

# The immobilization of adult male and female elephant *Loxodonta africana*, Blumenbach with etorphine and observation on the action of diprenorphine

by

H. Ebedes

Private bag X5020,

Stellenbosch, 7600

Republic of South Africa

## ABSTRACT

Forty-two adult elephant (22 males and 20 females) were captured in the Etosha National Park with etorphine (M99 Reckitt). The utilization of a helicopter resulted in the capture of 41 elephant in 7 days. The mean immobilization time was 14 min 56 seconds. The effects of the etorphine were antagonised in 17 elephants with diprenorphine at a ratio of 1:0,5. Cyrenorphine antagonised the etorphine at a ratio of 1:2,5. The capture operation was successful and only one death was recorded.

## 1 INTRODUCTION

The fencing of the Etosha National Park was completed towards the middle of 1973, resulting in the Park becoming the largest fenced wildlife reserve in Southern Africa (22 700 sq. km). There has been much speculation in the past on the movement of wildlife populations in and out of the Park. Detailed studies on the movements of some of the populations have become essential for correct management procedures and this is particularly the case for the African elephant *Loxodonta africana*, Blumenbach. To facilitate these studies a number of elephant in different areas of the Park had to be captured and marked. The writer was responsible for capturing elephant for marking by means of drug immobilization and with the aid of a helicopter. The effectiveness and safety of etorphine HCl (M99, Reckitt), modern sophisticated darting equipment such as the Palmer Cap-Chur gun and automatic projectile darts and the dexterity of helicopter pilots in their ability to manoeuvre their aircraft in the most difficult terrain and under adverse and dangerous situations has made the capture of elephant a relatively simple operation.

Pienaar *et al.* (1966 a) immobilized a series of 31 elephant bulls in the Kruger National Park and found that using a drug-combination of M99 and acetylpromazine maleate was a very safe and expedient method of capturing elephant. The same drug-combination was successfully used to capture 27 young elephant in the Kruger National Park (Pienaar 1967), and 9 young elephant in the Zambezi Valley (Hanks, 1969). Young (1972) immobilized five adult elephant in the Addo National Park with initial doses of 6 to 7 mg etorphine plus 40 mg acetylpromazine maleate. Elephants which were not recumbent within 30 minutes after the initial injections, were given additional small intramuscular or intravenous injections of etorphine. Thus a dosage of 7 to 9 mg etorphine plus 40 mg acetylpromazine maleate were administered to achieve satisfactory immobilization.

Elephant have also been captured in Rhodesia (Kerr, 1973 *pers. comm.*; Cummings, 1973 *pers. comm.*) and in Botswana (Von Richter and Raseroka, 1973 *pers. comm.*).

## CONTENTS

Abstract . . . . .	19
1. Introduction . . . . .	19
2. Materials and method . . . . .	20
3. Results . . . . .	20
4. Discussion . . . . .	22
5. Acknowledgements . . . . .	22
6. References . . . . .	22

Harthoorn and Bligh (1965), Harthoorn (1969) and Wallach and Anderson (1968) found that elephant could be immobilized successfully using only M99 and without the addition of tranquillizers or hyoscine hydrobromide (Scopolamine). Hanks (1969) immobilized one young elephant bull with M99, but incorporated small quantities of acetylpromazine for the following 9 young animals in his series. In 1965 and again in 1969 and 1972 adult elephant bulls were immobilized in the Etosha National Park with etorphine alone. Using 6 mg etorphine a bull was immobilized in 18 minutes and with 10 mg immobilization was achieved in 9½ minutes and 8½ minutes (Ebedes, unpublished manuscript). After these results the benefit of incorporating acetylpromazine, other tranquillizers and hyoscine hydrobromide in drug mixtures for capturing elephant was questioned by the writer.

Both nalorphine hydrobromide and cyprenorphine hydrochloride (M285, Reckitt) were used as morphine antagonists to reverse the narcotic actions of etorphine (Pienaar *et al.*, 1966 b; Harthoorn and Bligh, 1965; Hanks, 1969; Wallach and Anderson, 1968; Young, 1972). The use of diprenorphine HCl (M 50 50 HCl, Reckitt) as an etorphine antagonist for elephant has not been published previously.

In the available published literature on the immobilization of adult elephant with etorphine, it appears that mainly bulls and very few cows were immobilized. Nearly half of the elephants immobilized in the Etosha National Park were cows. This is probably the largest number of cows ever captured to date in Africa. In this paper the results obtained from immobilizing 42 adult elephant in Etosha National Park with 6-10 mg etorphine alone and the use of the M99 antagonists diprenorphine and cyprenorphine are recorded.

