# A REPORT ON SOME IMMOBILIZING DRUGS USED IN THE CAPTURE OF WILD ANIMALS IN THE KRUGER NATIONAL PARK

By

J. W. VAN NIEKERK, B.V.Sc.
*(State Veterinarian, Skukuza, Kruger National Park)*

and

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

During the past year, several experiments were conducted on the immobilization and transportation of game in the Kruger National Park. Various drugs were used as immobilizing agents on a number of wild ungulate species. It is our intention in this paper to present a brief resumé of the results achieved with a discussion of the merits and disadvantages of each drug per se.

The method of drug administration was essentially the same as described by us in a previous publication (1962). A few minor improvements on the crossbow and projectile-syringes were made by the manufacturer (Mr. G. L. van Rooyen of Greytown, Natal).

Field trials were conducted with the following drugs.

(1) SERNYL (Parke Davis) — This is the trade name for 1-(-1-Phenyl cyclohexyl) piperidine hydrochloride — a drug with several applications inter alia as a tranquilizer or anaesthetic for certain animal species.

(2) FLAXEDIL (May Baker) — Gallamine triethiodide — a muscle relaxant which blocks impulses at the neuro-muscular junction.

(3) OMNOPON (Roche) — A drug incorporating all the alkaloids of opium in their natural proportions.

DISCUSSION.

(i) SERNYL.

The use of Sernyl as an immobilizing drug for game has come to our notice through the work of Harthoorn (1962) on the white rhinoceros, *Diceros (Ceratotherium) simus simus* (Burchell), in Natal, and Carter (1961) on the black rhinoceros, *Diceros bicornis bicornis* (Linnaeus), in Kenia. Both workers claim to have achieved excellent results. We consequently decided to test this drug's efficacy on different ungulate species and baboons in the Kruger National Park.

(1) GIRAFFE *(Giraffa camelopardalis* Linnaeus).

It is common knowledge from research done by other workers that giraffe may be successfully captured with the aid of paralytic drugs or muscle relaxants such as Scoline and Flaxedil. Due to the fact that this is a species exceptionally prone to stress factors, resulting in shock and other complications, as well as difficulty in lying down and retaining its feet again (in the adult), the use of a tranquilizer was thought to be of an advantage and superior to a muscle relaxant without sedative properties.

A female giraffe with an estimated body weight of 900 lbs. was darted with 250 mgm of Sernyl. The dart syringe was shaken off soon after it struck the animal and a second dart (also 250 mgm) was fired 12 minutes after the initial shot. The second dose was administered under the impression that the first dart had not injected. It was subsequently established that it had; the animal thus received a total dose of 500 mgm. (0.55 mgm/lb.).

Ataxia occurred in 12 minutes and the animal was down in 20 minutes. The animal showed initial restlessness, then struggled violently and subsequently went into a coma. It was obvious that this animal suffered from overdosage and it was destroyed after 4 hours.

A two-toothed male giraffe with an estimated body weight of 1500 lbs. was darted with 375 mgm of Sernyl. Ataxia occurred in 7 minutes, the animal was down in 21 minutes and remained immobilized for $2\frac{1}{2}$ hours. Complete recovery occurred in 4 hours. This animal received an estimated dose of 0.25 mgm/lb. As in case No. 1 the animal was restless and sustained episthaxis and concussion in the process of struggling. It is possible that this animal's body weight had been under estimated.

It was subsequently decided to incorporate a tranquilizer in a syringe containing Sernyl. The object was to counteract the excitory stage evidenced in the abovementioned cases. A mixture of Sernyl and Trilafon (Perphenazine) Schering, was administered to a male giraffe weighing $\pm$ 1,000 lbs. Ataxia again occurred in 7 minutes with the animal going down at 22 minutes post administration. The animal's balance was disturbed and it also showed initial restlessness, until the Trilafon started taking effect after one hour. At this stage salivation increased but ceased after 60 minutes. The animal remained recum-

bent, unable to get on it's feet, with it's general condition deteriorating. As a result of an unfavourable prognosis the animal was destroyed ten hours after it was darted. The dosage rate in this case was Sernyl 0.3 mgm/lb. and Trilafon 0.04 mgm/lb.

