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THE LARGE MAMMALS OF THE MATOPOS NATIONAL PARK

by

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INTRODUCTION

The granite hills of the Matopos which lie some 30 miles south of Bulawayo, Rhodesia, consist primarily of large bare hills and gorges. There are vast numbers of kopjes in which a great number of shelters and caves are found. As Cooke (1959) has already pointed out the country is very broken and except in the silted valleys much of the area appears unsuitable for agriculture. He feels that the area could never have been really productive from the pastoral or arable points of view, and that in historic times it had always been a refuge place of defeated tribes.

Cooke (1959) mentions that it was very likely that the "Later Stone Age" people which were living in the more open surrounding grounds were forced into the shelter of the Matopo hills and prior to the arrival of the migrant Iron Age people the Bushmen were masters of the whole territory. He goes on to say that once the Iron Age people settled and started agriculture and cattle breeding in the surrounding country the Bush people would have been forced to remain within the fastness of the hills, except when they left the sanctuary of the hills to go on hunting expeditions.

However, when other Iron Age tribes attacked and raided the settled agriculturists, they also fled into the hills and the Bushmen were then forced to leave their shelters and caves, the walls of which they had painted, and these caves were used by the Iron Age people to hide in and to store grain and perhaps to hide their stock. It therefore appears as if the movement of people in and out of the Matopo hills must have gone on for many decades and then finally when Europeans settled in the surrounding country the Matabele also fled into the hills.

Left on the smooth granite walls of many of the caves and shelters were paintings of a great variety of animals and Cooke (1964) gives full details of most of the species which occur in the Matopo hills. The following animals are mentioned by Cooke (1964) as appearing on the granite walls of the Matopo shelters and caves: lion, a white leopard, cheetah, wildebeest, tsessebe, giraffe, impala, black and square-lipped rhinoceros, elephant, eland, buffalo, hippo, zebra, kudu, sable and duiker.

* Most of this work was carried out while the writer was employed in the Research Branch of the Department of National Parks and Wildlife Management, Rhodesia.
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There are many famous caves in the Matopo hills in which one can find a great variety of fine paintings. For example the White Rhino shelter, Nswatugi cave, Isotja cave, Siloswane cave, Bohwe cave, Inanke and the large Bambata cave. There are also hundreds of other caves and shelters which are not well known.

In the White Rhino shelter there is a very good selection of animal paintings and in particular the line drawings of wildebeest are extremely good. In this shelter there are also paintings of a male lion, a flock of guinea fowl, a kudu bull and, by far the most important, is the outstanding painting of an almost complete square-lipped rhino. A couple of other incomplete paintings of this rhino are also present.

On the walls of the Nswatugi cave there is a painting of two duiker, an eland, several kudu (a female, a large bull and several calves), the outline of a zebra, a white leopard and exceptionally fine paintings of three giraffe.

Amongst a vast number of other animals there is a fine painting of a cheetah in Bambata cave.

In October 1953 about 250,000 acres of the Matopo hills were proclaimed a National Park and the development of the area commenced. Dams were built on the Maleme, Mpopoma and Toghwana rivers and many new roads were marked out and graded. A detailed survey was also conducted in order to determine how many people and stock lived in the area. It was found that, although the carrying capacity of the area was about 400 families and 4,000 head of domestic stock, there were in fact 1,750 families and 13,800 head of stock in the Park (Tredgold, 1956).

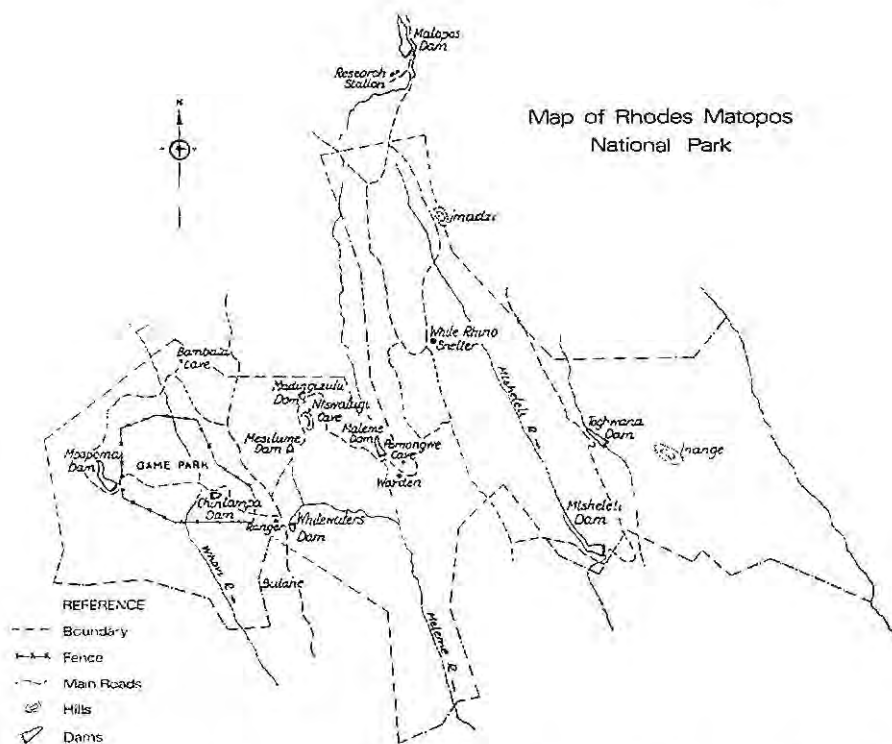
As a result of the intensive hunting that had taken place in the Matopos and surrounding country for decades, it was not surprising that when the area was proclaimed a National Park in 1953 there was virtually no game left in the hills.

The smaller antelope such as klipspringer, duiker and steenbuck survived in fair numbers and of the larger antelope only sable remained in several large herds. Mr. C. K. Cooke, Director of Historical Monuments Commission, who knows the area exceptionally well, informs me that the sable herds now in the area have bred up from the original herd which was introduced in the 1920s. The animals were in a fenced enclosure near the Warden's House in the Arboretum. Heavy flood damage washed away the fence and the sable escaped. A few kudu managed to escape being killed and there were also odd pairs of reedbuck and bushbuck about. It was generally believed that leopards were plentiful.

A small section of the National Park was selected as a game park and an 8-ft. high game fence was erected between the hills and approximately 3,500 acres were closed off. A number of game animals were captured in the Wankie National Park and released into the game park. Map 1 shows the position of the small game park in relation to the National Park and throughout the paper the words "game park" refer to the fenced area while the "National Park" refers to the entire area.

The first animals to be introduced into the game park was a group of five zebra and 12 wildebeest which were released on 23rd January, 1960, and then in March of the same year some eland calves and a few giraffe were released. From 1960 onwards additional animals were introduced from time to time.

The writer arrived in Rhodesia in January, 1965, to join the staff of the Research Branch of the Department of National Parks and Wildlife Management and immediately realised the possibilities of studying the reproductive rate of a known game population and also the food and feeding habits of several species. In order to get an idea of what species were introduced into the Park and the dates on which they arrived, the writer had to consult files kept by the various officers who were stationed in the area. Details were also kept of the births and deaths of the various species and



from January, 1966, the writer then had his own Research staff posted in the Park and he also visited the Park at least three to four times a month. The work on the Large Mammals was conducted from January, 1965, to July, 1968, and a detailed Small Mammal Survey was carried out from June, 1967, to August, 1969. Results of the Small Mammal Survey are to be published separately.