## 2 MATERIALS AND METHOD

Etorphine HCl (M99, Reckitt) at a concentration of 10 mg/ml, without the addition of any tranquillizers, was used for the immobilization. Etorphine is suitable for the capture of most African ungulates (Harthoorn, 1973) and its use to capture a wide variety of herbivores has been well documented in the literature, (Pienaar *et al.*, 1966 b, Pienaar 1968; Harthoorn, 1970, 1973 and Pienaar 1973).

Diprenorphine HCl (M 50 50 HCl, Reckitt) and cyprenorphine HCl (M285, Reckitt) were used as etorphine antagonists. Both these compounds were dissolved in a special buffer preparation to give concentrations of 10 mg/ml. In all cases the antagonists were injected intravenously into an ear vein.

The Palmer gas Cap-Chur gun and standard 1ml and 3 ml Palmer projectile automatic darts were used for the injections. Sterile distilled water was used to fill the darts to capacity. For the first 22 elephants in the series, 30 mm long single barbed Palmer needles were used and for the last twenty

animals 52 mm long special collared "rhino needles" manufactured by Mr G. van Rooyen of Kruger National Park were used.

A 3-seater Bell helicopter flown by pilots of Messrs Court Line Helicopters, Cape Town, was used to approach and dart the elephant. Because of dense vegetation and rocky terrain in most areas and the difficulties experienced and damage caused to motor vehicles transporting personnel to the immobilized animals, it was at all times attempted to herd the elephants slowly towards the nearest road with the helicopter. This was achieved by flying and hovering at heights of 50-80 m above the ground. When the animal or animals were near a road the helicopter swooped down and a selected individual was darted. Of the animals darted 35 fell within ¼ km from the road. As the helicopter approached, the animals ran away from the aircraft and in order to avoid unnecessary exertion by chasing the animals, the dart was fired as soon as the helicopter was within firing range and a suitable target area presented itself. Consequently the majority of darts were placed in the rump. Constant contact was kept between the helicopter and the ground teams with the aid of several National Panasonic transceivers.

Intramuscular injections of antibiotics ("Compropen", Glaxo or "Streptovin", Glaxo); corticosteroids ("Deltacortril", Pfizer or "Vecortenol", Ciba); metabolic stimulants ("Catosal", Bayer or "Metabolic", Waldemar Weimer) and "E.S.E." (Burns) were administered routinely to each animal as prophylaxis against any possible after-effects of the immobilization eg. abscessation from dart wound. 1-2 ml Anthrax Spore Vaccine (Onderstepoort) was injected intramuscularly because anthrax mortality had been reported in most of the areas in which the elephant were captured.

## 3 RESULTS

The results obtained from capturing the elephants with etorphine alone and relevant data as to area, sex, immobilization times, heart rate, respiratory rate, rectal temperature, dosage of antagonists and recovery times are presented in the table. The estimated weights of the elephant are not recorded but all the animals were adults.

The immobilization times varied from 6 min 25 secs to 35 min with a mean immobilization time (down time) of 14 min 56 secs (n=42). This compares very favourably with the approximate immobilization times recorded by Pienaar *et al.* (1966) of nearly 40 minutes (n=30) and Wallach and Anderson (1968) of 21 min 20 secs (n=7). The last-mentioned workers using M99 alone recorded mean immobilization times of 27 min 36 secs (n=5). Pienaar *et al.* (1966) felt that elephant immobilized with etorphine alone never become completely tractable and that spontaneous recovery could occur if the animal was sufficiently aroused or molested. In the Etosha National Park however,

all the elephant immobilized were completely tractable and the majority lay in lateral recumbency.

Elephant darted with the shorter Palmer needles (30 cm) were recumbent in a mean time of 15 min 43 secs (n=22) and those darted with the longer Van Rooyen "rhino needles" were immobilized in a mean time of 14 minutes (n=20). None of the needles broke on impact with the elephant's skin. Three of the elephant were darted twice. No. 18 was moving into a dense thicket and did not respond to the attempts of the helicopter to halt her progress. An additional 2 mg etorphine was injected. No. 35 was very aggressive and showed no apparent signs of ataxia after 8 minutes. The possibility that the plunger mechanism of the dart failed to function was considered and an additional 6 mg etorphine was injected. On examination it was found that the first injection was in fact delivered resulting in this elephant receiving 14 mg etorphine. No. 39, a large bull, was given an additional 2 mg etorphine. He was immobile at 26 minutes and stood with his legs "locked", but would not go down. After the second injection he collapsed onto his side at 32 minutes 34 seconds. This is a possible indication that elephants which are immobilized, but do not go down onto their sides, have probably not received the optimum dose of narcotic. Elephant No. 13, one of the tallest and heaviest bulls darted, was immobile at 28 minutes, but stood for a further 7 minutes before collapsing onto his side. An additional 2 mg etorphine would probably have brought him to the ground in a shorter time.

