OPERATION "KHOMANDLOPFU"*

By

U. DE V. PIENAAR, Ph.D.
(Biologist, Kruger National Park, Skukuza)

INTRODUCTION.

As part of the preliminary trials in the culling of elephant herds in the Kruger National Park, the Board of Trustees sanctioned the capture of a limited number of young elephants during September 1966.

It has always been the endeavour of the Nature Conservation department in the Kruger Park that, during the forthcoming culling operations of excess game, as many animals as would be practically feasible, and of which the exit from the Park would be allowed by the present stringent veterinary regulations, should be saved from destruction. These would then be sold or given away to selected institutions or private individuals.

With this object in mind, ways and means had been devised, over the years, whereby it became possible to capture safely, and with the minimum risk of injury, all the larger mammal species inhabiting the Kruger Park. (Pienaar et al, 1966a).

By means of drug-immobilization it is possible today to capture even the largest bull elephant with camparative ease. (Pienaar et al, 1966b).

The handling and translocation of such massive and potentially dangerous beasts as wild adult elephants, would present considerable problems however, and also from the viewpoint of domestication and management in captivity young elephants, under the age of puberty, constitute the age-group of choice in any capture operation involving these animals.

The capture team in the Kruger Park has already achieved a large measure of success in the immobilization and marking of adult African elephant bulls, but until July 1966, no adult females or young elephants had been captured, and such operations had also never been directed against the relatively timid breeding herds.

In view of the grave risks attending the tampering with these breeding herds on foot, and the absolute necessity to limit to a minimum the disturbance factor amongst the elephant in a game park with a heavy tourist-traffic such as Kruger, we were prompted to consider an aerial capturing technique employed with eminent success, in the case of rhino, by Carter (1965) in Kenya and Uganda.

We were doubly fortunate at the time to be able to call on the expert advice and assistance of B. Carter himself, the latter being currently employed as a Ranger in the Kruger Park.

* Shangaan (Tsonga) for 'Capture the elephants'.

After a very promising trial run in July 1966, during which a helicopter of Autair Helicopter Services was used, the whole capture operation was completed with excellent effect during the period 7-14 September 1966.

A total of 27 young elephants under the age of 5 years were eventually captured, without losing a single animal in the process, and with the minimum harassment of the breeding herds.

Of this number 20, of suitable size, were bought from the Board by an American businessman, A. Jones, for translocation to America and release in a proposed elephant reserve in the state of California.

METHODS.

A base camp, from which operations were launched, was constructed on the north bank of the Letaba River, near its confluence with the Malopanyane valley. The capture area included no tourist roads and encompassed most of the open, relatively treeless Tsende flats along the headwaters of the Makhadzi and Manyeleti Rivers, which was, for obvious reasons, more suitable country for this kind of operation than the more densely wooded areas to the west.

The capture team consisted essentially of two separate groups — an airborne party in the helicopter, consisting of the pilot and marksman armed with a crossbow, and a ground party consisting of several suitable vehicles transporting the crates and all the necessary impedimenta for loading them, camera men, a squad of workmen and several rangers armed with rifles.

The helicopter was a three-seater Bell, of which the doors were removed to allow unobstructed use of the crossbow. It was also equipped with a two-way radio and radio-contact was possible at all times with the ground party. (See fig. (i)).

The crossbow used is manufactured in South Africa by Mr. G. L. van Rooyen of Greytown, and was fitted with a special clip to hold the dart from falling when shooting at a downgrade, or from being dislodged by the slip stream of air when leaning out of the open door.

The darts used, were of 3 cc capacity and fitted with $2\frac{1}{4}$" needles. These were loaded with a combination of the drugs *M-99 and Acetylpromazine maleate, which, after some initial trials, were administered in a standard dose containing 1.0 mgm M-99 and 7 mgm Acetylpromazine. (See Table 1).