After briefly discussing the Study Area each large species will be discussed separately and details of births and mortality will be given in addition to dates on which the animals were released in the game park.

THE STUDY AREA (MATOPO HILLS)

The beginning of the Matopo hills lies some 20 miles south of Bulawayo and from east to west the hills stretch for about 50 miles and their depth varies from 25 to 30 miles. The entire area therefore covers approximately 1,350 square miles. However only a small section of this area is National Park.

The Park as originally proclaimed was about 250,000 acres and as mentioned previously a large number of African families and domestic stock lived in the area. By 1952/53 it was realised that the damage being done in the park by the cattle and people was considerable and therefore over half the Park was relinquished to the Ministry of Internal Affairs. The 70 odd families in the remaining part of the Park, which contained the headwaters of the rivers flowing into the Lowveld, were evacuated (Tebbit, pers. comm.). The entire National Park was then ringfenced to cattle fence standards.

The area of the National Park remaining is in the region of 108,000 acres while the small fenced game park is now 6,500 acres. Very recently (1967) the fenced game park was increased from 3,500 to 6,500 acres.

The highest point in the Matopo hills is about 5,075 feet while the altitude of Bulawayo is 4,409 feet above sea level.

The landscape is eminently picturesque and there are vast numbers of precipices, kloofs and caves. The extraordinary forms of the kopjes in the hills are always a source of wonder and many wrong ideas are entertained as to their origin. The present landscape of the hills has been carved from an almost flat surface and fantastic shapes have evolved by the slow processes of natural erosion. (Tredgold, 1956).

The very sharp contrast in the type of soil, vegetation and scenery between the flat dry country and the large granite domes of the Matopo hills is sudden and most striking. This change takes place near the Maleme drift and is about two miles south of the Matopos Dam (Map 1).

The entire area consists essentially of granite country and as the hills are part of the main watershed of Rhodesia the vegetation is, broadly speaking, typical of the highveld flora as is found in the Salisbury/Umtali area.

Colophospermum mopane is very common in the Park in addition to *Brachystegia*

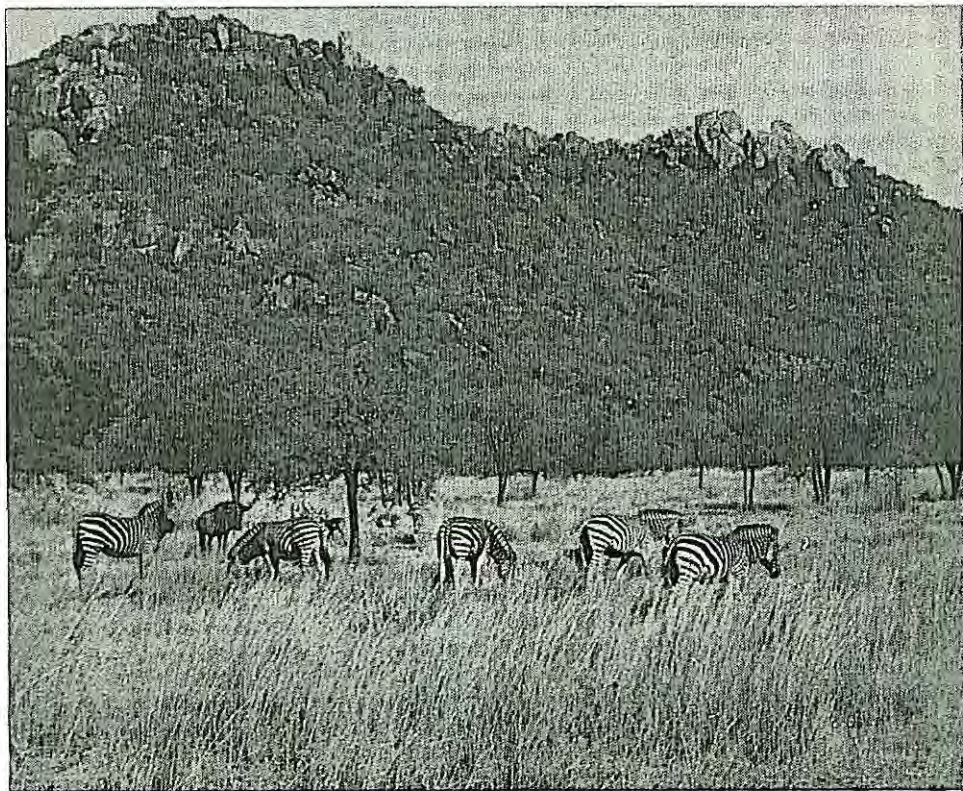


PLATE 1.—Typical type of hill found in the Matopos National Park, consisting of tumbled and broken granite boulders.

spiciformis and *Julbernardia globiflora*. *Parinari curatellifolia*, *Terminalia sericea* and *Peltophorum africanum* are also common in certain areas.

In addition to the dominant species a great variety of plant forms may be expected and will be found. To the botanist a very rich field is open for study, the wealth and variety of which is accounted for by the fact that within a very small area plants are found occupying a great diversity of situations.

Of greater importance in the Matopos is the huge area of massive kopjes of which many are bare and rounded while some are tumbled and broken granite masses (Plate 1). At the foot of some of the hills may be found swamps supporting luxuriant vegetation all the year round. There are also many small perennial streams fringed with evergreen trees.

In the cracks and between the boulders on the kopjes soil collects and some such places support luxuriant vegetation such as ferns and various small leguminous species. In the cracks on the tops of the huge domes *Vellozia* spp. and *Aloe chabaudii* are most common. In addition a very tall aloe, known as *Aloe excelsa*, is also present while the resurrection plant, *Myrothamnus flabellifolia*, is common on most hills.

In parts, where the hills are very broken, large pockets of soil accumulate and large trees are present.

Brachystegia tamarinoides is one of the species growing on the hills and often reach a considerable size. Quite often, among the *Brachystegia* on the hills, *Albizzia rhodesica* and *Commiphora marlothii* are present while *Euphorbia ingens* is common throughout the Matopos both on the hills and on the flat country.

One of the most striking plants in the Matopos is the large tree fern, *Cyathea dregei*, while *Erythrina caffra* and *Calodendrum capense*, both very beautiful trees, occur.

Finally, the runoff of rain from the granite hills produces many small streams and sponges; the latter, which are always wet, support a great variety of plants. The ground orchid, *Eulophia cucullata*, and *Gladiolus atropurpureus* are very common.

Barleria matopensis and *B. affinis* are two of the common Acanthaceae which may be found in the shade on the hills (Tredgold 1956).

The annual rainfall of the Matopos is in the region of 24 inches and falls mainly between October and March, most of it in January and February.

The mean annual temperature is only about 65°F. and the mean maximum 79°F. while the mean minimum is only 54.8°F. The hottest months of the year are October and November and a maximum temperature of 108°F. has been recorded while June is the coldest month with a mean minimum of 38.6°F. (Tredgold 1956). However, recent temperatures have dropped to much lower than this.

