The capture and care of eland *Taurotragus oryx oryx* (Pallas) using the boma method

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CONTENTS

ABSTRACT

The successful application of the plastic boma technique for the capture of more than 80 eland, *Taurotragus oryx oryx* (Pallas, 1766), with the aid of a light, fixed-wing aircraft and a helicopter is described. No animals succumbed to capture myopathy despite herding over long distances. Following a 3½ month captivity period in the bomas, during which 21 calves were born, the eland were successfully transported 250 km by road in communal crates. Adult bulls had to be transported separately and were sedated with haloperidol (R1 625—Serenace).

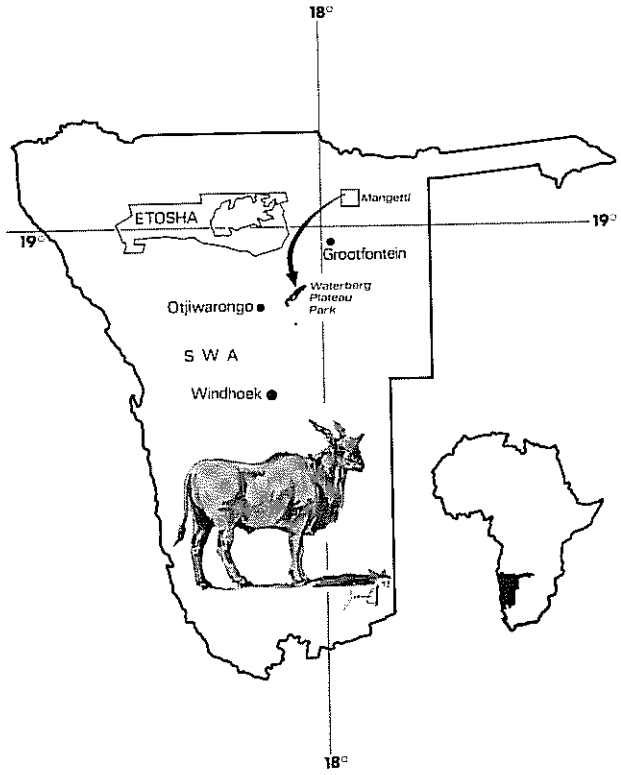
1 INTRODUCTION

The capture of eland, *Taurotragus oryx oryx* (Pallas, 1766), using various combinations of narcotics, neuroleptics and parasympatholytics, is described by Keep and Keep (1968), Pienaar (1968), Abbott (1973), Pienaar (1973a), Smuts (1973) and Hofmeyr and Norval (1976). Drug immobilisation has been shown to be particularly safe and is recommended for the capture of individual eland or for a small number of these animals. The plastic boma technique which was devised by Oelofse (1970) has been used for capturing a large number and variety of ungulates. More recently Pienaar (1973b) has described the use of bomas as well as the application of drop-nets for capturing eland. However, the capture, keeping and translocation of a large number of free ranging eland of various age groups have as yet not been documented.

Eland are by nature wary, gregarious and nomadic. In the past they roamed at will over a large part of South West Africa, particularly the woodland and savanna areas of northern and eastern parts of the country. However, more recently they have been confined to a few isolated areas. In order to protect a threatened population, it was decided to capture eland during May, 1972, in the Mangetti Quarantine Camp and transfer them to the newly proclaimed Waterberg Plateau Park, 250 km to the south (Map 1). This paper describes the capture, management, feeding during captivity and subsequent translocation of 85 eland.

2 DESCRIPTION OF AREA

The Mangetti Quarantine Camp is located at approximately 18°45'E and 18°45'S some 100 km north of Grootfontein. It is 60 000 ha in extent and enclosed with a 2,6 m gameproof fence. The eland were concentrated in an undeveloped terrain. The only permanent water supply was piped to a single drinking point. Thick bush hampered travel off the tracks. Fire-breaks and landing sites for the helicopter were limited to bush tracks and a few open spaces.



Map 1. Translocation of eland to the Waterberg Plateau Park, South West Africa.