A young female giraffe with an actual weight of 320 lbs. received a mixture of 80 mgm Sernyl and the same amount of Flaxedil. In this case the tranquilizer was substituted with a muscle relaxant. Ataxia occurred in one minute and the animal went down at $3\frac{1}{2}$ minutes. Prostigmin Vet. (Roche) was administered I.V. after 6 minutes at a dosage rate of 1 mgm/100 lbs. The animal was on it's feet at 8 minutes, but collapsed soon afterwards, and could not be risen again. The animal died suddenly $2\frac{1}{2}$ hours after drug administration.

A young female giraffe with an estimated body weight of 300 lbs. received a dart containing 45 mgm of Sernyl (0.15 mgm/lb.). The animal became ataxic in 8 minutes. With the animal's balance disturbed, a second dart containing 120 mgm Flaxedil could be conveniently delivered by means of the Cap-Chur pistol. The animal still did not go down, as the Flaxedil dose was obviously too low. A third dart containing 37.5 mgm Trilafon was then administered 57 minutes after the initial shot. The animal became tranquillised and was roped. It was down for 2 minutes after which it got up and it's subsequent recovery was uneventful.

A giraffe (female) weighing $\pm$ 700 lbs. was darted with a mixture of Sernyl and Flaxedil (Sernyl 0.13 mgm/lb. and Flaxedil 0.34 mgm/lb.). After a time-lapse of 26 minutes 87.5 mgm Trilafon was injected. Ataxia occurred 33 minutes after the initial shot and the animal went down at 36 minutes. At 37 minutes the animal rose to it's feet and walked away. Two hours after the Trilafon injection, the animal went down for a second time. Amphetamine phosphate (100 mgm) was administered after which it walked more than two miles fully tranquillised. (Fig. 1).

A thousand pound body weight female giraffe received a mixture of Sernyl (0.15 mgm/lb.) and Trilafon ,0.06 mgm/lb.). Ataxia occurred in 9 minutes, the animal was down in 36 minutes and remained recumbent for 76 minutes. (Fig. 2).

This animal did not show any signs of excitement and recovered completely after 90 minutes. (Fig. 3).

(2) IMPALA (*Aepyceros melampus melampus* Lichtenstein).

An adult Impala ram, weighing 93 lbs., received a dose of 0.215 mgm/lb. Sernyl. Ataxia occurred in 7 minutes and the stricken beast went down in 30 minutes. The animal was immobilized for $\frac{1}{2}$ hour during which period no sign of effective tranquillisation could be observed. At times the animal struggled violently and had to be secured until the excitory stage had passed off. The animal's posture and gait was normal after 90 minutes. Two other

Impala injected with Sernyl at a dosage rate of 0.1 mgm/lb. did not react at all.

(3) HIPPOPOTAMUS (*Hippopotamus amphibius* Linnaeus).

During July, 1962 three hippopotami were successfully captured with Sernyl as the main immobilizing agent. The first animal (a young female of 1300 lbs. est. body weight) received a dose of 0.076 mgm/lb. After the animal had been hauled out of the water by means of a net, an additional dose of 100 mgm Trilafon and 0.5 gm Omnopon (Roche) had to be administered to accomplish crating.

The second animal (a young bull of ± 1,500 lbs. b.w.) received a total Sernyl dose of 240 mgm (0.16 mgm/lb.) combined with 125 mgm Trilafon. The third hippopotamus (a bull calf of ± 600 lbs. b.w.) received a mixture of 75 mgm Sernyl and 250 mgm Largactil (May Baker). The respective dosage rates of the drugs used in this case were 0.125 mgm/lb. and 0.4 mgm/lb. This animal soon became tranquillised and it's reaction during capture and transportation was excellent.