The daily routine commenced with the helicopter taking off on a reconnaissance flight early in the morning to locate elephant breeding herds including calves of suitable size. When these had been spotted, the ground party was alerted by radio and the helicopter was grounded near the herd until the ground party arrived. After final discussion and instructions to all concerned, the helicopter would take off again and swoop in on the herd. Calves of the correct age group would be selected and darted with the minimum delay. The author, who did the shooting, found this not at all difficult in view of the excellent manoeuvrability of the helicopter. The elephant herd would invariably stampede on being approached by the helicopter, and the

* Propylorvinol hydrochloride, manufactured by Reckitt & Sons Ltd., Hull, England.

craft would then hover above and slightly behind them, keeping a distance of some 25-30 yards away from the selected beasts. At that range, and provided the animal did not twist and turn too much, it was no problem to score a hit with the crossbow. The American Cap-chur gun would undoubtedly also be suitable for the purpose at this close range.

After some initial misses the technique of approach was perfected by the pilot, so much so, that a run of 17 hits in succession was completed at one stage.

As soon as the requisite number of calves had been darted (which usually did not take more than a few minutes), the helicopter would rise to a higher altitude and move away from the herd. The latter calmed down almost immediately and were kept in sight by the helicopter crew as they moved about at their leisure. After about 10-15 minutes, the first calf darted would, as a rule, show signs of ataxia and go down soon afterwards. (See Fig. (ii)). This invariably halted the herd, and in the period while they bunched around the fallen calf, the other calves darted would also react to the drug and go down in the near vicinity of the first.

When all the darted calves were down on the ground, the capture team in the ground party was asked to move in, and the helicopter commenced harassing the remainder of the herd away from the recumbent calves from a lower altitude. This was done by "dive-bombing" the herd in repeated swoops down to treetop level and was invariably and rapidly successful.

With the arrival of the ground party, a crate was off loaded at each elephant calf, while the helicopter kept an eye on the herd in case the deprived cows attempted a belated rescue attempt (which they often did).

The crating of the calves was a relatively simple procedure and accomplished by securing a nylon rope around the beast's neck, while on the ground, and passing the other end of the rope through the open door of the crate to the far side. The antidote to the immobilizing mixture (M-285) was administered in an ear-vein and the calf would then rise to its feet within minutes. By gently hauling on the rope and guiding, the calf would then walk into the crate by itself and the latch could be closed and the crate loaded directly onto the transport vehicles. (See Figs. (vii) and (viii)). On several days we found it possible to have three or four calves crated and loaded, ready for transport, within less than an hour after darting the first calf.

The captured elephants were then transported by lorry to Skukuza, a distance of some 120-150 miles, where a solidly-constructed boma was erected to house the animals during their period of taming and adjustment to captivity. Here they were released in groups of 4, selected according to size and tended to by trained personnel. (See Figs. (ix) and (x)). They remained in their boma for a period of some 10 weeks, before they were finally crated and shipped to America. By this time, they were quite tractable and well adjusted to captivity. (Young, 1967).

Fig. (i) — Bell model helicopter used in the capture of young African elephants in the Kruger Park.

Fig. (ii) — Elephant cow guarding her calf which is immobile and under the influence of the neuroleptanalgesic mixture. Note dart in rump of calf.

Fig. (iii) — Elephant cow supporting her drugged calf — note thrust-out foreleg, while the rest of the herd is stampeding.

Fig. (iv) — Elephant cow at bay by the side of her incapacitated calf. The rest of the herd is moving away from the swooping helicopter.

