Lammergeyer, vol. 2 no 2 June 1962

The Capture and Relocation of the WHITE (SQUARE-LIPPED) RHINOCEROS *Ceratotherium simum simum* Using drug-immobilizing techniques, at the Umfolozi Game Reserve, Zululand, Natal

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From a report, to the Natal Parks, Game and Fish Preservation Board, on an exercise carried out from the 8th to the 30th June, 1961

I. BACKGROUND

The sole remaining nucleus of the Southern White Rhinoceros is restricted to one stretch of country in Zululand. This is an area of 600 square miles and includes the Umfolozi and Hluhluwe game reserves, which together total 129,000 acres. A total of some 650 white rhinoceroses remain in this land unit, but only about 200 are in the game reserves themselves. The remaining animals roam in a corridor of Crown Land connecting the two reserves, and adjacent areas of Crown Land which act as buffer zones between the game reserves and the surrounding settled land.

Over the last few years there has been an ever-increasing invasion of this land by squatters, thus compressing the area of land available for the rhinoceroses. If invasion of the buffer zones and corridor continues at the present rate the rhinoceros habitat will be restricted to the reserves themselves within a period of two years. This means that over 400 of these animals must be moved, or perish. Invasion of the reserves themselves is also likely. Furthermore, although two hundred animals find sustenance in the reserves at this time, it is unlikely that this number can be supported in the area if the boundaries are closed, and especially if the banks of the rivers are settled. A failure of rains may possibly see the extermination of the remaining stock through lack of food or through invasion of the reserves by domestic stock.

II. INTRODUCTION

As a result of laboratory experiments carried out at Kampala, and orientated on the experiences gained at Umfolozi in December of 1960, it has been possible to formulate a drug mixture that is suitable for the capture by immobilization of the white (square-lipped) rhinoceros.

A pilot scheme to test the efficaciousness of these drugs was carried out during June of this year. It was discovered that the mixtures used rendered the capture of rhinoceroses both simple and safe.

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Dr Horsveld,

Attached are copies of all the papers that have appeared in The Lammergeyer that may be of interest to you.

You will probably find other references that may be of use.

John Vincent.

Dr Hans Grobler Bioloog PMburg
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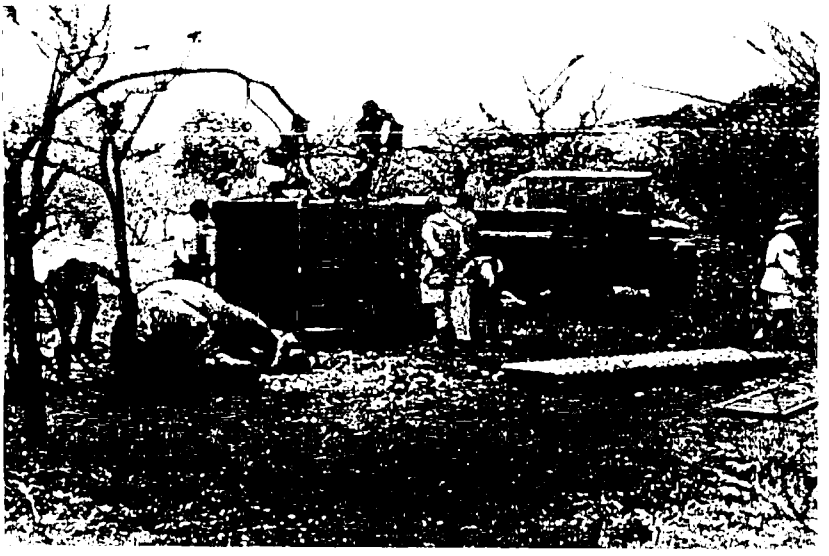

CRATING AN IMMOBILIZED SQUARE-LIPPED RHINO

THE CAPTURED RHINO WITHIN ITS BOMA

The exercise should be regarded as an experiment. Only twelve animals were immobilized and this should not be taken as the maximum number that could be caught in a similar period of time.