SPECIES

Each species is now to be discussed in detail.

Family Hyaenidae

Spotted Hyaena, *Crocuta crocuta*

This species no longer exists in the Matopos National Park and it is doubtful if any are left anywhere in the hills. During the 3½ years that the writer worked in the area there were no records of hyaena in the Park until very recently (May, 1968) when it was reported that a hyaena had killed four sheep in the Tribal Trust land just two miles south of the National Park, and according to the local Africans the animal came from the Gwanda area.

Brown Hyaena, *Hyaena brunnea*.

Smithers (1966) says this species occurs in the western part of Rhodesia and that it

is comparatively uncommon. This species has not been seen in the Matopo hills for many years and it is generally believed that the last Brown Hyaena was trapped by a ranger of the Department of National Parks and Wildlife in 1960. The skin and skull of this specimen are now in the National Museum, Bulawayo.

Family Felidae

Leopard, *Panthera pardus*.

Leopards occur naturally in the Matopos and it was generally believed that they were very common in the area and they were also blamed for the deaths of many of the animals when they were first released in the park. A number of leopards were destroyed due to stock depredation in the area and the skulls of six of these are now in the National Museum, Bulawayo.

Over the period that the writer had worked in the area including 48 nights of observations, which were conducted from an open landrover and using a powerful spotlight, only four leopards were seen. These night patrols often covered a distance of 20 miles and took from two to three hours. The writer is therefore of the opinion that the leopard is not as common in the Matopos as is generally believed.

The staff in the park collected leopard droppings whenever possible and over a period of 1½ years 15 different piles were found. The droppings were crushed, washed and sieved and the contents examined. It was found that only a few species formed the major part of the leopard's diet. Table 1 shows that the majority of the droppings contained hair of the Red rock hare, *Pronolagus crassicaudatus*, while several animals were found to have eaten dassies, *Procavia capensis* and/or *Dendrohyrax brucei*. The soles of the feet and vertebrae of dassies were often passed out undigested.

TABLE 1
Examination of 15 piles of leopard droppings.

No.	Date collected	Contents of droppings
1	10.3.67	<i>Pronolagus crassicaudatus</i> hair
2	17.4.67	<i>Pronolagus crassicaudatus</i> hair and <i>Procavia capensis</i> feet.
3	20.5.67	<i>Pronolagus crassicaudatus</i> hair.
4	1.6.67	<i>Pronolagus crassicaudatus</i> hair and klipspringer hair.
5	17.8.67	Hair and hooves of duiker, <i>Sylvicapra grimmia</i> .
6	12.9.67	<i>Procavia capensis</i> bones and soles of feet, also hair of <i>Pronolagus crassicaudatus</i> .
7	11.10.67	<i>Procavia capensis</i> bones and soles of feet, also hair of <i>Pronolagus crassicaudatus</i> .
8	16.11.67	<i>Procavia capensis</i> hair.
9	1.12.67	<i>Pronolagus crassicaudatus</i> hair and <i>Procavia capensis</i> hair.
10	11.1.68	<i>Pronolagus crassicaudatus</i> hair.
11	18.1.68	<i>Procavia capensis</i> bones and soles of feet.
12	12.2.68	Hair of klipspringer <i>Oreotragus oreotragus</i> .
13	15.3.68	<i>Procavia capensis</i> hair.
14	19.4.68	<i>Pronolagus crassicaudatus</i> hair.
15	21.4.68	<i>Pronolagus crassicaudatus</i> hair.

One leopard had obviously eaten a duiker, *Sylvicapra grimmia*, as hooves and hair of its prey were found in the droppings. Finally two animals were found to have eaten klipspringers, *Oreotragus oreotragus*; the hair of this species was very easy to identify in the droppings of leopards and they were even clearly visible in unwashed droppings.

Finally a young female leopard was destroyed by the ranger at Whitewaters in

July, 1967, as it was believed that this particular leopard was responsible for the death of several impala, *Aepyceros melampus*, calves. On examination of the stomach contents it was found that the leopard had eaten two whole Red rock hares, *Pronolagus crassicaudatus*, just before being shot.

Lion, *Panthera leo*.

There is a recent record of a lion in the National Park and this animal apparently came from the south and over a period of a few days crossed through the area and finally disappeared towards Plumtree (Tebbit, pers. comm.).

Cheetah, *Acinonyx jubatus*.

There is a fine rock painting of a cheetah in the Bambata cave and in a shelter near Whitewaters there is a painting of a "Cheetah Hunt" in which a number of cheetah appear. Four of the animals were painted lying on their backs as though dead (Jones, 1949). It is quite possible that the cheetah were seen in the surrounding Acacia country and not actually in the Matopo hills as the (flat) *Acacia* areas appear to be more suitable for them than the Matopo hills.

There are no recent records of cheetah from the hills and it is not known when last they were reported from there. However, the writer has recently been informed of a cheetah seen in January, 1968, a few miles south of the Matopos Agricultural Research Station. Mr. Tebbit, Regional Warden of the Department of National Parks and Wildlife, also informed me of two recent records of cheetah from the surrounding country. One was from near Figtree and the other from just south of Kezi.

Family Rhinocerotidae

Square-lipped Rhinoceros, *Ceratotherium simum*.

According to Player & Feeley (1960) the square-lipped rhino had a very wide distribution in Southern Africa about 1800 and at that time it occurred throughout Rhodesia. They point out that the species became extinct in Rhodesia in 1896. Smithers (1966) says the species was formerly widely distributed in Rhodesia and that it was recorded by Selous from Matabeleland from 1872 to 1880.* Smithers (1966) goes on to say that the last specimen was shot near Mazoe in 1895.

Ansell (1959) quoting Clay gives details of a European trader who operated in western Rhodesia about 1890 and who employed nearly 400 African hunters, and that the square-lipped rhino was exterminated from a very large area. Finally Cooke (1964) mentions that the late Mr. McDougall, founder of the Triangle Sugar Estates, saw three square-lipped rhino near the junction of the Sabi and Lundi rivers about 1920. He mentioned that two of them were shot soon afterwards and the last one disappeared. Mr. Cooke also informs me of a fine White Rhino painting at Melesanga Rocks on Nuanetsi Ranch.

As mentioned earlier there are some exceptionally fine rock paintings in the White Rhino shelter in the Matopo hills. These paintings obviously had a great influence on the National Parks authorities when they decided to introduce the square-lipped rhino into the game park.

The first group of rhino arrived from Zululand in May 1962 when a male and three females were received. The object of the operation was to re-establish a breeding nucleus of square-lipped rhino in Rhodesia. At the same time one male and three females were released in the Kyle National Park. An additional nine animals were

* "Wallis (1946) mentions in the Northern Goldfields Diaries of Thomas Baines that on Monday, 14th June, 1869, Baines and his party found wells which were dug by elephants and square-lipped rhinoceros. After some hours of tedious spooring they came across two rhino among some Mopani trees. Hartley, who was one of the party, wounded a cow rhinoceros which made off and while following this animal they came across another two. This incident apparently took place just south of the Matopos Hills at about 20° 45' S."

received in 1966/67 and details of dates on which these animals were received and their ages are given in Table 2.