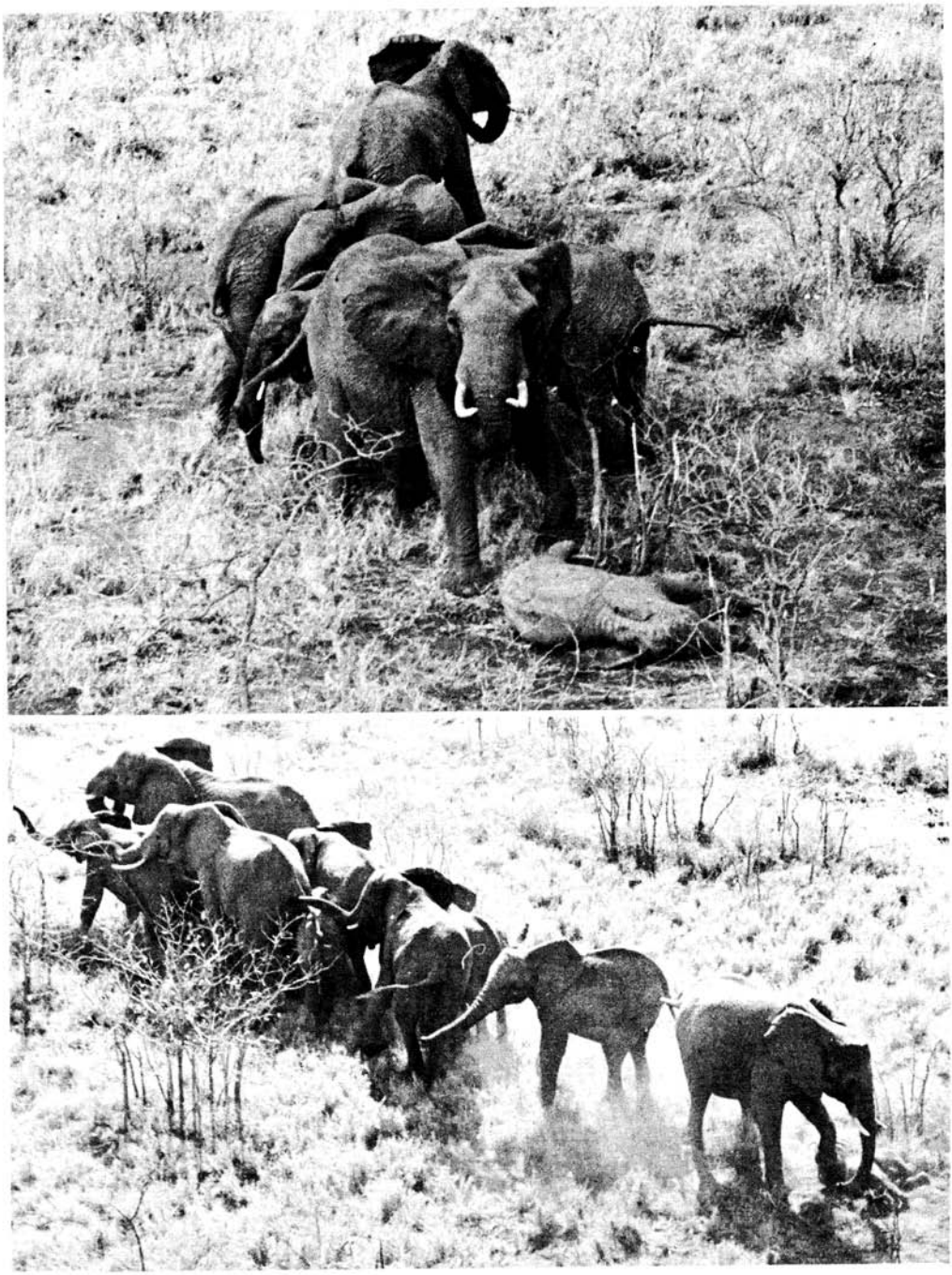

Fig. (v) — Elephant cow attempting to wake her immobilized calf by rolling it to and fro with her forefeet. The other elephants are moving off.

Fig. (vi) — Immobilized and recumbent 'Mother and child'. Note darts in hump of cow and near base of tail of calf.