The topography and vegetation are typical undulating Northern Kalahari Sandveld with savanna and woodland (Giess, 1971). Gently sloping dunes run in an east to west direction and are separated by large drainage lines or omurambas. The dune crests and slopes are thickly clad with woodland and scrub dominated by *Acacia ataxacantha* DC, *Baikiaea plurijuga* Harms, *Baphia massaiensis* Taub. ssp. *obovata* (Schinz) Brummitt, *Bauhinia macrantha* Oliver, *Burkea africana* Hooker, *Combretum engleri* Schinz, *C. mechowianum* O. Hoffm., *Croton gratissimus* Burch., *Grewia deserticola* Ulbr., *Lonchocarpus nelsii* (Schinz) Schinz ex Heering, *Mundulea sericea* (Willd) A. Chev., *Ochna pulchra* Hooker, *Pterocarpus angolensis* DC, *Rhus tenuinervis* Engler and *Terminalia sericea* Burch. ex DC.

The depressions are more open and covered with robust and coarse grasses interspersed with trees and bush, consisting primarily of *Acacia giraffae* Willd., *A. mellifera* (Vahl) Bentham ssp. *detinens* (Burch.) Brenan, *A. reficiens* Wawra, *A. tortilis* (Forsk.) Hayne ssp. *heteracantha* (Burch.) Brenan, *Boscia albitrunca* (Burch.) Gilg & Benedict, *Catophractes alexandri* D. Don, *Combretum celastroides* Welw. ex Lawson, *C. hereroense* Schinz, *Dichrostachys cinerea* (L) Wight & Arnott ssp. *africana* Brenan & Brummitt, *Grewia bicolor* Juss, *Lonchocarpus nelsii*, *Peltophorum africanum* Sonder, *Terminalia prunioides* Lawson and *Ziziphus mucronata* Willd. Several of the above plants are important in the diet of the eland and in the authors' opinion this vegetation type constitutes an ideal eland habitat.

3 THE CAPTURE OPERATION

3.1 Survey

An aerial census was conducted in February, 1972, with the aid of a Piper Super Cub aircraft and strip counts covering the entire area were done by flying parallel to the dunes. One hundred and thirty-two eland were observed, of which approximately 54 (41 %) were calves. The majority formed one large herd of approximately 100 animals. Isolated groups of bulls were scattered throughout the area. The animals traversed a large portion of the camp during a short period of time.

3.2 Capture technique and procedure

In view of the gregarious nature of the eland and because they are easily herded by a helicopter, it was decided that the most economical and practical method of capture would be to drive them into a plastic enclosure. In addition the vegetation afforded ideal camouflage for concealing the boma. Taking the prevailing wind into consideration, a well-concealed boma (Plate 1) was constructed 1 km from the nearest permanent water supply.

Woven, fawn-coloured plastic sheeting, 2,4 m wide and affixed to a cable at the top and bottom, lined the inside wall of the enclosure. The outside was reinforced with 15 cm nylon mesh nets. The boma (A) (Fig. 1) was oval in shape and had an entrance 70 m wide which could be closed from both ends with a plastic-net curtain. Two plastic lined arms diverged from this entrance, thus forming a funnel (Fig. 1).

Leading from the capture boma (A) was a separate passage connecting it to two similarly constructed