TABLE 2
Ages and sexes of 13 rhino received from Zululand and released into the game park.

Date received	ADULTS		JUVENILES		Total
	Males	Females	Males	Females	
5.5.62	1	3	—	—	4
31.10.66	2	1*	1	—	4
6.11.66	—	1	—	1	2
8.11.66	—	1	1	—	2
16.1.67	—	1	—	—	1
	3	7	2	1	13

* This female died on 1st November, 1966. In fact she never recovered from her trip from Zululand and had to be forced out of her crate. She died on the spot at which she was lying when removed from the crate.

Breeding:

The first calf to be born in the Matopos and in Rhodesia for 60-70 years was a male which was born on 19th March, 1967, but this animal died of bacterial enteritis on 29th March, 1967. The mother of this calf was heavily pregnant when she arrived from Zululand, South Africa, on 16th January, 1967.

The calf weighed 121 lbs. at death and in addition it had the following body measurements:

Total length: 142 cms (tip of nose to tip of tail).
Tail length: 29 cms (tip of tail to body).
Hind foot: 15 cms (from shank to sole of foot).
Ear: 14 cms (from notch to fleshy tip).
Shoulder height: 64 cms (from sole of foot to highest point on shoulder).

The skin and skull of this specimen are now in the National Museum, Bulawayo.

Bigalke *et al.* (1950) gives the weight of a 6-day old female calf as 105½ lbs. and a height of 23.4 inches. This specimen is considerably smaller than the Matopos male although the Matopos male was slightly older. The next calf was born on the 27th December, 1967, its mother having arrived from Zululand on 6th November, 1966. As with the previous female this one was also heavily pregnant when she arrived and en route to Bulawayo knocked her anterior horn off in the crate.

The first calf to be born in the Matopos to a female which actually conceived in Rhodesia was born on 27th March, 1968, and another rhino which conceived in Rhodesia produced a calf on 17th April, 1968. Details of dates of birth and sexes of the calves are given in Table 3.

The two calves born in 1967 were both from females which conceived in Zululand and were heavily pregnant when they arrived in Rhodesia; however, the calves born in 1968 were from the females which arrived from Zululand in 1962 and this showed that they had now completely settled down in their new surroundings and had commenced breeding.

The female which produced a calf on 17th April, 1968, was observed mating on 10th September, 1966. The male which was observed mating with her was one that

TABLE 3
Square-lipped rhino calves born in the Matopo hills.

Details of Calves		Details of Mother	
Date born	Sex	Date Received	Notes
19.3.67	Male*	16.1.67	Pregnant when received.
27.12.67	Male	6.11.66	Pregnant when received.
27.3.68	Male	5.5.62	
17.4.68	Female	5.5.62	Mating observed on 10.9.66

* This calf died on 29th March, 1967.

also arrived from Zululand in May, 1962, and had been with the female from the time of their arrival. It is not known how often copulation took place while the female was in oestrus but the gestation period was calculated from the date on which the writer observed mating to the date of birth; this proved to be 584 days and is only six days longer than the maximum period of 578 days quoted by Kenneth & Ritchie (1953). Foster (1960) gives the period of gestation as 19 months.

During copulation the Matopos male remained mounted for 18 minutes while Player & Feeley (1960) mention that during copulation a male may remain mounted for as long as one hour.

Each rhino was known individually to the writer and the various staff employed in the Park and each animal had been named. It was therefore unlikely that the rhino seen mating on 10th September, 1966, could have been mistaken for another one and was definitely the one that calved on 17th April, 1968.

Feeding:

Cynodon dactylon, locally known as "Quick grass" is a very common perennial creeping grass and is the most abundant species in the park. There are hundreds of records of this grass being eaten by rhino while other preferred grasses were *Urochloa panicoides* and *U. bolbodes*. *Panicum maximum*, *Digitaria pentzii*, *Setaria pallidifusca* and *Tricholaena monachne* were also much sought after grasses and often eaten in large quantities.

The following grasses were also eaten by the square-lipped rhinoceros in the Matopos National Park: *Aristida barbicollis*, *A. congesta*, *Eragrostis* sp., *Heteropogon contortus*, *Hyparrhenia dissoluta*, *H. filipendula*, *Pogonarthria squarrose*, *Pennisetum glaucocladum*, and finally the semi-aquatic or aquatic perennial reed *Phragmites mauritanus* was recorded as being eaten by the rhino on a number of occasions.

Player & Feeley (1960) say that in Zululand the most frequently eaten grasses are certain "sweet" species such as *Urochloa*, *Panicum* and *Digitaria*.

Family Equidae

Burchell's Zebra, Equus burchelli.

The first zebra to be released in the game park arrived as yearlings on 23rd January, 1960. These were captured in the Wankie National Park and the group consisted of two males and three females. One of the males died on the day of arrival and at the time of writing the remaining four animals are still alive and now about eight years old.

In September, 1965, another two zebra, a male and a female, arrived from Wankie and were released into the game park. The animals were in poor condition when they

arrived and the male died on 26th October, 1965, exactly one month after arriving from Wankie. A final group of one young male and two females, all young adults, were released into the park on 16th January, 1968, and these were also captured in the Wankie National Park. Table 4 gives details of ages and sexes of all zebra released into the Matopos game park.

TABLE 4
Sexes and ages of the 10 zebra released into the game park.

Date released	Males	Females	Total	Notes
23.1.60	2	3	5	Yearlings*
26.9.65	1	1	2	Adults†
16.1.68	1	2	3	Young adults
	4	6	10	

* One male died on the day of arrival.

† The male died one month after arrival.

Breeding:

It was interesting to note that the zebra which were introduced into the park in 1960 had still not bred at the time of writing. One of the original stallions died which left a group of one stallion and three mares. When they arrived in January, 1960, each animal was just over a year old and, according to King (1965), stallions of the Grevy and Grants zebra in East Africa become sexually mature between $2\frac{1}{2}$ and four years of age. He goes on to say that young adult stallions are unable to compete with older stallions.

In September, 1965, another two zebra were introduced into the park and their presence was immediately strongly resented by the old established stallion. The animals were in poor condition when they arrived and after being chased about considerably by the resident stallion the new stallion died on 26th October, 1965, only one month after being released into the park. The remaining single mare was then allowed to join the existing group of zebra and this then formed a herd of one stallion and four mares. (Plate 1).

In spite of the fact that the stallion was observed mounting the mares on a number of occasions no foals were born and it was then realised that the stallion must be sterile. Therefore in January, 1968, another group of zebra were introduced into the game park and consisted of one stallion and two mares which were caught in Wankie National Park. The old established stallion immediately resented the presence of the new arrivals and would not allow them to join the herd. This type of reaction has already been mentioned by King (1965). Each time the new herd came within sight of the old group they were driven off by the old stallion and have now taken up residence in a small corner of the park well away from the old herd.

Family Suidae

Bushpig, Potamochoerus porcus

As the bushpig is normally a nocturnal animal and because of the nature of the country in which the bushpig occurs in the Matopos, it is hardly ever seen. There are, however, a few records of the animals being seen in a number of localities both in the fenced game park and in the surrounding part of the National Park.