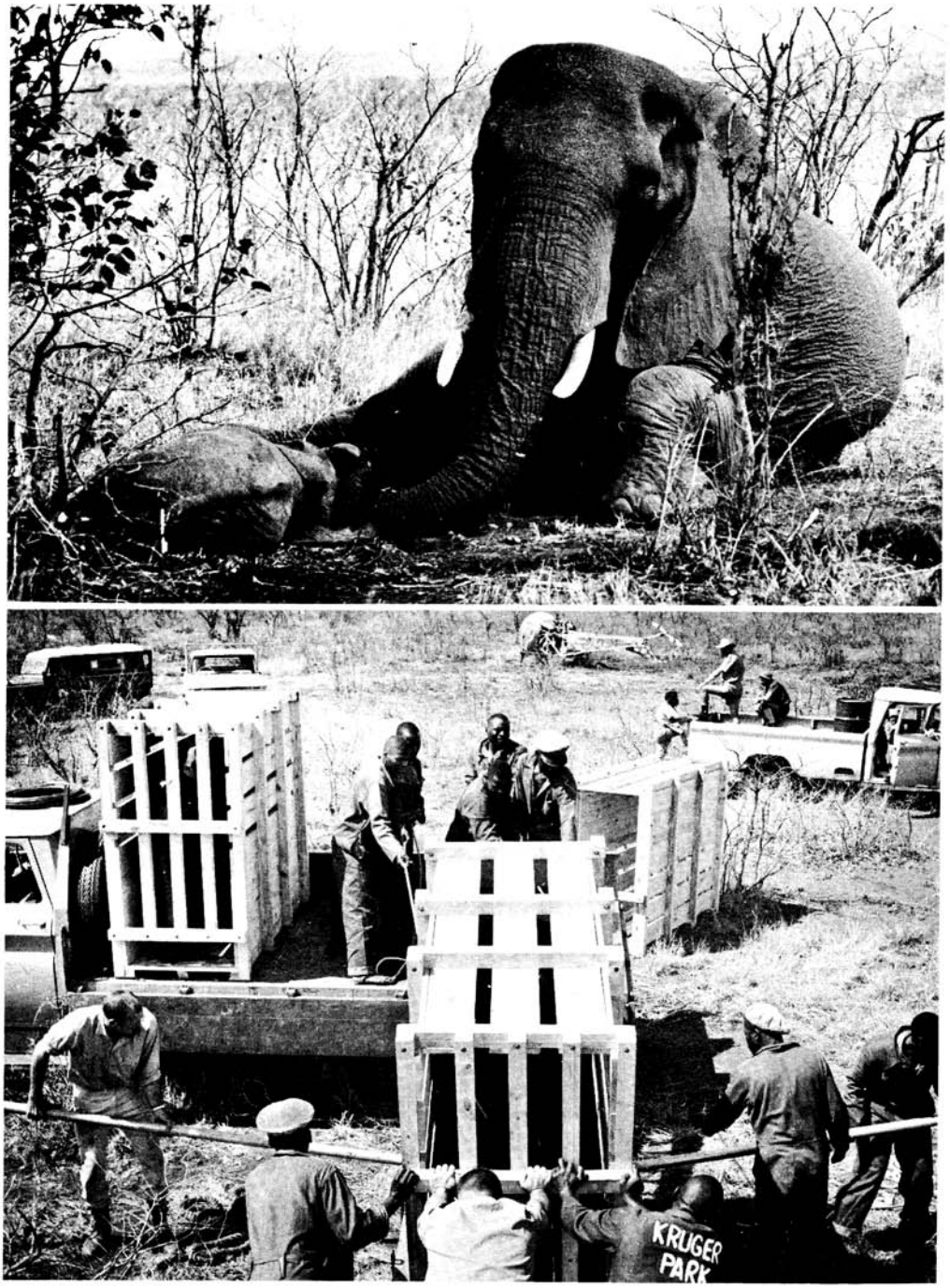

Fig. (viii) — Loading of crated elephant on transport vehicle.

Fig. (vii) — Elephant calf being guided towards entrance of crate after receiving antidote.

Fig. (ix) — Three new arrivals after release in their 'boma' at Skukuza.