The mean heart-rate for 42 elephant was 46, 5 per minute. Elephant No. 34 had the slowest heart-rate (28 per minute) and the reason for this was ascribed to old age. She was the oldest animal captured. Her respiration rate was also the slowest recorded (3 per minute). The mean respiration rate was 6 per minute (n=42).

Rectal temperatures varied greatly from 95,6°F to 103,2°F, and were influenced to a large extent by the external ambient temperature. The first 8 elephants were captured between 11 h 00 and 18 h 00 when the ambient temperature was in excess of 90°F. Elephant No. 9, 13, 18, 23-26, 33-37 were captured during the early morning. Nos. 32, 33 and 38-42 were captured during the afternoon, but the weather was cool and the sky overcast. Nos. 19-22 were captured on a very hot day when the ambient temperature recorded on a whirling hygrometer at 16 h 00 was 98°F. When the rectal temperatures rose to 100°F and over, water was poured over the body and particularly over the upper ear to assist cooling. The upper ear was also pushed forward over the head to assist evaporation. When rectal temperatures in excess of 99°F were measured the blood vessels in the ear were greatly distended. This was not the case during the early morning captures or in the animals captured on cool days. The mean rectal temperatures of the elephant captured on the hot days i.e. Nos. 1-22 was 100,5°F (n=20) and that of elephant captured on the cool overcast days, Nos. 23-42 was 97,4°F (n=19). The mean rectal temperature for 39 elephant was 99°F.

Pienaar *et al.* (1966) found that body temperatures varied from 95,6°F to 99,5°F and the highest recorded temperature was 100°F.

One elephant (No. 15) died approximately 25 minutes after immobilization. He lay on his sternum and collapsed shortly before the team were to roll him onto his side after the collar was attached. A post mortem examination was not carried out, but death was probably due to heart failure and dyspnoea caused by the intestines and abdominal viscera pressing against the diaphragm. This condition has been described by Pienaar *et al.* (1966), and Harthoorn (1966, 1970 and 1973). Shortly before death he breathed through his mouth and gasped for breath. The heart-rate increased and soon after he collapsed onto his side he gave one last gasp and his heart stopped beating (M. Grobler, *pers. comm.*) Nine of 42 elephant lay in sternal recumbency and were rolled over onto their sides soon after the collars were fitted.

Collars could not be fitted to two of the elephant, Nos. 4 and 8, because they lay on their sides on rocky terrain and the collars could not be slipped under their necks. In an attempt to revive No. 4 sufficiently so that he would just raise his head to facilitate slipping the collar under his neck, a small amount (4 mg) of diprenorphine was injected. The diprenorphine revived him completely and he was on his feet in 2 minutes 21 seconds. Elephant No. 8, a large bull, was injected with 1/5th (2 mg) of the recommended dose of diprenorphine. He lifted his head once after 3 minutes, but dropped it before the collar could be slipped under his neck. While waiting for him to raise his head again and while a syringe was being prepared to inject a further 1 mg of antagonist he revived completely and was on his feet, fully awake and aggressive at 13 minutes 39 seconds. 2,5 mg diprenorphine were injected into cow No. 7 and she lifted her head after 1 minute 25 seconds. There was sufficient time for the collar to be slipped around the neck and the bolts tightened before she was on her feet and completely awake at 7 minutes 40 seconds.

The recommended dosage of diprenorphine is a ratio of 1-1½ antagonist to 1 mg of etorphine. After the experience with the three elephant recovering with far less than the recommended dosages of diprenorphine, it was decided to do a trial in which only half the recommended dosage of diprenorphine was used. Thus 17 elephants, Nos. 9-14, 16 and 17, 19-22, 24 and 25 and 28-30 were injected with diprenorphine at an etorphine/diprenorphine ratio of 1:0,5. The mean recovery time was 3 minutes 58 seconds (n=17).