The drug formula could be tested only on laboratory animals and the exact combination most suitable for rhinoceroses was not known. Nine different drugs were brought from Uganda, thus limiting the quantity of each. Five of these were tested in three sets of three combinations.

Delays occurred due to a number of factors besides that of unseasonable weather. Needles of special design are necessary for the rhinoceros. These were in short supply and the use of unsuitable needles was largely responsible for approximately half the injections failing as syringes fell out immediately on being placed. This materially contributed to a shortage of the drugs of choice, much being wasted.

The experiment should, however, be classed as a success, and, on the basis of the tests carried out from the 8th to the 30th June, firm recommendations can be put forward to cover the following points:

(*a*) The type of drugs which can be safely used for the capture of the white rhinoceros.
(*b*) The drug to be used during transport to other areas.
(*c*) The size of syringes, type of needles and method of propulsion of syringes that can be usefully employed.
(*d*) Methods of handling on capture and at the release point.
(*e*) Equipment and personnel needed for a large-scale movement of rhinoceros. (Not included in this article).

III. MATERIALS USED

(*a*) *Drugs.*

The principal immobilizing drug used was Themalon (diethylthiambutene). The induction of narcosis was rendered smooth by incorporating a sufficient quantity of tranquilliser and either Largactil (chlorpromazine hydrochloride) or Sernyl (1- (1-Phenylcyclohexyl) piperidine monohydrochloride) was used for this purpose. The third drug added to the mixture was Scopolamine (hyocine hydrobromide). Shortage of Themalon dictated the use of morphine hydrochloride for a proportion of the animals.

The approximate dosages first used were as follows:

1. Sernyl (¼ gramme); Themalon (3 grammes); Scopolamine (60 mgm.) for a 2,000 – 2,500 lb. animal.
2. Sernyl (¼ gramme) morphine (½ gramme); Scopolamine (60 mgm.) for a 2,000 – 2,500 lb. animal.
3. Largactil (½ gramme); Themalon (3 grammes): Scopolamine (60 mgm.) for a 2,000 – 2,500 lb. animal.

In the light of experience the following dosage table was compiled. Either Sernyl or Largactil should be used in the primary immobilizing solution.

Given at the rates suggested in the table, the mixtures should

be perfectly safe as they represent less than half the dosage rates from which rhinoceroses have recovered without difficulty. Neither the tranquilliser nor the hyocine is capable of affecting the rhinoceros to any extent and the Themalon only with the adjuvant action of the other two drugs. The Themalon is readily reversible with Lethidrone, although at the dosage rate prescribed, the animals are capable of recovering unaided.

(*b*) *The Type of Drug used for Transport to Another Area.*

The five animals moved were given varying doses of Largactil. This drug is a tranquilliser and has, in the past, proved most successful in alleviating apprehension, preventing struggling; in promoting rapid acquiescence to capture conditions and inducing the animals to take food and drink. It has previously been used during transport of antelope, giraffe and black rhinoceros.

During this exercise, it became plain that heavy doses of tranquillisers are necessary if the animal is to be crated and transported over a long distance immediately. Also, the immobilizing drug should be antagonised as completely as possible and, at the same time, replaced with more tranquilliser. Whereas the animal under the influence of opiates is perfectly and, in fact, extraordinarily, tractable under most conditions, he will fight if confronted with a solid obstacle in his path of progress. A dose of Largactil of approximately $\frac{1}{4}$ mgm. per pound body weight, added to the $\frac{1}{4}$ mgm./lb. already received in the immobilizing mixture, will prevent this tendency and induce the animal to lie down in the crate. This is of especial advantage when the truck has to cover rough country such as stream-beds before it reaches a main track.

There appears to be no disadvantage in administering Largactil to an animal which has previously received Sernyl as tranquilliser in the immobilizing dose.

The use of drugs in the capture of rhinoceroses permits their immediate crating. It is there that the principal advantage lies in the drug method of capture over conventional roping methods. The journey to a holding area usually takes at least two hours, and it is customary to transport the animals tied and lying on their sides. Immediate crating obviates all need for excessive haste and relieves the captured rhinoceros of much discomfort.