In all three cases ataxia occurred within 9-10 minutes, and after a time lapse of 25-30 minutes, the animals could be hauled out of the water. They remained immobile for a period of 6-8 hours, after which they slowly recovered.

In addition to the hippopotami captured (which were all young animals) we had to immobilize six adult hippos which became aggressive while we were handling the young ones and hauling them out of the water with a net. This was safely and efficiently accomplished by administering a total dose of 1 gm Sernyl, which put paid to all aggressive tendencies of even the biggest hippo bull (weighing up to two and a half tons) for several hours.

An interesting observation during the capture of the hippopotami was that one could always tell that the drug was taking effect by looking at the stricken animal's eyes. The drug seems to have some relaxing action on the eye musculature and the beasts became decidedly "pop-eyed" after about 15-20 minutes.

(4) BUFFALO (*Syncerus caffer caffer* Sparrman).

Two buffaloes were darted in our Sernyl experiments, but unfortunately both animals had to be destroyed in view of complications arising. The first animal received 0.15 mgm/lb. Sernyl and 0.06 mgm/lb. Trilafon. Ataxia occurred in 5 minutes, (Fig. No. 4), the animal was down in 22 minutes and remained immobilized for 6 hours. Due to prolonged lying in a cramped position, blood circulation to the hind quarters was impaired with resultant degeneration and necrosis of the musculature in the hind legs. (Fig. No. 5).

The second experimental case had to be destroyed as a result of regurgitation of rumen contents. The dosage rate in this case was 0.2 mgm/lb. Sernyl.

(5) BABOON *(Papio (Chaeropithecus) ursinus orientalis* Goldblatt).

A male baboon, weighing 61 lbs., was successfully immobilized with a mixture of 150 mgm Sernyl and 50 mgm Largactil. Ataxia occurred in $1\frac{1}{2}$ minute and the animal was down in 5 minutes. The effect of the drug was that of surgical anaesthesia and lasted 12 hours. Complete recovery occurred after 13 hours had elapsed.

The abovementioned experimental case histories are admittedly far too inadequate to express a definite opinion on the use of Sernyl as an immobilizing agent in the 5 species mentioned. Nevertheless in analising the results obtained, the following salient characteristics may be mentioned.

(a) At the dosage rates applied locally Sernyl exhibits little or no tranquillising effect but appears to act rather as a depressant of the balance centre in the brain. Some of the animals immobilized were only slightly tranquillised — but their sense of equilibrium was completely impaired. — a condition which manifested itself in the animal becoming immobile, walking (or swimming) about in circles.

In the case of giraffe the hind legs are affected initially and in buffalo the fore legs.

(b) The time lag between darting and the drug taking effect was surprisingly short. This is a significant advantage as the animals, in most cases, are unable to escape and can either be roped or darted again with the Cap-Chur pistol.

(c) There is no detectable depression of respiration, except in cases of severe overdosage. In this respect the drug is superior to muscle relaxants like Succinyl choline chloride and Curare-like drugs.

(d) A specific antidote for Sernyl is not available. Amphetamine has some value in the symptomatic treatment of severely depressed animals.

(e) The most promising results were obtained where Sernyl was combined with a suitable tranquilliser. Both Chlorpromazine hydrochloride and Perphenazine were used and both drug combinations gave eminently satisfactory results.

(f) From these initial field trials it appears that Sernyl has a much wider safety margin in the hippopotamus than in giraffe.

(g) At the low dosage rate applied, Flaxedil — in combination with Sernyl — did not seem to be beneficial in giraffe.

(ii) FLAXEDIL.

Flaxedil is one of the first drugs used in the immobilization of game. Hall *et al* (1953) reported on the use of Flaxedil to produce paralysis in white-tailed deer in 1953 and it is still to this day one of the most effective drugs for the capture of certain animal species. The fact that this drug has a reliable antidote renders it preferable to many other preparations. (Talbot & Talbot, 1962).

Initial experiments with Flaxedil in the Kruger National Park were conducted on the Impala. As reported in a previous publication (1962) Flaxedil has a very wide safety margin in this species.