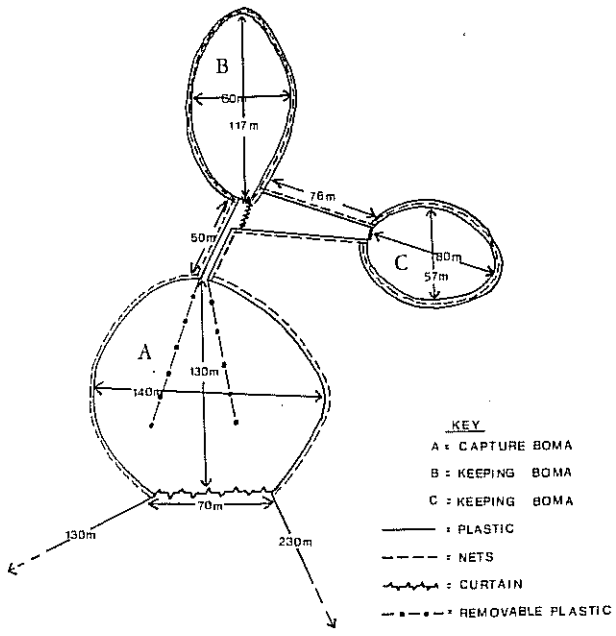


Figure 1. Diagramatic representation of the capture and holding-bomas.

Plate 1. The plastic-net enclosure and keeping bomas illustrating the degree of camouflage.

oval shaped holding-bomas. Boma B and C were 292 m and 230 m in circumference, respectively. Water troughs and rock salt were placed in all three enclosures. Additional shade was provided and, as a safety precaution, a fire-break was constructed around the entire complex.

The capture operation was launched in May to coincide with the onset of cooler weather and the weaning of calves. Average maximum and minimum air temperatures recorded during the capture period were 27 °C and 5 °C, respectively. The catching was confined to the cooler part of the day when temperatures were below 25 °C.

A Bell 47G4A helicopter was employed at the beginning both to spot the eland and to herd them into the boma. However, the majority of animals were 10 to 25 km from the capture site and by the time they had been located and had arrived at the entrance of the boma, the fuel supply of the helicopter was usually exhausted. In addition, it was found that in May the large herd had become fragmented into smaller groups, containing up to 20 animals. This greatly hampered the operation and necessitated long hours of flying. Consequently, to reduce the expense of a helicopter, an expertly piloted Super Cub was used with great success for the initial spotting and herding of the eland, reserving the helicopter for the final part of the drive only.

The eland were located by flying a square search. When located, they were often sheltering under dense stands of *Terminalia prunioides* and low flying was necessary to chase them out. They were then immediately herded on course and the plane, by flying figures of eight approximately 50 m above ground level, remained approximately 1 km behind the animals, closing in only if they changed course. The helicopter pilot was then instructed by radio to become airborne once the eland were within 2 km of the boma. He approached the plane via a wide detour and moved in behind it to take over the final herding operation.

As the eland entered the confines of the plastic-lined funnel, capture vehicles moved in, one from either side and one from behind to assist with the final drive. Members of the capture team were well concealed and stationed at each side of the entrance to close the curtains on command by radio from the helicopter. Once inside the capture boma, the eland were left to recover for a period of 6 to 12 hours and usually rested overnight. In order to herd the eland into the holding-bomas, attendants, linked by radio communication, entered and affixed the removable plastic sheets to cables which

had been previously strung in the shape of a funnel (Fig. 1, Plate 1). The animals were then herded into the funnel through the passage and into one of the holding-bomas.

3.3 Response to herding and capture

The eland responded remarkably well to being herded, provided they were not driven too hard and were permitted to proceed at their own characteristic trot. This they maintained through thick scrub and loose sand for many kilometres. On occasions they stopped and viewed the aircraft and were then given time to rest, provided they remained in a group. The eland were herded at a mean speed of 8 to 15 km per hour, depending on the distance to the boma. Ptyalism was a marked feature of some individuals and usually developed soon after herding commenced. They preferred to move against the wind, but could be chased in any direction provided the wind velocity was not excessive.

Scattering of the group usually occurred when the animals were chased too fast and became fatigued, when they were herded downwind with a strong wind blowing or when they scented or sighted danger as they approached the capture site. It also happened occasionally where thick scrub made splitting up of the group inevitable, particularly when young animals lost sight of one another. The eland could only be herded into the entrance of the boma in the absence of wind or when a down or crosswind prevailed.