Because of the difficulty in assessing accurately the number of animals in any one group seen the figures given in Table 5 should be regarded as only approximate. They spend most of the time at the base of the kopjes in the thickets or else in the long grass in the open vleis. Only nine different groups were located in the hills and details of these are given in Table 5. In March, 1968, a group of two adults and four immature animals were reported to be doing damage to gardens in the Tribal Trust land and then retreating to the Park during the night. A ranger destroyed four of them. A large female also chased an African Game Scout in June, 1968, and the African was forced to climb a large tree where he remained for several hours. Finally the bushpig disappeared into some thickets and the Game Scout examined the surrounding area and found spoor of several young bushpig together with the spoor of the adult female.

Although the sight records of bushpig are very few it is generally believed that they are far more common in the hills than the records show.

TABLE 5
Approximate size of nine bushpig groups and localities where seen.

Date seen	Group size	Locality	Notes
15.6.65	4	Whitewaters area	Near Whitewaters Dam
21.11.65	3	Bambata Cave	
10.3.66	7	Mpopoma dam	
18.5.66	1	Maleme dam	
12.12.66	3	Mesilume dam	Seen at 11 a.m.
2.3.67	5	Toghwana dam	Three piglets about 2 months old
18.7.67	4	Whitewaters dam	Possibly same group as seen 15.6.65
March '68	6	Imadzi area	2 adults and 4 young
4.4.68	3	Eastern boundary	4 young shot*
	36		

* Shot by Ranger.

Warthog, *Phacochoerus aethiopicus*.

On 25th February, 1960, a group of six adult warthogs were released into the game park, but unfortunately no records of sexes are available. The animals scattered over a large area while no details of sightings or breeding were kept until January, 1965, when the writer commenced observations in the area.

Several of the warthogs left the fenced game park and established themselves outside the park but still actually in the National Park. Therefore all observations which follow are for the entire National Park. Finally a young warthog was put into a research game pen at the Ranger's house at Whitewaters and escaped at the beginning of 1967. It has often been seen near the house but actually in the game park. Therefore a total of seven animals were released into the area.

Reproduction:

Details of all sightings and young piglets have been kept since January, 1965, and by the size of each group and locality at which seen, different groups have been recognised. Details of these different groups are given in Table 6 which also shows the time of year during which young are born. Only records of young believed to be

TABLE 6
Breeding groups of warthogs and number of piglets seen.

Date seen	Adult Warthogs			Sub-Adults	Piglets under 1 month old
	Males	Females	Unsexed		
1965					
10th Jan.	—	2	—	1	4
27th Jan.	—	—	4	—	6
1966					
29th Jan.	—	1	—	—	3
19th Feb.	1	1	—	—	6
21st Feb.	—	2	—	—	6
1967					
3rd Jan.	1	1	—	1	3
17th Jan.	—	2	1	1	2
21st Jan.	—	—	2	—	2
1st Mar.	1	1	—	—	5
1968					
16th Jan.	1	2	—	—	4
10th Feb.	—	1	—	1	3
15th Feb.	1	1	—	—	3
	5	14	7	4	47

under one month old are given in Table 6. Some of the groups shown in this Table may well be the same group seen the previous year and unless one had actually marked the animals it would be extremely difficult to say. However one female seen on 10th January, 1965, with four piglets had a clearly recognisable broken upper left tusk. She was seen again on 21st January, 1965, in the same area and again with the same other female and sub-adult that were with her on the 10th January, 1965. On the second observation only one of the four piglets was still with the group indicating that three were lost within 11 days.

On another occasion on 19th February, 1966, a male, a female and six piglets were seen. They were seen again on 10th March, 1966, and the group of six piglets were reduced to three, again showing a loss of three animals. The average number of piglets seen from 12 groups (Table 6) between January and March was four animals, while in July and still covering the same number of groups for the same years, the average size of a piglet group was reduced to one animal. This shows a very high mortality rate.

Warthogs are now known to occur and have been seen at least four miles from the game park where they were originally released. If these animals are in fact from the original stock they have now spread over a very large area and it is therefore not surprising that very few are actually seen.

Family Giraffidae

Giraffe, *Giraffa camelopardalis*.

As mentioned previously there is an exceptionally fine painting of three giraffe on one of the rock walls of Nswatugi cave. The presence of this painting and many

others does not necessarily mean that giraffe occurred in the Matopo hills. It has already been suggested by Cooke (1959) that the painters obviously travelled and hunted in the surrounding *Acacia* veld, and as that country appears to be ideal giraffe habitat it is quite likely that the giraffe were seen there. The Matopo hills, other than in a few isolated patches, does not appear to be ideal giraffe habitat and it is quite possible that giraffe were never present in the hills.

However, three males and three females were captured in the Wankie National Park and released in the Matopos game park on 17th March, 1960. None of the animals, which were yearlings, died immediately but one died in July 1960, another in September, 1960, a third in October, 1960, and a fourth died in December, 1961. Therefore of six giraffe introduced into the park four died within two years. See Table 7 for full details.

TABLE 7
Giraffe released into the game park.

Date released	Males	Females	Notes
17.3.60	3	3	1 male died 14.7.60. 1 female died 19.9.60. 1 male died 13.10.60. 1 female died 27.12.61. 1 male destroyed 10.5.68.*
24.7.62	1	1	Female destroyed 25.7.62.† Male found dead 10.10.62.
	4	4	7 (87%) died.

* This animal was destroyed as it had a large unhealed cut on its right front foot.

† This animal was destroyed as it had a broken jaw.

Another two giraffe were captured in Wankie National Park and released in the Matopos on 24th July, 1962. Once again the mortality was very high. The female had to be destroyed the day after arrival as it was found to have a broken jaw and on 10th October, 1962, less than three months after arrival, the male was found dead. This showed that of eight giraffe introduced into the park six died.

Breeding:

The rate of reproduction was slow. The female, which was released into the park on 17th March, 1960, when over a year old, calved for the first time on 19th October, 1965, when she was roughly six years old. The mother appeared to have abandoned the calf as there was no sign of her in the immediate vicinity. The calf was then examined by the writer and this may have contributed to the complete abandonment of the calf. The calf was found dead the following day. It had the following measurements:—

Weight:	170 lbs.
Ear:	15 cms.
Hindfoot (c.u.):	72 cms.
Hoof:	14 cms.
Hip height:	127 cms.
Shoulder height:	150 cms.
Total length:	210 cms. (tip of nose to tip of tail with body stretched out).

Tail length: 46 cms. (above).
Tail length: 48 cms. (below, mid-anus).

The baby was a female, had two pairs of mammae and the umbilical cord 12 hours after birth was $5\frac{1}{2}$ inches long and already dry. The placenta was found at the site of birth and it weighed 17 lbs. The cotyledons varied greatly in size with the largest measuring 9 inches by 2 inches while the average measured $2\frac{1}{2}$ inches in diameter. Less than four months after losing her calf, the female was observed mating again. This took place on the 4th February, 1966, and again on 5th February. A male calf was born on 14th April, 1967, after a gestation period of 434 days. Kenneth & Ritchie (1953) give the period of gestation from 420 to 468 days. When the calf was only three months old the female was observed mating again and this took place on 9th July, 1967. It is not known if she conceived or not as at the time of writing only 350 days of gestation have passed.