The wildebeest *(Connochaetes (Gorgon) taurinus taurinus Burchell)* was the next species utilized in our Flaxedil trials. Our results indicate that there is a remarkable difference between the dosage rate used in East Africa and that administered to wildebeest in the Kruger National Park. The optimal dose of Flaxedil in East Africa in both wildebeest and buffalo is 1.2 mgm/lb.

From results obtained in the Kruger National Park it appeared that the optimal dose in both species is 0.8 mgm/lb.

An adult wildebeest bull, weighing 550 lbs., received a dose of 660 mgm Flaxedil (dosage rate : 1.2 mgm/lb.). Ataxia occurred within one minute and the animal was down in 3 minutes. It was obvious that the animal received an overdose, as apnoea was already present 2 minutes after the animal went down. The antidote Prostigmin Vet. (Roche) was injected I.V. and artificial respiration exercised. Two minutes after the administration of Prostigmin (2 cc of 2.5 mgm/cc solution) a sudden improvement in the animal's respiration occurred. Although the animal's general condition improved, it remained recumbent and unable to rise to its feet. A second dose of 2 cc Prostigmin was administered I.V. After a time lapse of 2 minutes the animal responded again and was able to raise its hind quarters. 70 minutes after the animal went down an additional 3 cc Prostigmin was given I.M. The animal was immobilized for a period of $1\frac{1}{2}$ hours after which it recovered completely.

In subsequent trials with Flaxedil on wildebeest and buffalo the dosage rate was reduced to 0.8 mgm/lb. and gave eminently satisfactory results in combination with Atropin (5 mgm/100 lbs.). A number of animals of both species responded very well to this drug as an immobilizing agent. (Figs. 6 and 7).

The time lag between darting and the drug taking effect varied from 9-20 minutes. In the majority of cases the animals reacted within $1\frac{1}{2}$-2 minutes, post antidote administration intra-venously.

It is difficult to explain the difference in susceptibility between animals in East and South Africa, as quite a number of factors may be involved eg. climatic conditions, nutritional states, difference in syringe mechanisms etc.

(iii) OMNOPON.

In a drug mixture used during our initial experiments in the capture of hippopotami, the following drugs were incorporated viz. Morphine hydrochloride, Largactil and Scopolamine.

The morphine has subsequently been replaced with Omnopon (Roche), as the latter has a less depressant effect upon the respiratory centre than morphine. The dose of Omnopon successfully used for the capture of hippo was 0.5-1.0 mgm/lb.

Omnopon is a valuable substitute for Themalon (Burroughs Wellcome) and preferable to morphine.

RESUMÉ.

The results achieved with the immobilizing drugs Sernyl (Parke-Davis), Flaxedil (May Baker), and Omnopon (Roche), when applied to such free roaming species as giraffe, impala, buffalo, wildebeest, hippopotamus and baboon in the Kruger National Park are presented.

The respective merits of each drug is assessed in the light of comparable findings in other parts of Africa. In the case of Sernyl and Omnopon more favourable reactions were obtained when these drugs were combined with tranquillisers such as Chlorpromazine or Perphenazine.