Although the animals generally detected the curtains at the entrance to the boma, the back was well concealed and they usually entered without hesitation. Once caught they settled down quickly and never attempted to jump the plastic unless disturbed. Two eland among the first fifteen caught escaped by clearing the boma wall which was 2,1 m high. However, once the plastic was raised to its full height of 2,4 m no animals attempted to escape. It was nevertheless imperative for humans to enter the enclosure carefully in order to get the animals accustomed to the presence of people before any attempt was made to herd them into the holding enclosure. Talking, to indicate approach or presence, calmed the animals considerably.

Of a total of 91 eland caught (Table 1), 85 were captured using the boma technique. Except for four animals, which were immobilised after capture to collect blood specimens, none of these animals was handled or received supportive treatment. In addition, six cows were immobilised from the helicopter to collect blood samples and to record body measurements and masses. These results are reported elsewhere (Hofmeyr *et al.*, 1976). The masses of five of the cows ranged from 345 kg to 455 kg with a mean of 380 kg.

4 MANAGEMENT OF THE ELAND IN CAPTIVITY

4.1 Adaptation

The animals were kept in the holding enclosures for 3½ months, which included a 75 day quarantine period. The majority of the eland settled down quickly and were soon sufficiently tame so as to be approached to within a few paces. During feeding some would venture as close as 3 m from the attendants who were presenting the food. Adult bulls, however, caused innumerable problems. A group of seven bulls, confined to one boma, remained restless and fought constantly, inflicting serious wounds on one another. This resulted in the death of one bull that sustained a fracture of the sixth rib which had penetrated the right ventricle. The remaining six escaped three days after capture by breaking through the plastic-net lining. Never-

Table 1. Fate of the eland during capture, quarantine, translocation and release.

Operation	Caught	Escaped	Released	Died	Born	Total
Capture	91	8	1	1	—	81
Quarantine at end of period		11	—	1	21	90
Loading		1	—	4	—	85
Transportation		—	—	—	—	85
Release (Waterberg Plateau Park)		—	—	—	5	90
Total	91	20	1	6	26	90

Table 2. Sex and age composition of captured eland during quarantine before parturition.

	Adults and subadults		Calves 8-12 months old		Total	Percentage calves	Ratio
	Males	Females	Males	Females			Males:Females
	11	39	15	16	81	38,3	1 : 2
Total	50		31		81		

theless, a few bulls exceeding 450 kg were present among the other eland and were successfully kept with the cows and calves. Shortly after capture, a cow which had remained restless and had adversely influenced the behaviour of the rest of the herd, was immobilised and then released before she created further problems. A total of 81 animals was quarantined, 55 in boma B and 26 in boma C. The sex and age compositions are shown in Table 2. A significant difference between the number of adult/sub-adult bulls and cows existed, as eland herds consisting predominantly of cows and calves were usually selected and caught. The 1:1 male to female ratio of the calves captured should however, be a representative sample of the population.

In the holding-bomas the eland never attempted to clear the plastic or leap against it, although certain individuals developed the habit of ripping the plastic lining with their horns at night. Strong wind also ripped the plastic. Consequently repairs were constantly necessary. Unfortunately, these apertures led to the escape of 11 animals 75 days after capture. The plastic also deteriorated and eventually became perished by exposure to the sun and much of it had to be replaced. In addition, it became necessary to line the outside of the netting with plastic sheets and, as an additional precaution, attendants slept close to the bomas and kept vigil over the nocturnal activities of the eland.

4.2 Feeding

Baled lucerne (alfalfa) hay and antelope cubes (Epol (Pty.) Ltd.) were provided in the mornings and evenings in well distributed feeding lots to enable animals to feed without competition or aggression (Plate 2). The feed was placed in large worn truck tyres which were cut in half and filled in the centre with concrete to avoid wastage. The cubes contained the following: protein 16,0 % (min), fat 2,5 % (min), fibre 8,0 % (max), calcium 1,6 % (max), phosphorus 0,7 % (min), salt 1 %, cobalt 0,85 ppm, copper 5 ppm, iodine 0,6 ppm, iron 44 ppm, magnesium 20 ppm, and zinc 24 ppm. Rock salt and water were provided *ad lib.* At first, the eland were particularly partial to rock salt but its usage became less frequent as their craving for it diminished. In the evenings natural fodder was also provided for the animals in the form of freshly cut branches of some favoured plants (personal observations). These included *Baphia massaiensis* ssp. *obovata, Bauhinia macrantha, Combretum mechowianum,*