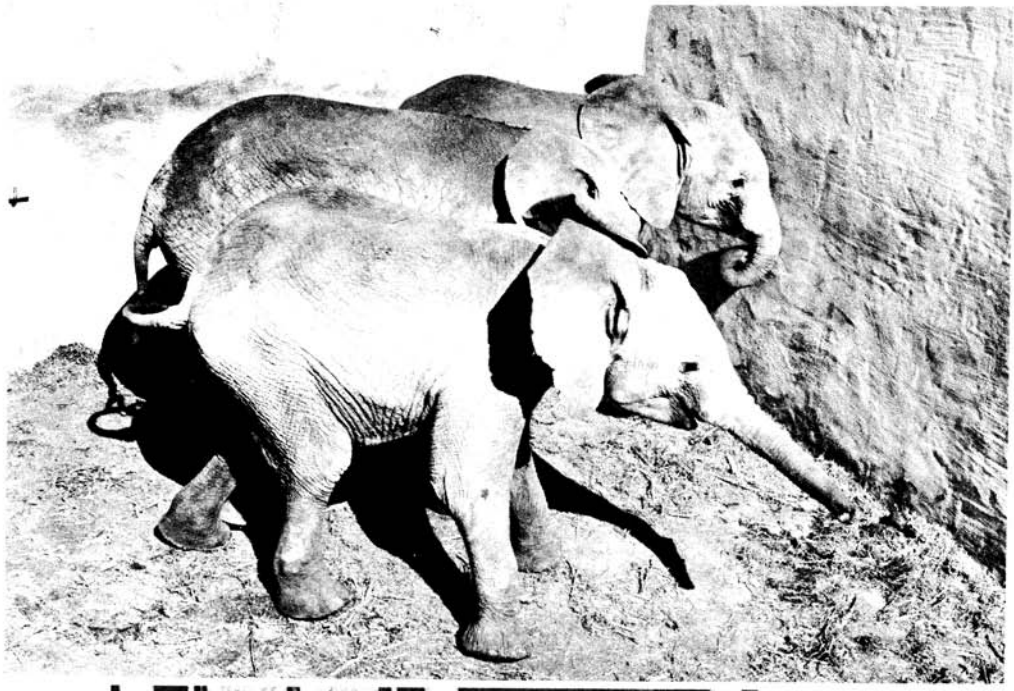

Fig. (x) — Young elephant calf being fed on liquid food from a bucket.

RESULTS.

Despite the fact that there was considerable scepticism and reservations at the commencement of the operation, the results exceeded our wildest expectations.

The mere fact that 26 selected young elephants could be captured with such ease during only 7 "catching"days, and that many more could have been caught had we not been limited to a quota of 4 per day by the available crates, testifies amply for the efficiency of the technique.

We do not consider that the same number of young elephants could have been captured by any of the older, more conventional methods, in even the most favourable surroundings, within such a limited period, and with such limited disturbance of the breeding herds themselves. The herds from which the calves had been removed, could still be found in the same localities after the termination of the operation, and there was no visible signs that they had been at all adversely affected by the experience.

Most important, the amicable relationship between elephants and tourist traffic had not been sacrificed in any way.

M-99 in combination with Acetylpromazine has a high therapeutic index in young elephants and was very well tolerated by all age classes captured.

This is particularly well illustrated by the fact that a standard dose of 1.0 mgm M-99 and 7.0 mgm Acetylpromazine was eventually administered to all the young elephants captured — some of which were at least twice as heavy as the smallest individuals darted. One accidentally received a double dose of the drug (see No. 20 in Table 1), but suffered no adverse effects.

Not a single animal was lost in the process, which in itself is a remarkable result in the field of animal immobilization.

Upon intra-muscular delivery of the drug-mixture, a period of 7-10 minutes usually elapsed before the first signs of ataxia could be noticed in the stricken animal, and the calf was usually down within 12-15 minutes after darting. This often happened with the beast lying on its brisket, but this did not cause concern as young elephants do not exhibit the same degree of respiratory distress as adult animals when lying in this position. (Pienaar, 1966b). The calf also invariably ended up on its side because its mother generally made frantic efforts to coax the youngster to rise again. She would either attempt to lift it bodily by means of her trunk, or roll it to and fro with her foreleg in a vain attempt to wake it up. (See Figs. (iv) and (v)). During the ataxic stage the cow would also often support the swaying calf by means of her trunk or by allowing it to lean against an out-thrust limb. (See Fig. (iii)). Very often the mothers would also discover the darts in their offspring and remove them immediately with their trunks. Darts thus removed were sometimes trampled or bitten in half by the enraged parent.

Once the calf showed signs of distress as the drug began to take effect, the mother, as well as some of its elder brothers and sisters in the family group, would remain with it and attend it at all times. This usually brought the moving herd to a halt and all the elephants would remain clustered around the immo-

bilized calf, the while trumpeting, throwing up dust and showing other signs of great excitement.