(*c*) *Syringes.*

The size of syringe is determined by the size of animal to be captured. The 10 cc. syringe is sufficient for small half-grown animals. These take about $2\frac{1}{2}$ grammes Themalon, which forms a solution comprising about 6 ccm. This leaves about 3 ccm. for tranquilliser or 300 mgm. Sernyl at a 10% concentration. Most of the animals suitable for moving are rather larger than this, weighing practically 2,700 lbs. on an average. These would take four grammes of Themalon or 10 ccm. of solution and 400 mgm., or 4 ccm. Sernyl at 10% solution. A standard syringe body holding about 15 ccm. is probably most useful and should be ample to immobilize adult females. Twenty ccm. bodies are necessary in case fully grown

Est. Body Weight	*Sernyl: amount in mgm.*	*Sernyl: 10% Sol. in ccm.*	*Largactil: amount in mgm.*	*Largactil: 5% Sol. in ccm.*	*Themalon in gramme*	*Themalon tablets of 50 mgm.*	*Hyocine*	*Penicillin Sodium & Procaine*
1,000	150	1½	250*	5	1½	20** + 10	50	½ + ½ mega unit
1,500	225	2¼	400	8	2¼	2 × 20 + 5	75	
2,000	300	3	500	10	3	3 × 20	100	1 + 1 mega units
2,500	375	3¾	600	12	3¾	3 × 20 + 15	125	
3,000	450	4½	750	15	4½	4 × 20 + 10	150	1½ + 1½ mega units

* Largactil doses can probably be further increased.

** 20 tablets = 1 vial or 1 gramme.

bulls are required. In an emergency, syringe space may be saved by dissolving the Themalon in the Sernyl solution with only a small addition of distilled water.

Two-inch needles appear adequate to ensure the drug is injected intramuscularly. Shorter needles will result in a number of sub-cutaneous injections. In the latter case it is unlikely that the animals will go down unless the drug dose is approximately doubled. Delay in narcosis will not protect the animal from possible poisonous effects of the drug and the smaller intramuscular dose is to be preferred. The needles must be reinforced to prevent breakage due to the weight of the large syringe in striking a slightly inclined plane, or its inertia in the early part of a gallop. Even if all the drug is already injected, needle breakage may result in a part of the dose being extruded. The syringe is an important marker for those following if several rhinoceros are together. It should be barbed near its base, the barb being fixed to the needle and not the reinforcing rod.

The special design of syringe activation used is essential for all the large syringes to ensure consistent functioning of the activating mechanism and rapid emptying of the syringe.

Polyesterene discs (cut out of ½ inch sheeting with a cork-borer) mounted on the anterior end of the syringe, are advantageous, especially with the use of the powder-charge gun. They prevent damage to syringe and animal alike.

When the country is fairly thick, the Palmer Capchur gun is the weapon most easily used. Whereas it is not always easy to approach within the 25 yards necessary to project the large syringe with accuracy, there is no field of fire for the powder-charge gun. The latter is, however, a useful adjunct to capture animals on the plain where the grass is short. Rangers should not attempt to fire at groups of rhinoceroses from 25 yards if no cover is at hand. Both types of guns should therefore be available if a large scale exercise is planned or if a number of rhinoceros must be caught in a limited time. The powder charge gun is particularly useful during cold weather, early morning and late afternoon, when a sudden and unpredictable loss of power in the gas-operated gun may occur.

IV. RESULTS

Twelve rhinoceroses were immobilized and all twelve recovered from the immobilizing drug-dose. The dose administered varied considerably and an impression was formed that the margin of safety was very wide indeed. A dose that immobilized an adult bull in eight minutes was given to a small calf without ill effects. Similarly, doses designed for small animals will also immobilize large bulls, albeit over a long period of time. Unlike the types of drug known as neuro-muscular-blocking agents, more commonly used for wild-animal capture, the drug mixture used will immobilize the recipient even though only about ⅓rd of the optimal dose is used. On the other hand, overdosage of 100% permits recovery. The drug mixture used, furthermore, has the added safety factor

of allowing animals to recover unaided, although recovery may be expedited by the administration of an antidote.