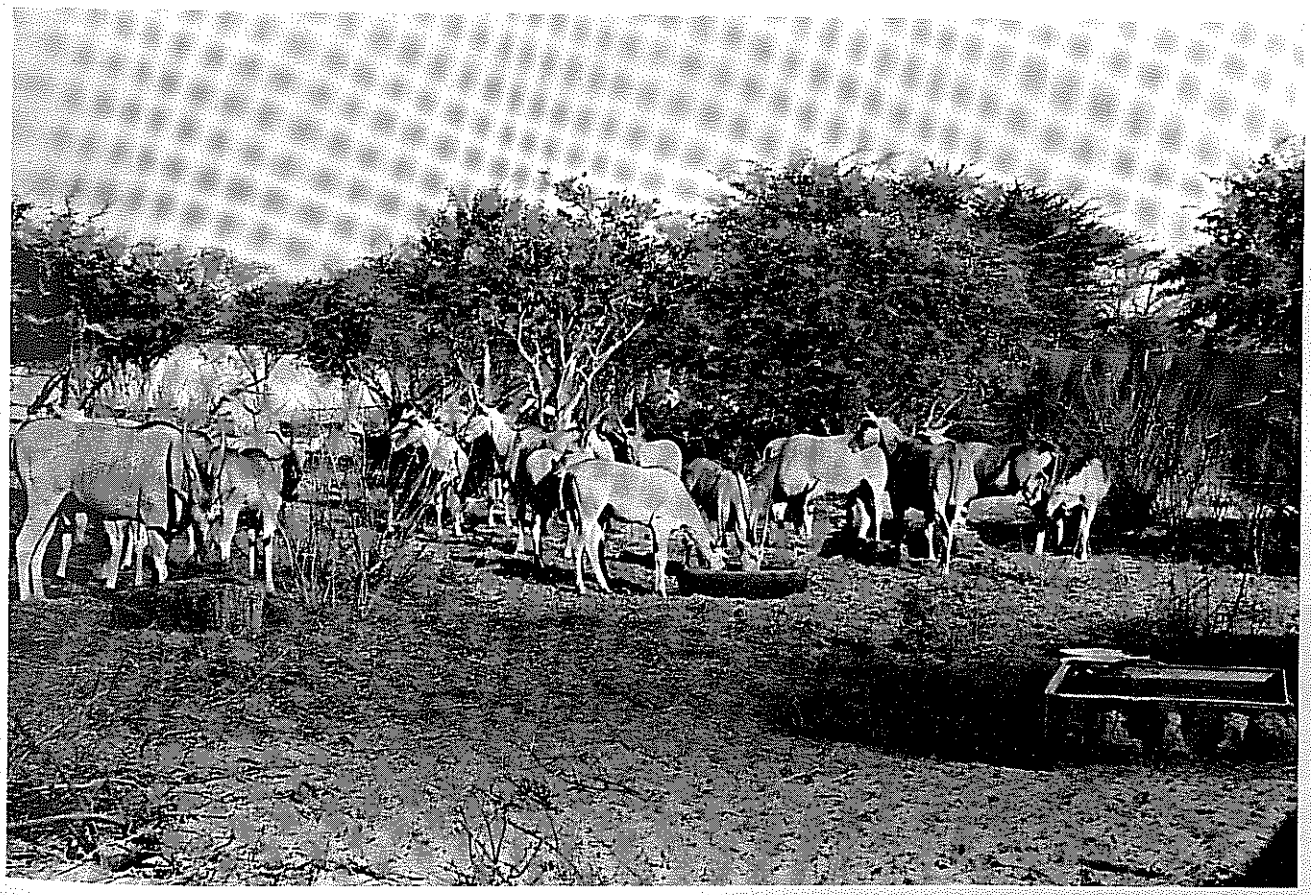


Plate 2. The feeding of eland during quarantine. The cows are in the advanced stages of pregnancy as evidenced by the third eland from the right which shows a prominent protuberance on her right flank.