The mean recovery time for 28 elephants receiving varying doses of diprenorphine was 4 minutes 12 seconds. The mean recovery time for 12 elephants receiving cyrenorphine at a ratio of 1:2,5 was 2 minutes 52 seconds. There was a difference of approximately 1 minute between elephant revived with ratios of 1:0,5 diprenorphine and elephant revived with cyrenorphine at a ratio of 1:2,5.

Elephant No. 23 was accidentally injected with 5 mg cyprenorphine instead of diprenorphine. Although this was far less than the recommended dose for cyprenorphine, and the elephant took 3 times longer to recover than if the recommended dosage was used, he recovered fully.

#### 4 DISCUSSION

Some interesting observations were made during the elephant immobilization project. The most important was that half the recommended dose of diprenorphine and even  $\frac{1}{5}$ th of the recommended dose successfully antagonised etorphine in elephant. Two factors probably account for this. Firstly, because elephants are particularly sensitive to etorphine, they are similarly sensitive to the potent antagonist diprenorphine. Secondly, no tranquilizers were used which could have prolonged the recovery time. Harthoorn (1966) recommended a dose of 40 mg M285 for resuscitating elephant and found this compound more effective than nalorphine for reversing the immobilizing effect of M99. According to Harthoorn (*pers. comm.*) elephants often appear to resuscitate after very small doses of cyprenorphine. He has had the experience that elephants suddenly get up and walk off after a small dose of cyprenorphine has been injected to remedy suspected hypoventilation. He also experienced elephants suddenly getting up without the injection of an antagonist after the animal appeared to have been sufficiently narcotised. Pienaar *et al.* (1966) also suggested that elephants might be left to recover on their sides without the administration of an antidote. Although Harthoorn did not specify the dosage of etorphine used, the writer suspects that they were lower than those used in the present series because all the elephants, with one possible exception, were very deeply narcotised even to the extent that the eyes were closed in the majority of cases.

From our results it would seem that Harthoorn (1966 and 1967) and Pienaar *et al.* (1966) used excessively large doses of cyprenorphine. As we have demonstrated that excellent results can be obtained with an etorphine/cyprenorphine ratio of 1:2.5, the antagonist dose of 40-60 mg cyprenorphine recommended by Pienaar (1968) to antagonise 7-8 mgms of etorphine is excessively high. Wallach and Anderson (1968) confirm this observation.

The rapid immobilization times compare favourably with those of Pienaar *et al.* (1966), and Wallach and Anderson (1968). From a financial point of view this was a very important factor considering that the helicopter cost R2 per one minute flying-time. Pienaar *et al.* (1966) working from the ground immobilized 30 elephants in a mean time of 40 minutes per elephant. In using higher etorphine dosage than Pienaar *et al.* (1966), our elephants were immobilized in a shorter period. The average flying time cost per elephant captured was R30.

#### 5 ACKNOWLEDGEMENTS

The writer wishes to thank all the personnel of the Nature Conservation and Tourism Branch who assisted with the project. A special word of thanks to the helicopter pilots Henk Kaiser and Bill Walzer for their excellent handling of the helicopter and to M. Grobler of the Research Section for assisting so ably and willingly with the collection of the clinical data and injection of the antagonists.

Drs E. Young, H. E. Dodds and M. Keep were kind enough to read the manuscript and the writer herewith acknowledges his appreciation for their comments.

On behalf of the Director of Nature Conservation and Tourism Branch the writer wishes to thank Messrs Reckitt and Colman for the complimentary supply of diprenorphine and cyprenorphine used during the project.

Lastly, thanks to our office lady, Mrs Hanne-Dore Smith, who stayed behind to keep our office functioning smoothly and was responsible for typing the manuscript and the long tables.