The maternal instinct is very highly developed in elephant cows, and some quite pathetic instances were witnessed of mothers defending their babies in the face of mortal danger, when the rest of the herd had long departed. When operating in the Lebombo mountains, a herd was once trapped in a box canyon and some cows were seen to lift their young calves over large boulders and obstacles as they negotiated the steep incline in the most amazing manner.

This almost human concern and care of cow elephants for their young was responsible for the only difficult procedure in the whole operation — that of separating the rest of the herd from the immobilized calves.

When swooping down on the herd milling around an immobilized calf, the majority of the herd would almost invariably make off on the first attempt, and could be harassed away with comparative ease. Soon, only the mother and a few of the immediate family relations remained with the stricken calf. The latter lost their nerve soon after, however, and then only the mother remained with the calf.

As a rule several swoops low over her head had to be made before the cow would finally budge and move off. They stood their ground in the most commendable manner, and although visibly distressed (vide intermittent watery bowel movements), would charge anything approaching the calf with murderous intent. Some actually reared up on their hindlegs and attempted to pluck the helicopter from the air with their trunks.

The younger the calf, the more determined were the efforts of the cow to protect it against all odds, and the longer it took to herd her away from it. Except in one instance however, (No. 4 in Table 1), this was eventually accomplished, and although most cows made several attempts to return to their calves, they could be kept at bay with the helicopter, while the ground party moved in and loaded the calf.

In the above-mentioned case the calf was very young and the cow would not budge and had to be immobilized too. This was satisfactorily accomplished by administering 6 mgm M-99 and 40 mgm Acetylpromazine to the mother and she went down next to the calf within 18 minutes.(See Fig. (vi)).

Considering this general display of maternal love, the two cases experienced where elephant cows abandoned their young calves on the first sign of danger, are all the more inexplicable.

The captured calves ranged in shoulder height from 40" to 68" which, according to the age criteria provided by Johnson and Buss (1965), as well as Offerman, quoted by Morrison-Scott (1947), would indicate a range of ages from just less than 12 months to about 4 years and 8 months, and weights from some 550 lbs to about 2,200 lbs (See Table 1).

It was noticed that the youngest elephants captured i.e. those with 40-41 inch shoulder height (± 12 months old), were just cutting their first molar teeth and were still all but completely dependant on their mothers. Elephant calves of about 55" in shoulder height usually show visible tusks just protruding from

the gum margin and it was found that elephants above this age group do not tame easily.

Subsequent experience with the captured elephants in the bomas indicate in fact that the ideal size of elephant calf to capture for this purpose, are those ranging in shoulder height from 44"-50" (i.e. from about 18 months to 27 months old). (Young, 1967).

The immobilized elephant calves responded very well to the intravenous administration of the specific antidote (M-285)*. A total dose of 6-8 mgms. was usually sufficient to reverse completely the narcotic effect of the M-99, and the animal would rise from its prone position in a most dramatic manner some 2-3 minutes post-injection. In some cases, where the animal was heavily sedated or an obvious overdose had been administered, small additional doses of M-285 had the desired effect. (See Table 1).

A summary of the vital statistics and dose rates and responses for each individual captured, is provided in Table 1.

In conclusion, we have no hesitation in recommending the procedure for the capture of young elephant calves outlined above to other workers in this field, and the technique may, in our opinion, quite feasibly be adapted to the capture of other large, free-roaming animals.

SUMMARY.

A technique is described whereby 27 young African elephants, ranging in age from 12 months-56 months old, were captured successfully, without loss, using a helicopter and crossbow to effect the darting. The drugs employed consisted of an immobilizing mixture of M-99 and Acetylpromazine and an antidote M-285, both of which proved to be eminently suitable to the purpose.

ACKNOWLEDGEMENTS.

Our thanks are due to all the members of the Nature Conservation staff who contributed to the successful planning and execution of the operation. The pilot of the helicopter, Capt. M. Skeen, also contributed in no mean manner to the success of the venture, as the darting of the beasts was only made possible by his expert handling of the aircraft.

We are, once again, greatly indebted to Messrs. Reckitt & Sons of Hull, England, for providing us, free of charge, with a quantity of the drugs M-99 and M-285 used in operation "Khomandlopfu".