On 23rd December, 1967, the last remaining adult male which arrived on 17th March, 1960, was observed to have a very large cut on its right front foot. It was at first thought that the wound would heal naturally but as the months passed it got worse and finally the animal lost condition to such an extent that it had to be destroyed. This took place on 10th May, 1968.

Feeding:

The most sought after plants in the Matopos appear to be *Acacia karroo*, *Albizzia harveyi*, *Albizzia versicolor*, *Colophospermum mopane*, *Lonchocarpus capassa* and *Ziziphus mucronata*. Other plants eaten included *Ximenia caffra*, *Terminalia sericea*, *Salix subserrata* and *Ptilostigma thonningii*. The young male giraffe, born on 14th April 1967, appeared to be very fond of *Grewia bicolor*, *Grewia flavescens* and *Grewia monticola* while the same plants were also eaten occasionally by the adults.

There were a few records of giraffe eating *Bridelia mollis*, *Combretum hereroense* and *Combretum zeyheri*. Plants rarely eaten included *Paropsia brazzeana*, *Pterocarpus rotundifolius*, *Rhus lancea* and *Combretum imberbe*. Large quantities of *Ziziphus mucronata* were eaten by all giraffe during 1967 while this did not appear to be the case the previous year.

Family Bovidae

Common Duiker, *Sylvicapra grimmia*.

The duiker is a common animal in the Matopo hills and is one of the species that has managed to survive in spite of the dense African settlement that once existed in the area. Although the species is common it is seldom seen due to its nocturnal and secretive habits. However, it is quite often seen about on cool and overcast days, in early mornings and late in the afternoon.

Seven duiker were marked and released in various parts of the National Park and other than one male near Whitewaters headquarters, none of them have ever been seen again. A detailed study of the movement and territorial behaviour of this species, in addition to density per square mile, is at present being conducted and results are to be published elsewhere.

During the Small Mammal Survey of the Matopos National Park a few duiker were collected and several more were collected in the Tribal Trust land to the south of the Park.

Baby animals believed to be less than two months old were seen on a few occasions on the following dates: 15th December, 1965, 21st January, 1966, 4th February, 1967, and 11th February, 1968. As the sample is very small it is not possible to say if there was any breeding season or if the species bred throughout the year.

It is well known that duiker calves are hidden for some time (Wilson & Clarke, 1962), and consequently very few baby animals were ever seen.

Predators:

In January, 1968, Senior Game Scout Alois Dhlodiyi, saw a large adult male baboon catch and eat a baby duiker.

He reported how the baboon caught the young duiker and while it was screaming climbed onto a nearby large boulder and proceeded to eat it. The Game Scout shouted as loudly as possible in order to make the baboon drop its prey but the animal took no notice of him. The mother duiker was nearby and also watched the whole performance.

The baboon chewed the leg bones of the duiker and opened the animal's belly without making any attempt to kill it. The Game Scout reported that the duiker was screaming all the time while the baboon was chewing its legs. The duiker eventually died.

As already discussed, a leopard has been recorded feeding on duiker and the skull of a young duiker was found under the nest of a black eagle, *Aquila verreauxi*, in September, 1967.

Steenbok, Raphicercus campestris.

As with duiker this species was also common in the National Park and perhaps even more plentiful than duiker. They were also less nocturnal in this area and were often seen during the day. At night pairs were often seen on the burnt areas and places of short grass close to the dams, particularly near Mpopoma and Toghwana dams.

Duiker and steenbok were often found inhabiting the same piece of land and yet there was no competition as the feeding habits of the two species were quite different. The duiker, for instance, is almost entirely a browser and is very fond of wild fruits and *Acacia* pods. The steenbok, on the other hand, eat a fair quantity of grass and, in the Matopo hills, very seldom eat fruits and pods. This was established as a result of the examination of a number of stomach contents of both species.

Klipspringer, Oreotragus oreotragus.

The klipspringer is by far the commonest antelope in the Matopo hills. They were often seen during the day and in the early morning and late afternoon often leave their rocky outcrops and venture onto the surrounding flat areas to feed on short green grass and the various small herbs and shrubs. They were frequently seen in pairs or threes while groups of four were not rare and as many as six were recorded together.

The writer is at present carrying out a detailed study of this species in the Matopo hills and a vast amount of data is now available on the food and feeding habits, group size and behaviour of the species. These details are to be presented in another paper to be published later. Klipspringer in the Matopos appeared to be very fond of the fruits of the various species of *Ficus* and also ate large quantities of *Pseudolachnostylis maprouneifolia* fruits. Very little data is available on reproduction of this species and records show that the leopard often preyed on adult klipspringer while young specimens were taken by Serval cats, *Felis serval*, and pythons, *Python sebae*.

Reedbuck, Redunca arundinum.

Only two reedbuck were released into the game park and as these two animals were reared in captivity they found it extremely difficult to adjust to the harsh environment and different foods of the park. They survived for only a few months and both died.

However, the species occurs widely throughout the Matopos National Park although

nowhere are they plentiful. Perhaps they are more plentiful around Mpopoma dam than elsewhere in the park and a number of animals also occur in the Mtsheli Valley. The largest number seen together was a group of six adults close to White-waters dam on the night of 24th June, 1968. In addition numbers have been seen near Toghwana dam, Mtsheli dam, in the long grass area north of Madingizula dam and they are often seen in the fenced game park.

The writer has personally recorded 45 different animals in the park in widely separated areas and is of the opinion that the population is considerably higher. The species tends to stick to areas of long grass and are therefore very seldom seen.

Virtually no data is available on the food and feeding habits of the species and there are no records of breeding.

Impala, Aepyceros melampus.

Twenty six impala were released into the fenced game park during the period February, 1960 to April, 1963 in seven different herds. Details of composition of these groups, in addition to dates on which released, are given in Table 8. The Table

TABLE 8
Impala released into the game park.

Date released	Males	Females	Total	Notes
6.2.60	—	2	2	Mother and calf ex Colleen Bawn.
17.11.60	2	—	2	Ex Kenilworth Estate.
24.6.61	—	3	3	Ex Kenilworth Estate.
2.3.62	3	1	4	Yearlings from Wankie National Park.
21.5.62	3	1	4	Yearlings from Wankie National Park.
29.6.62	—	4	4	From Wankie National Park.
24.4.63	2	5	7	Yearlings from Wankie National Park.
	10	16	26	

also gives details of where the impala were captured and their ages. A number of the animals died soon after arrival and details of all deaths are recorded in Table 9. For example, two males were released on 17th November, 1960, and one died the same day while the second animal died five days later. Of four animals released on 2nd March, 1962, one died the same day and a second one died a week later, representing a loss of 50 per cent. Of the 26 animals introduced into the game park nine (34 per cent) died within a few months of arrival.

In addition to the 26 impala introduced into the fenced game park, 30 animals were captured in the Tuli Circle and released into the Hazelside section of the Matopos National Park on 27th February, 1968. This group consisted of one adult female, two yearling males and 27 young animals less than a year old. Four died within two weeks of arrival. One of them was examined by a Veterinary Officer who was of the opinion that the animal died as a result of excessive ticks (Reese, pers. comm.).