Croton gratissimus, Grewia bicolor, Lonchocarpus nelsii, Rhus tenuinervis and *Terminalia sericea*. All the above species were avidly eaten.

The first captives utilised all the available vegetation inside the enclosures, including *Boscia albitrunca, Grewia bicolor* and *Croton gratissimus*, before they resorted to lucerne and the bomas soon turned into "dust bowls". The dust was difficult to control and was a problem, particularly at night when there was little or no air movement. However, apart from the occasional cough the eland did not seem to be adversely affected by these conditions.

During the capture and quarantine period 3 000 bales of lucerne and over 200 bags of antelope cubes were fed. Forty bales of lucerne (average mass of 28 kg per bale) and three bags of antelope cubes (each with a mass of 70 kg) were presented to 81 eland daily. This represents 13,8 kg lucerne and 2,6 kg antelope cubes, totalling 16,4 kg feed per eland per day. The average mass per eland, estimated from previously recorded masses (Hofmeyr *et al.* 1976) and herd composition (Table 2), was between 275 and 300 kg. Contamination of the lucerne with faeces and urine was inevitable and wastage, as is apparent from the above figures, was considerable, although difficult to estimate precisely in relation to the amount fed.

The eland were in excellent condition throughout captivity. The condition of an old cow, estimated to be approximately 16 years old, improved during this period. She calved shortly after she was released in the Waterberg Plateau Park.

4.3 Parturition

The majority of adult cows were six to seven months pregnant when caught (Plate 2). Towards the end of July and during the first two weeks of August, shortly before the eland were transported, 21 calves were born. Parturition usually occurred in the late afternoon and at night. In one observed case the foetus was expelled rapidly within 30 minutes of the first noticeable signs. The foetal membranes were expelled 30 minutes later and were consumed by the dam. The calves normally grouped together, particularly when resting. One calf died of enteritis after receiving an artificial milk substitute. It was rejected by its mother, which had sustained an injury and lost condition temporarily.

5 TRANSLOCATION

5.1 Procedure

The eland were transported to the Waterberg Plateau Park which is situated 250 km south of the Mangetti Quarantine Camp. Two 5-ton, four-wheel-drive trucks and a 15-ton truck, each suitably enclosed at the back with a communal crate, were used. Each crate had adequate ventilation and a thick layer of sand was placed on the floor to improve the stability of the vehicles and to prevent the animals from slipping.

Twenty eland, including heifers and young bulls, were selected for experimental purposes, immobilised (Hofmeyr *et al.*, 1976) and transported as a group, following clinical examination, foot and mouth disease vaccination and blood sampling. Unweaned calves were separated, caught by hand and transported in 1¼-ton vehicles to prevent them from being trampled to death by the adults. The other animals were herded through a passage and a well-constructed crush, 6 m long and 0,9 m wide, and entered the crate via a portable loading ramp (Plate 3).

5.2 Reactions to loading, transportation and release

The eland had become so accustomed to the boma that they were reluctant to leave. When attempts were made to separate the calves from the adults and to chase the latter into the passage leading to the loading ramp, the animals tended to bunch together. As a result one calf was kicked to death and another escaped during loading.

The crush was essential to facilitate loading, which effectively prevented any animal from turning back. Animals which failed to move onto the loading ramp were induced to do so by an electric bull-prodder. Although restless initially, the eland calmed down quickly in the crates, provided they were not too crowded. One adult bull fatally injured three cows in an over-crowded crate. He was transferred to another crate and transported with two other adult bulls.