Seven males were immobilized and five females, with estimated body weights ranging from 1,500 lbs. to 4,500 lbs. The shortest time to become immobilized was 6 minutes, two were stationary in eight minutes, and with a mean of about 15-20 minutes. The shortest distance travelled between "darting" and capture was 300 yards and the longest 3½ miles.

Those animals immobilized with Themalon appeared to recover more quickly and completely than the ones caught using morphine as the principal drug. Largactil and Sernyl appear equally effective as tranquillisers, while the latter has the advantage of being available in higher concentration and with somewhat greater stability in the mixed solution. Largactil has the advantage over Sernyl for quietening animals during transport and was used for this purpose in every case. It has a certain soporific effect that is desirable while the animals are in a crate, and renders the recipient animal particularly serene and acquiescent.

The change in temperament of the animals while under the synergistic influence of the drugs used was remarkable. Walking rhinoceros could be hobbled without their evincing any attempt at aggression, or even resistance. Rhinoceroses which went down in unsuitable places would comply with being led several hundred yards by the horn. Projectile syringes were retrieved from standing animals and penicillin and tranquilliser injected without eliciting a reaction. Placing the ear tags, usually an experience which is highly disliked, went unnoticed. Many of the animals, while standing with the hind legs tied during the time lapse for the crate to arrive, would pass the time agreeably by alimentation.

No difficulty was experienced in inducing any of the transported animals to enter the crate. It is in this that the greatest advantage appears to lie with the drug-immobilizing method. When rhinoceroses are caught by conventional roping methods, they are transported tied, and lying on their side. The tranquillised rhinoceros, on the other hand, will resign himself to enter the crate under his own locomotive powers, with only the minimum of coercion and some guidance. The females especially, will consent with good grace and submit to the confinement of a crate with equanimity and stoicism and, one in particular, showed no traces of resentment but composure and forbearance, in spite of having to stand on a tilted floor for 24 hours while the lorry was extricated from mud.

On the whole, it can be said that these rhinoceroses caught with the help of drugs, showed neither resentment nor fear. When hobbled to prevent their walking away, they struggled only very mildly and aggressive instincts were in abeyance. The impact of the dart and the prick of the needle caused panic only if the shooter was seen or winded.

V. METHODS OF CAPTURE, HANDLING AND TRANSPORT

The drill of capture and transport as evolved during this exercise is as follows:

(*a*) Scouts are sent out beforehand to likely areas in charge of a ranger in a Landrover, equipped with a Pye "Reporter" wireless. Contact is made with base on finding suitably sized animals.

(*b*) The Landrover carrying the drugs, gun, etc., sets out to the area after instructing the lorry to go to a rallying point.

(*c*) Contact is made with the two horsemen who have set out to the area some hours previously.

(*d*) The chosen animal is examined. A syringe is loaded with the correct quantity of drug. The gun is tested, if the gas gun is to be used.

(*e*) The rhinoceros is stalked. The shooter is kept in sight from a small distance by at least one of the two horsemen from the vantage-point of their horses.

(*f*) The dart is projected and success is signalled by the shooter. No move is made unless the animals run. If they run, they are followed by the two riders at as great a distance commensurate with the type of country and assurance that they will not lose sight of the injected animal.

(*g*) The Landrover containing drug equipment, ear tags, tranquillisers, etc., follows if the country permits easy sight of the rider. If not, it remains where it is.

(*h*) When the rhinoceros becomes immobilized, the riders check to see if it is well, and signal on whistles. If it needs help, they inject about 200 mgm. of the antidote. One rider remains with the rhinoceros and the other contacts the Landrover. Each rider is equipped with a syringe; four rubber-capped 5 ccm. vials of antidote, holding 125 mgm. Lethidrone each, and a packet of needles. Also a short rope for hobbling the hind legs in case, as a result of the antidote administered, the rhinoceros chooses to walk away.