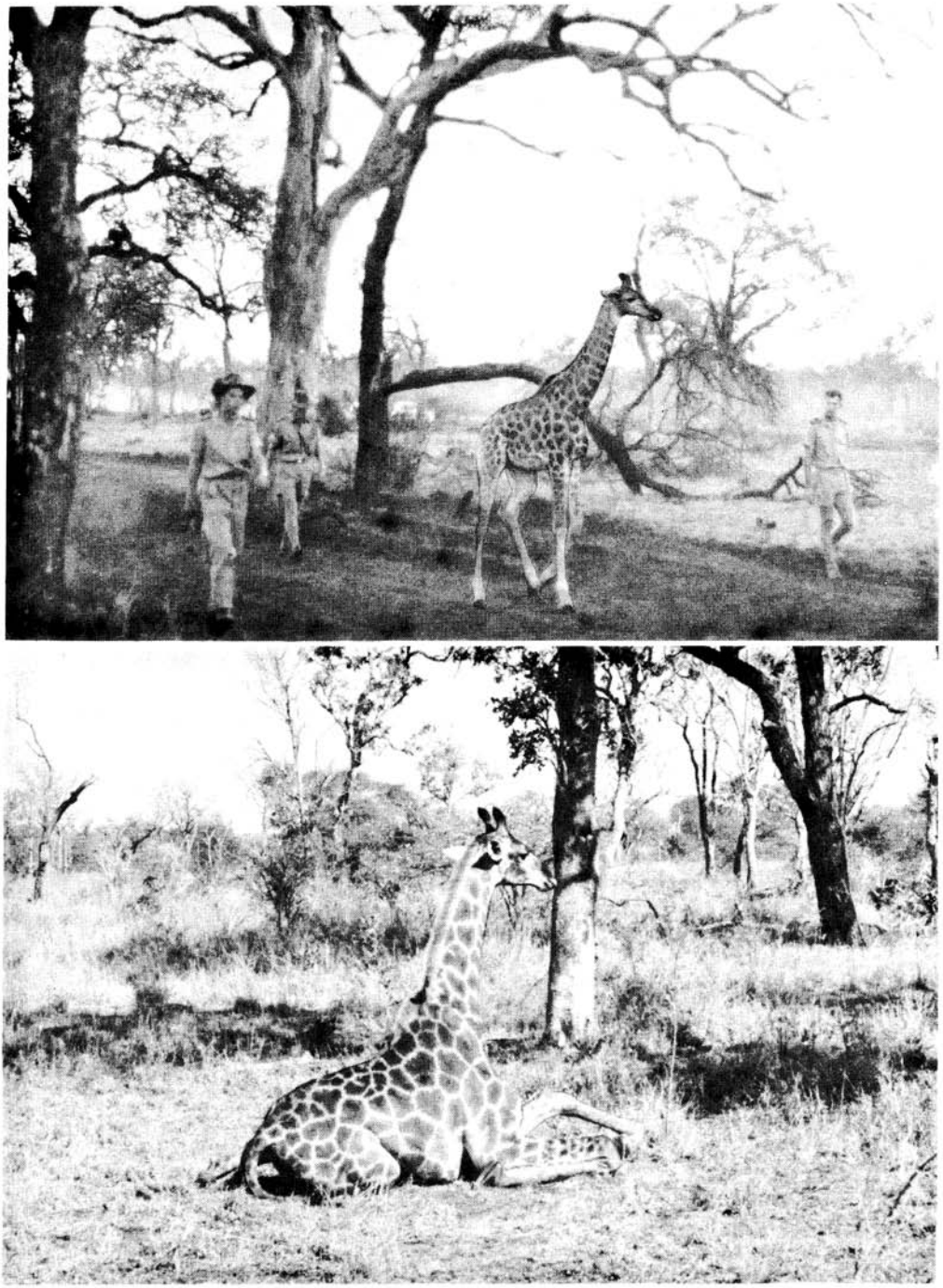
ACKNOWLEDGEMENTS.

The authors wish to express their gratitude to the Pharmaceuiical Houses who so generously co-operated in this project, and supplied trial samples of all the drugs used in these experiments. Particular thanks are due to Messrs. Parke Davis & Co., Scherag (Pty.) Ltd., May Baker S.A. Ltd., and Roche Products (Pty.) Ltd., for their respective donations of Sernyl, Trilafon, Flaxedil and Largactil, and Omnopon and Prostigmin.

We are also indebted to all members of the biological section, Senior Ranger Wolhuter and Rangers Adendorff, Kloppers and Van Reenen van Vuren for their continued interest and assistance throughout the course of this work.