Following immobilisation with 8 mg etorphine hydrochloride/M99 (Reckitt) and 200 mg azaperone (Janssen Pharmaceutica) each of these bulls, depending on their size, was injected with 50 to 90 mg haloperidol (R1625—Serenace) (Searle), that is approximately 0,1 to 0,125 mg/kg. This long acting neuroleptic was maintained at a therapeutic level for 9 to 12 hours and the bulls were suitably tranquillised during the nine hour journey.

Altogether 85 eland (Table 1), including 18 calves, were transported. They remained calm during transit and lay down during some stages of the journey.

After having been off-loaded into the boma, the cows reaccepted their calves and those calves which were orphaned as a result of injury by the bull, were successfully suckled by foster mothers. Within 12 hours after off-loading, two cows gave birth to normal calves in the boma and three more calves were born later in the adjoining camp. Once they had settled down they were released in a 12 ha quarantine camp where they remained for three months. They again utilised much of the available natural vegetation before resorting to lucerne. Although they were accustomed to humans by this time they remained wary and it was no longer possible to venture close to them. The experimental

Plate 3. Loading of eland for transport using a portable loading ramp.

group, retained in the plastic boma, reacted similarly initially, but soon became approachable again (Hofmeyr *et al.*, 1976).

The eland were finally released in a 1 000 ha paddock in the Waterberg Plateau Park which is ecologically similar to the Mangetti Quarantine Camp and constitutes an ideal eland habitat. Few, if any, problems were anticipated in their readaptation (Hofmeyr, 1975).

6 DISCUSSION AND CONCLUSIONS

The plastic boma, as previously described, was effectively used for the capture and holding of eland. There are several possible modifications which may prove equally effective. For instance

(i) the use of vehicles to assist with the final drive is unnecessary, provided the entrance is wide enough and the eland are unable to see or smell anything foreign as they approach it.

(ii) the construction of a holding enclosure, attached to the back of the capture boma and separated from it by a curtain, should facilitate management and be more effective as newly captured eland were not alarmed by the helicopter during subsequent drives.

(iii) reinforcing the outside wall of the capture boma with nets is not essential provided the animals are immediately chased through to the holding enclosure (personal observations).

In the present investigation no eland jumped over the 2,4 m high plastic but Dr P. A. Basson, State Veterinarian, Grootfontein, South West Africa *(pers. comm.)* observed eland jumping a plastic-lined boma 2,7 m high. It is therefore advisable to make the sides 3 m high and this should effectively contain them. Pienaar (1973b) suggests walls at least 3,5 m high and preferably a holding corral provided with a verandah-like overhang directed inwards.

The use of a fixed-wing aircraft proved both invaluable and economical. When expertly herded, eland can be moved considerable distances (up to 25 km). It may even be possible to drive them into a strategically placed enclosure without the aid of a helicopter.

Herd consolidation was apparent during the initial survey in February and it may have been advisable for economic reasons to capture the animals earlier in the year before fragmentation of the large herd occurred. However, during February high ambient temperatures prevail and capture operations would have to be restricted to the cool hours of the day.

Moreover, in thick bush herding of unweaned calves may be a disadvantage.

The birth of the majority of calves, towards the end of July and during the first two weeks in August, was unexpected and considered to be unusually early for the eland. For example, the eland calving season in the Grootfontein district, South West Africa, extends from August onwards, with a peak between October and November, according to Shortridge (1934). Moreover, a similar calving season has been observed for eland in the Etosha National Park (personal observations). However, none of the calves were born prematurely and all the calves were cared for by their dams, except in one instance where a cow had sustained an injury. It seems unlikely therefore that parturition was stress induced. As this is the first record of such early births the phenomenon deserves further investigation.

Stringent veterinary regulations which required a protracted quarantine period resulted in several difficulties that had to be overcome. Plastic sheets on either side of the net-lining are essential for the retention of eland in a plastic-net enclosure. The supporting vertical poles should also not be more than 7 m apart, depending on the nature of the soil.