(*i*) On arrival of the Landrover, the rhinoceros is examined. Tranquilliser is injected and then a part-dose of antidote. Ear-tags are placed, penicillin injected, measurements are taken. A rider is sent to guide the truck carrying the crate. Tick-grease is applied and antiseptic ointment where necessary.

(*j*) On arrival of the truck, the crate is unloaded and the rhinoceros and crate brought together on suitable ground. A full dose of antidote is now given and more tranquilliser if required. The rhinoceros is led into the crate. A suitable quantity of grass is added. Ropes are placed round his chest to the posterior end of the roof of the crate to prevent him from lurching forward while negotiating river beds.

(*k*) The crate is winched up the roller to the lorry. A stop for rest is made about every hour and a half, unless the animal is asleep. Sufficient tranquilliser should be administered to try

and induce this desirable state, especially while traversing the rough country.

VI. FACTORS IN HOLDING AND RELEASE

Much has been learnt during the transport of five rhinoceroses and, doubtless, further problems will arise that must be solved. The moving of rhinoceroses caught by the drug technique and under the influence of drugs presents problems which are different from those facing the animal trapper. They are also easier to solve than his are. There is no doubt that the use of drugs for catching and transporting saves a great deal of pain and discomfort to the animal, and difficulty and expense to the personnel in charge. The problems, however, are new and must be overcome and some losses are inevitable while these arise.

The prime essential for crating is heavy tranquillisation. It is preferable that the animal goes down during the initial stages of the journey. By the time he rises, he will not panic having accustomed himself to motion. He will be too concerned with keeping his footing to try and fight his crate. Pushing against the anterior door has only been observed immediately after entry into the crate. A padded head-board is important as the forehead is a better part of the rhino to bump than the snout. The board can be slid into a vertical slot from the middle to the top of the crate, and the plank tied in with thin rope for quick release in emergency.

Other padding consists of a motor tyre on the front and rear doors and on the sides either side of the head. All should be only lightly tied.

The top of the crate should be largely open to allow easy access for injection or other purposes. The crate should be equipped with slots at front and back of sufficient dimensions to allow feeding and watering on the journey or if the truck breaks down. Nylon ropes round the chest and fixed to the rear top of the crate seem efficient in preventing the recumbent animal from sliding forward if the truck brakes, especially down a steep declivity. Grass bedding should be plentiful. Straw bags should be available.

The rhinoceros should be watched by a responsible person for the entire length of the journey.

On arrival, the rhinoceroses are placed in an enclosure measuring about 15 x 20 feet. The wall should be made of natural wood only and be about seven feet high with no foothold on the inside. The gateway is closed by logs piled between two sets of posts. Drinking facilities are most easily provided by a depression with puddled clay.

The principal reason for holding at the release point is to ensure that the rhinoceroses are released in batches. The homing instinct of the white rhinoceros is strong and natural barriers should, whenever possible, exist between the release area and the compass bearing to its original home.

SUMMARY

A short description is given of the capture of twelve white (square-lipped) rhinoceroses with the drug-immobilizing technique. The types of drug used are stated and the approximate dosages used are given.

The drill for capture and transport is set out and recommendations are made, as a result of this experience, for methods of release of the rhinoceroses in the new area.

ACKNOWLEDGMENTS

Thanks are due for the following donations:

To Messrs. Burroughs, Wellcome, Ltd., for "Themalon" and "Lethidrone";

Messrs. May and Baker, Ltd., for "Largactil";

Messrs. Parke Davis Laboratories, Ltd., for "Sernyl".

Twenty ccm. syringe bodies were donated by the Palmer Chemical Company, Inc., Atlanta, Georgia.

The costs of my journey were defrayed by the Natal Parks Game and Fish Preservation Board. The Board's staff, by their assistance and teamwork, were the major factor in ensuring the success of the operation.