500	— —	Nil	11 00
14	10	800	— —	Nil	11 35
15	10	800	— —	Nil	11 37
16	10	800	— —	Nil	11 33
17	10	400	— —	Nil	11 41
18	10	800	— —	Nil	11 00
19	10	800	— —	Nil	12 05
20	10	800	— —	Nil	11 35

Release

In March 1971 two of the authors visited the Kruger National Park to investigate the proposed release area and to discuss the translocation and the construction of the holding pens.

The National Parks Board intended to release one male and one female into a predator/elephant proof paddock, 1 km² in size, situated near Skukuza. The purpose of this paddock was primarily to monitor reproduction and associated behaviour, and habitat utilization. The remaining 18 animals were to be released directly into the wild state after spending an initial acclimatization period of approximately 14 days in pens constructed at two release points. The release points, about 4 km apart, are each supplied with permanent borehole water.

The bomas in the Kruger National Park were similar in construction to those in Umfolozi except for the absence of a roof and an adjoining paddock. Off-loading ramps were constructed at each boma entrance.

On arrival, the crate unit was turned from the travelling to the off-load position. The vehicle was manoeuvred so that one of the compartments of the unit was in line with the boma entrance. The compartment door was opened and the rhino released into the boma (Fig. 3). The release of the second animal into the adjoining boma was accomplished in a similar manner. The vehicle then proceeded to the other set of bomas where the release operation was repeated.

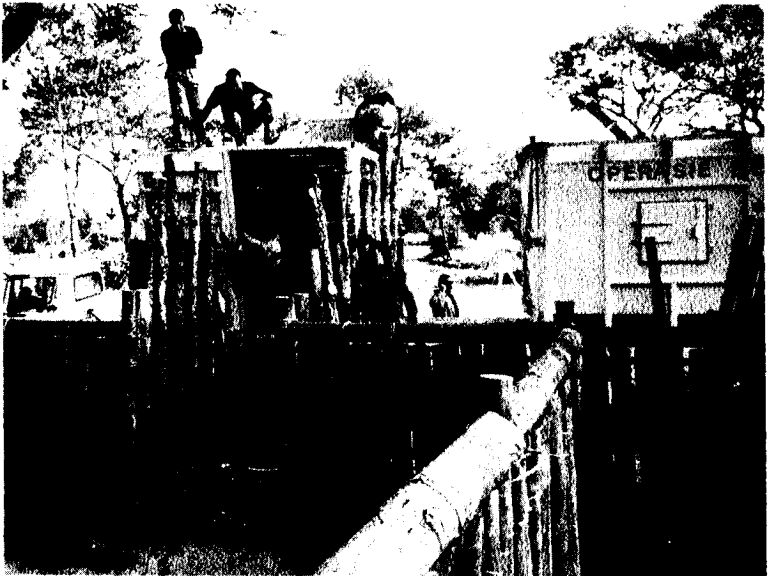


Figure 3.
Releasing at Kruger National Park with one swivel crate in the unloading position.

After release water and food were supplied and the animals left to settle down. Acclimatization periods in these bomas varied from 6 to 16 days before being released into the wild. Before the first few batches of rhino were released, their dung, which had been collected at the Umfolozi bomas and transported with the individual rhino, was taken out into the release area and randomly scattered, in an attempt to

stabilize the individual upon leaving the field bomas. Whether this had the desired effect is not known.

Each rhino was separately released from its boma into the wild. The second animal, in the adjoining boma, was never released while the first animal was still visible or even known to be feeding in close proximity to the bomas. Once the boma gate was opened the animal was not disturbed and was allowed to leave in its own time. Some individuals were hesitant in leaving the bomas and walked out quietly and immediately started feeding, whilst others came out with a rush and rapidly disappeared.

The capture and translocation aspects of this operation were highly successful. By the completion of the operation on 10 August, 1971, 15 animals had been released from the bomas. From reports received (Dr. U. de V. Pienaar and D. Swart pers. comm. 11 August, 1971 and 7 March, 1972), it appears that the rhino have settled down in the release area.

SUMMARY

A short history and an outline of the present status of the black rhino in South Africa, is given. This is followed by a description of an operation undertaken between 13 April and 10 August 1971 to capture ten pairs of animals in Hluhluwe Game Reserve, Zululand, and translocate them to the Kruger National Park. Capture by darting from a helicopter using immobilizing drug mixtures is described. The rhinos were moved from the capture area to holding pens in the adjacent Umfolozi Game Reserve, and from there to the Kruger National Park, by means of specialised transport equipment. Acclimatization periods were spent in holding pens in both Zululand and in the Kruger National Park. The structural details of these pens are given, and the final release of the rhinos into the wild state is described.

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