#### 6 REFERENCES

- EBEDES, H.  
1969 The Nomadic Plains Zebra *Equus burchelli antiquorum* of the Etosha Salina. Unpublished ms.
- HANKS, J.  
1969 The Capture of young elephant in the Zambezi Valley. *The Puku*, 5:87-90.
- HARTHOORN, A. M. and BLIGH, J.  
1965 The use of the new oripavine derivative with potent morphine-like activity for the restraint of hoofed wild animals. *Res. Vet. Sci.*, 6 (3) : 290-299.
- HARTHOORN, A. M.  
1966 Restraint of undomesticated animals. *J. Am. Vet. Med. Ass.* 149 (7) : 875-880.  
1967 Comparative pharmacological reactions of certain wild and domestic mammals to thebaine derivatives in the M-series of compounds. *Federation Proceedings* 26 (4) : 1251-1261.  
1970 *The Flying Syringe*. Geoffrey Bles, London.  
1973 The drug Immobilization of large wild herbivores other than the antelopes. In Young (Ed.) *The Capture and care of wild animals* : 51-61. Human and Rousseau, Cape Town and Pretoria.
- PIENAAR, U. de V., VAN NIEKERK, J. W., YOUNG, E. and VAN WYK, P.  
1966 a The use of oripavine hydrochloride (M99) in the drug immobilization and marking of wild African elephant (*Loxodonta africana* Blumenbach) in the Kruger National Park. *Koedoe* 9 : 108-124.  
1966 b Neuroleptic narcosis of large wild herbivores in South African National Parks with the new potent morphine analogues M-99 and M-185. *Jl. S. Afr. vet. med. Ass.* 37 (3) : 277-291.
- PIENAAR, U. de V.  
1967 Operation "Khomandlopfu". *Koedoe* 10 : 158-146.  
1968 Recent advances in the field immobilization and restraint of wild ungulates in South African National Parks. *Acta Zool. et Pail. Antverpiensia*. 46 : 17-38.  
Capture and immobilizing techniques currently employed in South African National Parks and re-

serves. In Golley and Buechner; (Editors) *A practical guide to the study of the productivity of large herbivores* : 132-144. IBP Handbook No. 7. Blackwell Scientific Publications. Oxford and Edinburgh.

1973 The drug immobilization of antelope species. In Young, (Ed.) : *The capture and care of wild animals* : 35-50. Human and Rousseau, Cape Town and Pretoria.

WALLACH, J. D. and ANDERSON, J. L.  
1968 Oripavine (M-99) combinations and solvents for immobilization of the African elephant. *J.A.V.M.A.* 153 (7) : 793-797.

YOUNG, E.  
1972 Notes on the chemical immobilization and restraint of the Addo elephant (*Loxodonta africana*). *Koedoe* 15 : 97-99.

Table 1 A. The capture of adult male and female elephant *Loxodonta africana* Blumenbach in the Etosha National Park, S.W.A. with etorphine hydrochloride (M99, Reckitt)

No.	Date	Area	Sex	Dart Site	M99 mg.	Immobilization Time	Heart rate per min.	Respiration per min.	Temp. °F	Antagonist		Recovery Time
										Compd	Dose mg	
1.	23.7. 1973	Gemsbok-vlakte	M	Shoulder	9	14 min 30 sec	42	8	100	M50-50	20	1 min 38 sec
2.	19.9. 1973	Gemsbok-vlakte	M	Rump	10	13 min 40 sec	42	6	—	M50 50	10	2 min 42 sec
3.	19.9. 1973	Okaukuejo/Ombika	M	Rump	10	19 min 15 sec	54	8	101	M50 50	10	4 min 25 sec
4.	19.9. 1973	Okaukuejo/Ombika	M	Flank	10	19 min 30 sec	58	8	101,4	M50 50	4	2 min 21 sec
5.	20.9. 1973	Rietfontein	F	Rump	10	11 min 35 sec	46	4	100	M50 50	10	5 min 10 sec
6.	20.9. 1973	Rietfontein	F	Rump	10	8 min 37 sec	54	5	—	M50 50	10	4 min 48 sec
7.	20.9. 1973	Nuamses	F	Rump	10	7 min 22 sec	46	4	100	M50 50	2,5	7 min 40 sec
8.	20.9. 1973	Nuamses	M	Rump	10	23 min 12 sec	44	5	101,5	M50 50	2	13 min 39 sec
9.	21.9. 1973	Rietfontein	F	Rump	10	9 min 20 sec	50	7	97,8	M50 50	5	3 min 20 sec
10.	21.9. 1973	Nuamses	F	Rump	6	18 min 8 sec	48	6	100,2	M50 50	4	3 min 58 sec
11.	21.9. 1973	Rietfontein	F	Rump	8	8 min 2 sec	46	11	103,2	M50 50	4	1 min 34 sec
12.	22.9. 1973	Rietfontein	F	Rump	6	13 min 54 sec	64	8	101,3	M50 50	3	4 min 24 sec
13.	22.9. 1973	Okerfontein	M	Rump	10	35 min	54	6	99,6	M50 50	5	3 min 41 sec
14.	22.9. 1973	Okerfontein	M	Rump	10	20 min 4 sec	46	4	100	M50 50	5	7 min 4 sec
15.	22.9. 1973	Kalkheuwel	M	Rump	10	14 min 35 sec	54	4	101	—		Died
16.	22.9. 1973	Twee Palms	M	Rump	8	14 min 31 sec	40	6	102	M50 50	4	2 min 20 secs
17.	23.9. 1973	Aroe	F	Thorax	8	12 min 7 sec	52	6	101,2	M50 50	4	5 min 35 secs
18.	23.9. 1973	Kameel-doring	F	Rump	8+2	15 min 45 sec	36	8	97,2	M50 50	10	3 min 29 secs
19.	23.9. 1973	Kameel-doring	F	Rump	10	22 min 41 sec	48	6	100,2	M50 50	5	4 min 40 sec
20.	23.9. 1973	Acacia Border	M	Rump	8	18 min 38 sec	48	5	98,2	M50 50	5	2 min 48 sec