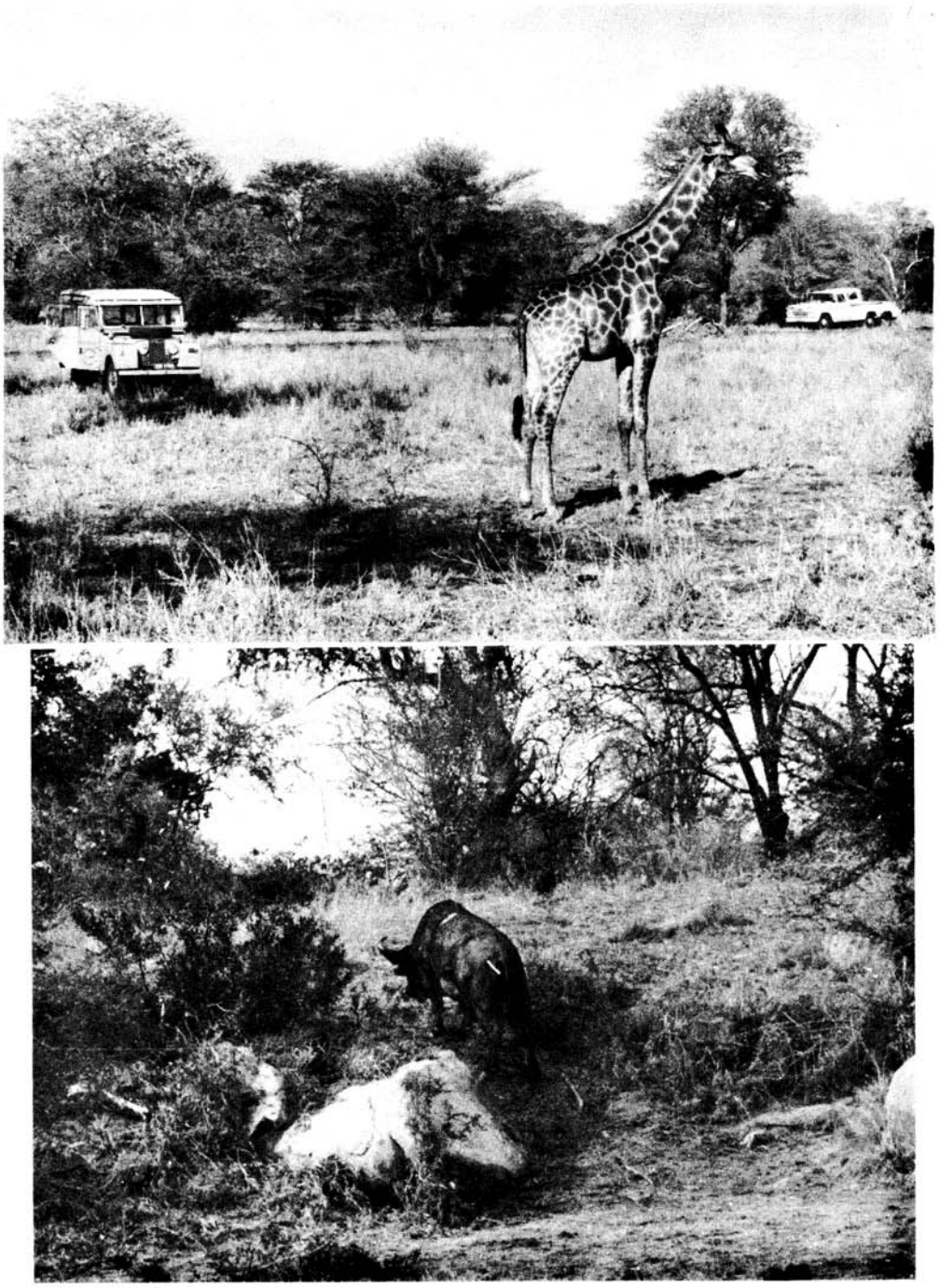
REFERENCES

1. Buechner, H. K., Harthoorn, A. M. & Lock, J. A. (1960). Immobilizing Uganda Kob with Succinyl choline chloride. Canadian Jnl. of Comp. Med. Vol. 24, No. 11.
2. Buechner, H. K., Harthoorn, A. M. & Lock, J. A. (1960). The Immobilization of African animals in the field with special reference to their transfer to other areas. Proc. Zool. Soc. London. Vol. 135. Part 2, page 261.
3. Buechner, H. K., Harthoorn, A. M. & Lock, J. A. (1960). Recent advances in field immobilization of large mammals with drugs. Trans. 25th North Amer. Wild Life Conference.