* N-cyclo-propylmethyl-19-methyl-nororvinol, manufactured by Reckit & Sons.

REFERENCES

Carter, B. H. (1965) — The Arm'd Rhinoceros. Andre Deutsch Co. Ltd., London. 281 pp.

Harthoorn, A. M. (1965) — Application of Phamacological and Physiological principles in the restraint of wild animals. Wildlife Monographs, Vol. 14. 78 pp.

Johnson, O. W. and Buss, I. O. (1965) — Molariform teeth of male African elephants in relation to age, body dimensions and growth. Journ. of Mammalogy, Vol. 46, No. 3, pp. 373-384.

King, J. M. and Carter, B. H. (1965) — The use of M-99 for the immobilization of the Black rhinoceros *(Diceros bicornis)*.
E. Afr. Wildlife Journ., Vol. 3, p. 19.

Morrison-Scott, T. C. S. (1947) — A revision of our knowledg of African elephants' teeth with notes on "forest" and "pygmy" elephants.
Proc. Zool. Soc. London, Vol. 117, pp. 505-527.

Pienaar, U. de V., Van Niekerk, J. W. et al (1966) — Neuroleptic narcosis of large wild herbivores in South African National Parks with the new potent Morphine analogues M-99 and M-183.
Journ. S. Afr. Vet. Med. Ass., Vol. 37, No. 3. pp. 277-291.

Pienaar, U. de V., Van Niekerk, J. W. et al (1966) — The use of Oripavine hydrochloride (M-99) in the drug-immobilization and marking of wild African elephant in the Kruger National Park.
Koedoe No. 9, pp. 108-123.

Young, E. (1967) — The management and nutrition of twenty newly-captured young African elephants.
(Paper in press).

TABLE 1.
RESULTS OF DRUG-IMMOBILIZATION WITH M-99 NARCOTIC MIXTURES OF 27 YOUNG AFRICAN ELEPHANTS.