Breeding:

Reproduction was at first very slow mainly as a result of the few females available. No calves were born during 1961 and only one in 1962. There was a big improvement in 1963 and from then onwards many calves were born each season.

It was not possible to sex the calves immediately after birth therefore Table 10

TABLE 9
Mortality of introduced impala.

Date introduced	Males	Females	Total	Date	Males	Females	Total	% Died
6.2.60	—	2	2	18.8.63	—	1	2	100%
				14.4.63	—	1		
17.11.60	2	—	2	17.11.60	1	—	2	100%
				23.11.60	1	—		
24.6.61	—	3	3					
2.3.62	3	1	4	2.3.62	—	1		
				9.3.62	1	—	2	50%
21.5.62	3	1	4	25.5.62	1	—	1	25%
29.6.62	—	4	4	30.6.62	—	1	1	25%
24.4.63	2	5	7	1.5.63	1	—		
				13.6.63	—	1	3	43%
				19.8.63	—	1		
	10	16	26		5	6	11	42%

does not include sexes of the calves. However, it was possible to sex the calves when they were about 10 months old and just before the new calf crop was born. Table 10 gives details of dates on which the calves were born, while Fig. 1(a) shows a histogram of the breeding season of impala in relation to the other species breeding in the park. It is clear from this data that the great majority of calves are born in December (51 calves) while five were born in November and six in January. One late calf was born on 15th February. Smithers (1966) says there is a peak of calving between September and January and that this was variable according to the area.

Ansell (1960), when referring to Zambia, says there is a sharply defined lambing season which in the north-western plateau is September/October while in the Luangwa Valley and Middle Zambezi Valley it is a month later (October/November). Dasmann & Mossman (1962) say that in Rhodesia the breeding season of impala appeared to coincide with that for the warthog, with most young being born in December and this confirms observations obtained during the present study in the Matopo hills.

Table 9 shows that there was a high mortality of animals introduced into the park while this was not the case with calves born there. Not one of the calves born between 1962 and 1966 died and only one from the 1966/1967 season died. However, the calf born on 23rd January, 1967, was found to be missing on 27th January, 1967. It may well have been taken by a leopard or some other predator. Another calf was found dead on 20th February, 1967. This was from the same group of calves which were dropped during the 1966/67 season.

It was not possible to establish if any of the 1967/68 season calves died as there are now too many impala in the park to keep accurate records of them. The large herd has now split into several smaller groups and are scattered over a wide area in the park.

TABLE 10
Dates on which impala calves were born.

Date calves born	No.	Date calves born	No.	Date calves born	No.
1962		1965		1967	
12th Dec.	1	12th Dec.	1	23rd Jan.	1
Total	1	13th Dec.	2	10th Dec.	1
		14th Dec.	1	12th Dec.	1
		17th Dec.	2	18th Dec.	2
1963		21st Dec.	1	21st Dec.	2
30th Nov.	1	25th Dec.	2	22nd Dec.	2
6th Dec.	1	Total	9	24th Dec.	4
10th Dec.	1			28th Dec.	2
Total	3			29th Dec.	2
				30th Dec.	1
				Total	18
1964		1966			
1st Dec.	1	19th Jan.	1		
3rd Dec.	1	31st Jan.	1		
4th Dec.	1	15th Feb.	1		
5th Dec.	1	23rd Nov.	1		
6th Dec.	1	29th Nov.	1		
10th Dec.	1	30th Nov.	2		
14th Dec.	1	4th Dec.	3		
19th Dec.	1	5th Dec.	2	1968	
23rd Dec.	1	7th Dec.	1	1st Jan.	3
27th Dec.	1	12th Dec.	5	3rd Jan.	2
Total	10	23rd Dec.	1	4th Jan.	1
		Total	19	Total	6

Other mortalities:

A male which had only one horn was found dead in April, 1966, and in July, 1966, an adult female died while another adult was found dead on 2nd February, 1967.

Present position:

There are now several herds in the park and a recent count showed that there are now at least 75 impala of which 14 are adult males. This excludes the group in the Hazelside section of the National Park.

Feeding:

From 189 feeding records it has been quite clearly shown that the impala in the Matopos game park is mainly a browser. They have, however, been observed grazing on 31 occasions on a variety of grasses and mainly just before and at the beginning of each rainy season (October-December). Grasses eaten were mainly *Heteropogon contortis*, *Eragrostis* sp., *Aristida* sp., *Hyparrhenia dissoluta* and *Hyparrhenia filipendula*. *Eragrostis patens* appears to be the most sought after grass followed by *Cynodon dactylon*.

Browse plants included *Acacia karroo*, *Terminalia randii*, *Ziziphus mucronata*, *Grewia flavescens* and *Rhus lancea*.

Euclea undulata is eaten quite extensively during the dry season (May-September) while *Combretum hereroense*, *Grewia cordata* and *Grewia monticola* are favourite foods most of the year round. *Diplorhynchus condylocarpon* and *Ximenia caffra* are eaten in large quantities while *Colophospermum mopane* is also eaten on occasion.

Sable, Hippotragus niger.

In August, 1960, a large sable (male) was driven into the game park from the surrounding country and this animal died on 6th June, 1963.

The first group actually to be introduced into the game park arrived from Wankie National Park on 22nd July, 1961, and consisted of two males and a female. This was followed by eight yearling females, also from Wankie National Park, which arrived on 24th July, 1962.

Additional animals were caught in Wankie and transported to the Matopos in November, 1963, October 1964, and a final group of two males and a female arrived on 6th February, 1967.

Mortality of the introduced animals was very low. One of the males introduced on 22nd July, 1961, died a year later (25th July, 1962) but most probably of other causes and not as a result of being introduced into the area. However, of the three sable introduced on 6th February, 1967, a male and a female died within four days of being released. These animals were in poor condition when they arrived in the Matopos and it was not surprising that two of the three died. Table 11 shows details of all animals introduced into the fenced game park.

TABLE 11
Sable introduced into game park.

Date released	Males	Females	Total	Notes
22.7.61	2	1	3	Ex Wankie National Park.
24.7.62	—	8	8	Yearlings from Wankie National Park.
15.11.63	1	3	4	Yearlings from Wankie National Park.
24.10.64	2	6	8	Yearlings from Wankie National Park.
6.2.67	2	1	3	From Wankie National Park.
	7	19	26	

Breeding:

The first calves to be born in the game park arrived in April, 1964, when two were born. Eight calves were born between February and June, 1965, while six calves were born during 1966.

In 1967 there were seven calves and in March, 1968, nine calves were born. Details of date of birth of each calf is given in Table 12. Unfortunately it was not possible to give sexes of calves and even when the animals were a year old it was not always possible to distinguish between males and females.

The calf born on 1st February, 1965, was found dead and partly eaten by a leopard on 4th February, 1965, when it was just over one month old. It is not known if the calf was in fact killed by the leopard. Another calf, which was born on 10th June, 1965, was found with a broken leg and was destroyed on 2nd July, 1965. None of the 1966, 1967 or 1968 calves were lost and of 32 calves born over a period of five years only two (6 per cent) were lost.