4. Buechner, H. K., Harthoorn, A. M. & Lock, J. A. (1960). The Immobilization of wild animals as an aid to management and control. Oryx Vol. V. No. 6. Nov. 1960.
5. Buechner, H. K., Harthoorn, A. M. & Lock, J. A. (1960). Control of African wild animals. Nature Vol. 185, No. 4705, page 47.
6. Carter, N. (1961). Progress in drugging technique. Wild life Vol. 2. No. 4, page 9.
7. Cowan, McT. I., Wood, A. J. & Nordan, H. C. (1962). Studies in the tranquillization and immobilization of deer *(Odocoileus)*. Canadian Jnl. of Comp. Med. and Vet. Science 26(3) : 57-61.



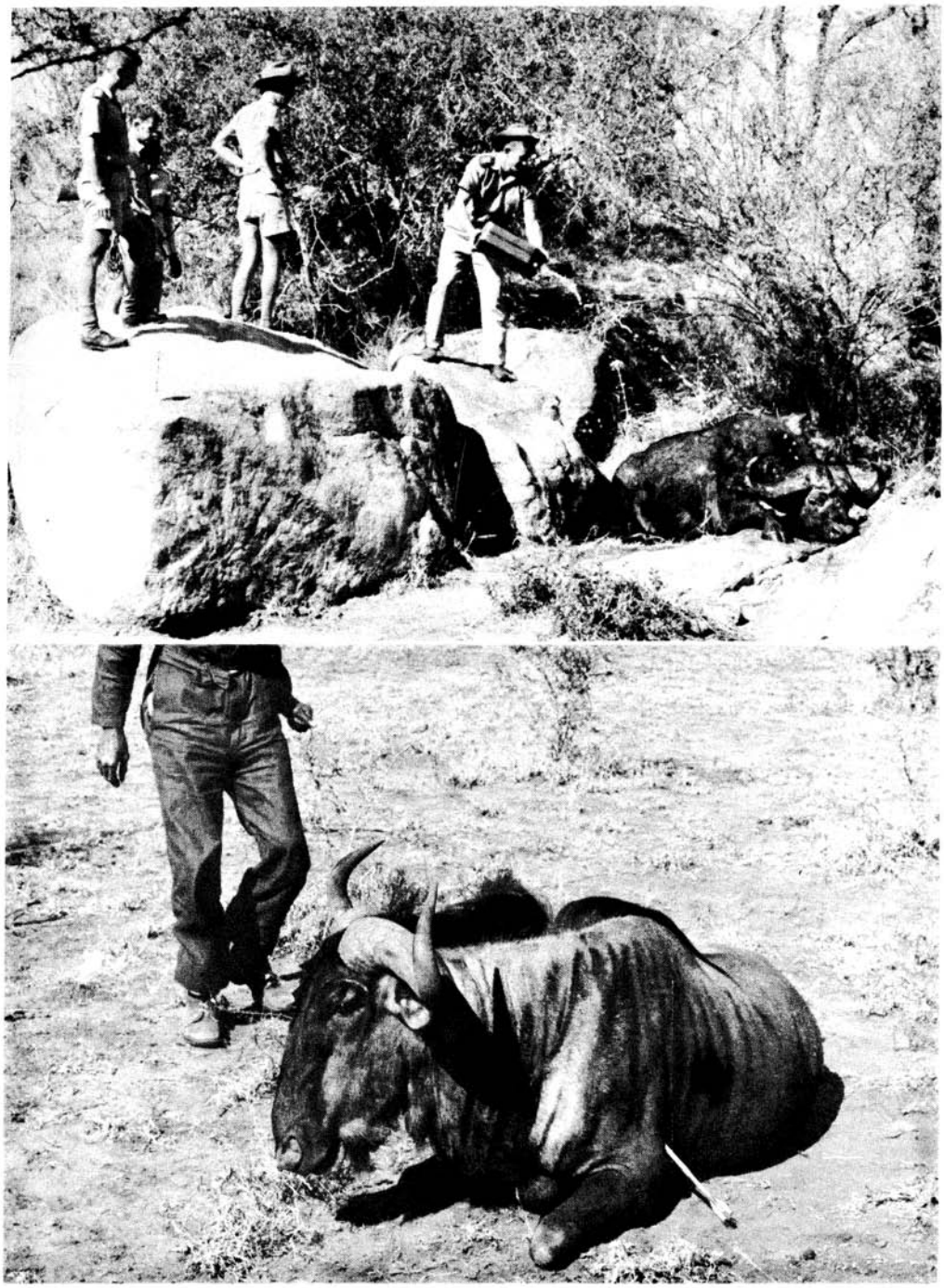
Above — Fig. 1.
*Young female giraffe after Sernyl immobilisation and under the tranquillizing influence of Perphenazine.*