Number	Date	Estimated age of animal (in years)	Sex	Estimated body weight (in lbs)	Body measurements			Site of injection	Route of injection	Dosages of Narcotic Mixture		Animal down (Time in minutes after darting)	Dosage of Antidote M-285 (Total dose in mgm)	Reaction to Antidote
					Circumference of forefeet (inches)	Shoulder height (inches)	Chest girth (inches)			M-99 Total dose in mgm)	Acetylpromazine maleate (Total dose in mgm)			
1*	29.7.66	4.75	♀	± 2,200	—	68	—	Back	Intra-muscular	1.5	5	12	10 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
2	7.9.66	2.5	♀	± 1,300	—	54	—	Neck	Intra-muscular	0.75	7	18	8 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
3	7.9.66	2.75	♂	± 1,400	27	56	—	1st dart — back 2nd dart — rump	Probably subcutaneous Intra-muscular	1st dart — 0.75 2nd dart — 0.5	7 5	2nd dart fired 40 min. after 1st. Down 10 min. after 2nd dart.	8 i/v. 2 i/m.	Recovers well and regains feet ± 2 min. after injection i/v.
4*	7.9.66	1.1	♂	± 600	21½	41	54	Rump at base of tail	Intra-muscular	0.6	7	24	8 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
5	8.9.66	2.0	♂	± 1,000	23½	48	—	Hump of shoulder	Intra-muscular	1.0	7	18	8 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
6*	8.9.66	3.25	♀	± 1,450	—	57	—	Back	Intra-muscular	1.0	7	12	8 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
7	8.9.66	2.6	♀	± 1,300	25	55†	68	Back	Intra-muscular	1.0	7	±11	8 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
8	9.9.66	1.6	♂	± 800	21½	43	55	Rump	Intra-muscular	1.0	7	10	2 i/v. plus 8 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
9	9.9.66	2.2	♀	± 1,100	27	50	—	1st dart — shoulder 2nd dart — back	Probably subcutaneous Intra-muscular	1st dart — 1.0 2nd dart — 0.5	7 5	2nd dart fired 45 min. after 1st. Down 10 min. after 2nd dart.	2 i/m. 10 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
10	9.9.66	2.2	♂	± 1,100	26	50	-	1st dart — rump 2nd dart — back	Probably subcutaneous Intra-muscular	1st dart — 1.0 2nd dart — 0.5	7 5	2nd dart fired 45 min. after 1st. Down 10 min. after 2nd dart.	2 i/m. 10 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
11	10.9.66	1.75	♂	± 950	24	47	—	Back	Intra-muscular	1.0	7	14	2 i/v. plus 4 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
12	10.9.66	2.1	♂	± 1,050	25	49	—	Back	Intra-muscular	1.0	7	+12	2 i/v. plus 4 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
13*	10.9.66	3.25	♂	± 1,450	28½	57	—	Rump	Intra-muscular	1.0	7	±14	8 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
14	10.9.66	2.0	♂	± 1,000	24	48	—	Rump	Intra-muscular	1.0	7	±12	6 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
15*	12.9.66	3.4	♂	± 1,600	—	±60	—	Back	Intra-muscular	1.0	7	±12	6 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
16*	12.9.66	3.3	♂	± 1,500	—	±58	—	Top of thigh	Intra-muscular	1.0	7	15	6 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
17	12.9.66	2.1	♂	± 1,050	24	49	—	Back	Intra-muscular	1.0	7	±12	6 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
18	12.9.66	2.0	♀	± 1,000	22½	48	—	Rump	Intra-muscular	1.0	7	±14	6 i/v.	Recovers well and regains feet ± 2 min. after injection i/v.
19	12.9.66	2.1	♀	± 1,050	23½	49	—	Back	Intra-muscular	1.0	7	±15	2 i/v. plus 6mgm.+2mgm.	Slow response to antidote.
20	13.9.66	1.8	♀	± 925	24	46½	—	1st dart — shoulder 2nd dart — rump	Intra-muscular	1st dart — 1.0 2nd dart — 1.0	7 7	10	10 i/v.	Accidentally darted twice but responded well to antidote.
21	13.9.66	2.1	♀	± 1,075	25	49½	—	Back	Intra-muscular	1.0	7	10	8 i/v.	Recovers well. Rises to feet ± 2 min. after i/v. injection.
22	13.9.66	1.75	♀	± 950	25	47	—	Rump	Intra-muscular	1.0	7	10	8 i/v.	Recovers well. Rises to feet ± 2 min. after i/v. injection.
23	13.9.66	1.75	♀	± 950	23	47	—	2 darts dislodged on impact 3rd in rump after 40 min.	Some intra-muscular Intra-muscular	1st two darts some of 1.0 mgm. 3rd dart — 0.5 mgm.	7 3½	± 10 min. after 3rd dart	10 i/v.	Recovers well. Rises to feet ± 2 min. after i/v. injection.
24	14.9.66	1.2	♂	± 700	20½	41½	—	Back	Intra-muscular	1.0	7	13	10 i/v.	Recovers well. Rises to feet ± 2 min. after i/v. injection.
25	14.9.66	1.0	♀	± 550	19	40‡	—	Rump	Intra-muscular	1.0	7	±12	10 i/v.	Recovers well. Rises to feet ± 2 min. after i/v. injection.
26*	14.9.66	2.6	♂	± 1,350	27	55†	—	Rump	Intra-muscular	1.0	7	10	10 i/v.	Recovers well. Rises to feet ± 2 min. after i/v. injection.
27	14.9.66	1.8	♂	± 925	23	46½	—	Shoulder	Intra-muscular	1.0	7	±14	10 i/v.	Recovers well. Rises to feet ± 2 min. after i/v. injection.
28=	3.10.66	2.0	♂	± 1,000	—	±48	—	Rump	Intra-muscular	0.75	5	10	6 i/v.	Recovers well. Rises to feet ± 2 min. after i/v. injection.

* Elephants released after capture in view of their being over or under the required size or of the wrong sex.
= This elephant was immobilized in the boma after having been in captivity for some time.
† Elephants above 55" in shoulder height usually show visible tusks.
‡ Elephants of 40-41" shoulder height are in the process of cutting their first molar teeth and are still entirely dependent on their mothers.