No.	Date	Area	Sex	Dart Site	M99 mg.	Immobilization Time	Heart rate per min.	Respiration per min.	Temp. °F	Antagonist		Recovery Time
										Compd	Dose mg	
21.	23.9. 1973	Acacia Border	F	Rump	8	8 min 40 sec	36	5	103	M50 50	4	3 min 39 sec
22.	9.10. 1973	Acacia Border	F	Rump	8	17 min 18 sec	48	6	102,6	M50 50	5	2 min 51 sec
23.	9.10. 1973	Kalahari	M	Rump	10	11 min 38 sec	40	6	97,6	M285	5	9 min 45 sec
24.	9.10. 1973	Dolomiet-poort	F	Rump	8	8 min 20 sec	42	4	96,5	M50 50	4	2 min 57 sec
25.	9.10. 1973	Dolomiet-poort	F	Rump	8	8 min 26 sec	36	6	96,3	M50 50	4	5 min 45 sec
26.	9.10. 1973	Okawao	M	Rump	8	17 min 20 sec	40	8	97,2	M50 50	8	5 min 13 sec
27.	9.10. 1973	Okawao	F	Rump	8	7 min 10 sec	44	8	99,4	M50 50	8	2 min 40 sec
28.	9.10. 1973	Okawao	M	Back	10	10 min 50 sec	60	4	102,4	M50 50	5	3 min 42 sec
29.	9.10. 1973	Nomab	F	Rump	8	6 min 25 sec	44	4	99,2	M50 50	4	3 min 10 sec
30.	9.10. 1973	Nomab	M	Rump	8	14 min 20 sec	48	6	98,2	M50 50	5	2 min 36 sec
31.	9.10. 1973	Duineveld	F	Rump	8	15 min 20 sec	44	6	98	M285	20	1 min 50 sec
32.	10.10. 1973	Duineveld	M	Rump	8	11 min 45 sec	56	6	96	M285	20	2 min 10 sec
33.	10.10. 1973	Dolomiet-punt	F	Rump	8	10 min 25 sec	54	4	96,5	M285	20	2 min 47 sec
34.	10.10. 1973	Duineveld-grens	F	Rump	8	8 min 10 sec	28	3	95,6	M285	20	2 min 8 sec
35.	10.10. 1973	Duineveld-grens	F	Rump	8+6	10 min 30 sec	40	4	95,8	M285	30	4 min 2 sec
36.	10.10. 1973	Duineveld	M	Rump	6	12 min 11 sec	52	7	—	M285	15	2 min 35 sec
37.	10.10. 1973	Olifantsrus	M	Rump	8	14 min 43 sec	60	6	95,6	M285	20	3 min 45 sec
38.	10.10. 1973	Teespoed (S 3)	M	Rump	8	13 min 8 sec	44	6	98,2	M285	20	2 min 10 sec
39.	10.10. 1973	Bitterwater	M		8+2	32 min 34 sec	48	6	97,3	M285	25	2 min 58 sec
40.	10.10. 1973	Sonderkop	M	Back	8	23 min 40 sec	44	6	96,8	M285	20	3 min 10 sec
41.	10.10. 1973	Sonderkop	M	Back	8	32 min	60	6	96,8	M285	20	3 min 20 sec
42.	10.10. 1973	Sonderkop	M	Rump	10	12 min 28 sec	60	7	97	M285	25	3 min 34 sec

M50 50 = Diprenorphine HCl (M50 50 HCl Reckitt)  
M285 = Cyprenorphine HCl (M 285, Reckitt)