Below — Fig. 2.
*Young adult giraffe (♀) immobilised by the combined action of Sernyl and Trilafon (Perphenazine).*



Above — Fig. 3.
*Giraffe recovering from the immobilising effect of Sernyl and Perphenazine.*

Below — Fig. 4.
*Ataxic buffalo bull 8 minutes after darting with a combination of Sernyl and Perphenazine.*



Above — Fig. 5.
*An attempt to survive buffalo bull immobilised with Sernyl and Perphenazine.*

Below — Fig. 6.
*Wildebeest 15 minutes after darting with Flaxedil. Note arrow-syringe behind shoulder.*

Above — Fig. 7.
*Buffalo bull recovering from the immobilising effect of Flexedil.*

Below — Fig. 8.
*Young hippo calf captured after immobilisation with Omnopon Roche.*

8. Craighead, John J. *et al* (1960). Trapping, immobilizing and color-marking of Grizzly bears. Trans. of the 25th North Amer. Wild Life and Natural Resources Conf. March 1960, p. 347-63.
9. Hall, T. C., Taft, E. B., Baker, W. H. & Aub, J. C. (1953). Use of Flaxedil to produce paralysis in deer. Jnl. Wild Life Mngmt. Vol. 17.
10. Harthoorn, A. M. (1962). The use of a Neuro-muscular blocking agent on domestic cattle. Vet. Record. Vol. 74. No. 13.
11. Harthoorn, A. M. (1962). The capture and relocation of the White (Square-lipped) Rhinoceros *Ceratotherium simum simum*. The Lammergeyer Vol. 2. No. 2.
12. Heuschele, Werner P. (1961). Immobilization of Captive Wild Animals : Vet. Med. 56(8).
13. Heuschele, Werner P. (1961). Chlordiazepoxide for calming Zoo Animals. Jnl. Amer. Med. Assoc. Vol. 139, No. 9.
14. Talbot, L. A. & Lamprey, H. F. (1961). Immobilization of free-ranging East African ungulates with Succinyl choline chloride. Jnl. Wild Life Management Vol. 25. No. 3.
15. Talbot, L. M. (1961). Field immobilization of some East African wild animals and cattle. East Afr. Agr. & For. J. Vol. 26. No. 2, pp. 92-102.
16. Talbot, L. M. & Talbot, M H. (1962). Flaxedil and other drugs in field immobilization and translocation of large mammals in East Africa. J. Mammal Vol. 43. No. 1, pp. 76-88.
17. Van Niekerk, J. W. & Pienaar, U. de V. (1962). Adaptations of the immobilizing technique to the capture, marking and translocation of game animals in the Kruger National Park. Koedoe No. 5, page 137-143.

Received for publication : 7.12.1962.