Eland responded variably to different circumstances and marked differences in individual behaviour may exist within a group of animals. For example, although difficulty was experienced in loading the animals after a protracted captivity period, newly-captured eland react differently to loading. In fact, during a subsequent capture operation, conducted elsewhere, newly-captured eland usually moved up the loading ramp and onto the vehicle of their own accord and without hesitation. Mr. J. Oelofse, Private Game Dealer *(pers. comm.)* has shown that captive eland can be loaded successfully, provided they first become accustomed to the passage and a loading ramp 2 to 3 m wide.

Problem animals should be promptly attended to and, where feasible, removed and suitably accommodated. The management of adult bulls undoubtedly presents a major problem and in this operation, injury by bulls accounted for four of the six animals that died. Bulls exceeding 450 kg in mass or three years and older should be immobilised and either transported individually, or, if this is not possible, together with other bulls, provided they are effectively sedated with a long acting neuroleptic such as haloperidol. The use of haloperidol in eland, when used alone, that is without the after-effect of immobilising drugs, was not evaluated.

When transported in communal crates it is essential that sufficient space is provided for all the eland to lie down and to move freely within the crate. Congestion will inevitably lead to unnecessary stress and injuries. One animal to 1,5 m^2 surface area proved ideal for adult eland and, calves eight months and older were transported successfully together with adult cows and young bulls.

Capture myopathy is a well known phenomenon in capture and translocation operations and may be responsible for heavy mortalities in many animals, including eland (Basson, McCully, Kruger, van Niekerk, Young, de Vos, Keep & Ebedes, 1971; Basson & Hofmeyr, 1973). However, none of the eland captured by immobilisation (Hofmeyr *et al.*, 1976) or during the present investigation succumbed from or showed clinical manifestations of this condition. It was noteworthy that they possessed considerable stamina and could cover vast distances without noticeable ill effects. The eland's more docile temperament may be an important attribute and it would appear that, when pursued by a helicopter, they are not subjected to the same degree of fear and alarm as for instance roan antelope *Hippotragus equinus* (Hofmeyr, 1974) and springbok *Antidorcas marsupialis* (Gericke, Hofmeyr & Louw, 1976). In contrast to several other species, eland rarely go into a gallop when chased by aircraft and thus do not easily over-exert themselves. Moreover, as they are also known to be nomadic and to cover great distances rapidly during migrations, either a superior physiological or anatomical adaptation to exercise could make them less prone to capture myopathy. For example, an interesting observation in this respect is the presence of three or more coronary ostea, at least one in each aortic sinus, compared with the occurrence of only two in man, domestic animals and the majority of other South African ungulates (Basson & McCully, 1969; Basson *et al.*, 1971). It is tempting therefore to speculate that the presence of additional ostea may enhance the cardiac blood flow and increase cardiac output and therefore performance in the eland. Nevertheless, as it is known that they may also at times succumb to capture myopathy, it is important to consider both their behaviour and physiology and apply sound management practices and clinical procedures when capturing eland.

7 SUMMARY

The successful application of a plastic-net enclosure for the capture and retention of more than 80 eland and their translocation over 240 km to the Waterberg Plateau Park, South West Africa, are described. By using the boma method it was not necessary to physically handle the majority of the animals nor was supportive therapy required.

The eland responded well to herding by a Piper Super Cub, fixed-wing aircraft. A helicopter and vehicles were only employed during the final drive into the enclosure. By taking physiological, behavioural and climatic factors into consideration, the eland were successfully chased 8 to 25 km without showing clinical manifestations of capture myopathy. During a 3½ month captivity and quarantine period a salt lick, natural fodder and more than 3 000 bales of lucerne and 200 bags of concentrate were fed to over 80 animals. During this period 21 calves were born. For the prolonged

retention of eland in a plastic-net enclosure, a structure 3 m high with plastic sheets on either side of the net-lining is recommended. Cows, heifers, young bulls and calves 8 to 12 months old, were successfully transported together in communal crates, provided the animals were not congested. Adult bulls more than 450 kg in mass presented problems and had to be transported separately. During the nine hour journey they were effectively tranquillised with haloperidol, a long-acting neuroleptic, which maintains a therapeutic level for 9 to 12 hours.

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