Fig 1(b) shows a histogram of the 32 calves born in the Game Park and from this it is clear that there is a distinct peak in calving in March when 16 (50 per cent) of the calves were born. Nine were born in February and five in April. One out of season calf was born in June and another calf was born on 31st January.

TABLE 12
Sable calves born in game park.

Date calves born	No.	Date calves born	No.	Date calves born	No.
1964		1966		1968	
14th April	1	31st Jan.	1	4th Mar.	2
23rd April	1	4th Feb.	1	9th Mar.	1
		5th Feb.	1	11th Mar.	2
Total	2	10th Feb.	1	14th Mar.	2
		17th Feb.	1	29th Mar.	2
		27th Feb.	1		
		Total	6		
1965		1967			
1st Feb.	1	6th Mar.	1		
18th Feb.	1	2nd Mar.	2		
28th Feb.	2	23rd Mar.	1		
1st Mar.	1	25th Mar.	1		
2nd Mar.	1	4th April	2		
10th April	1				
10th June	1				
Total	8	Total	7	Total	9

Child & Wilson (1964) found that sable in Eastern Zambia have a peak in calving about October/November and they mention that in the Wankie National Park in Rhodesia there is a definite peak in calving in March. They go on to say that numerous very young calves were seen in the south-east of Rhodesia in mid-April.

From the data now available it appears that in Rhodesia sable have a definite calving period about March of each year. Smithers (1966) says that breeding occurs throughout the year.

A number of adult sable have died over the years in the game park and at the time of writing (June, 1968) there are 53 sable in the game park. These comprise two large herds and there are also several lone bulls.

In addition to the sable in the fenced game park there are several large herds in the surrounding hills but most of them are within the boundary of the National Park. Three large herds of 24, 28 and 26 sable (last count June, 1968) are resident in the Mtshelili Valley near the Imadzi hill and a further herd of 21 animals occurs a couple of miles above the Mtshelili dam. There is also a herd of 22 sable on the Rhodes Matopos Agricultural Research Station which is just outside the National Park. A herd of 10 occurs near Madingazulu dam and sable spoor has often been seen on Bambata cave road although the animals themselves have not been seen. There is also a large herd of sable in the Maleme Valley but they have not been seen by the writer (Osborne, pers. comm.).

On 23rd February, 1968, the writer found a newly born sable calf hidden in some long grass in Mopane woodland near Imadzi hill. The mother was about 200 yards away and kept watching the writer. The balance of the sable herd was about 400 yards away and this was the first calf to be born in the herd in 1968.

The calf was thoroughly examined and measured and it made no attempt to run

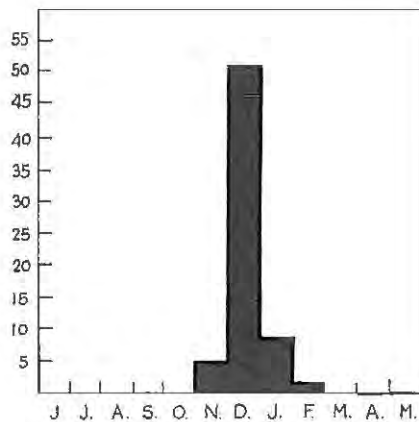


Fig 1a 66 Impala births

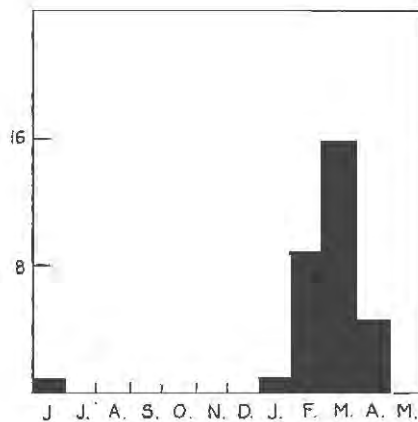


Fig 1b 32 Sable births

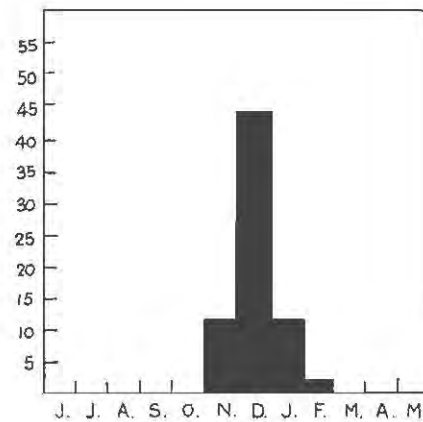


Fig 1c 69 Wildebeest births

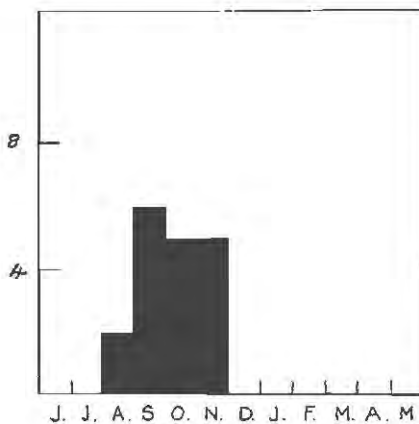


Fig 1d 18 Eland births

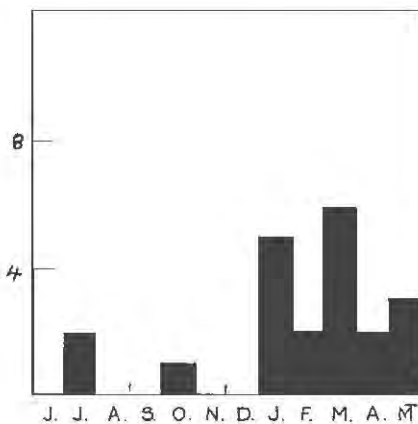


Fig 1e 21 Buffalo births

Fig 1 showing distribution of Births of various species by months

away nor was it in the least bit afraid. It was a male and had the following measurements:—

Ear:	13.5 cms.
Hind foot (c/u):	36 cms.
Total length:	112 cms.
Tail:	18 cms.
Height:	61 cms.

The umbilical cord was about 3 inches long, slightly dry and twisted. The calf could not have been more than a couple of days old.

When this same herd was checked again on 18th March, 1968, there were then seven young calves with the herd and on 10th April there were still seven calves indicating that all that season's calves were born between approximately 21st February, 1968, and 18th March, 1968—again indicating a definite peak in calving.

Feeding:

Sable in the Matopo hills are almost entirely grazers although they have been recorded browsing on a number of different plants. The main grasses eaten, by months, are as follows:—

January: *Aristida* sp., *Cymbopogon plurinodis*, *Cynodon dactylon*, *Heteropogon contortus*, *Hyparrhenia* sp., *Panicum maximum*.

February: *Aristida* sp., *Cynodon dactylon*, *Eragrostis* sp., *Cymbopogon plurinodis*, *Urochloa mosambicensis*.

March: *Panicum maximum* eaten in very large quantities, *Hyparrhenia dissoluta* and the seed-heads of *Phragmites mauritianus* are occasionally eaten.

April: *Aristida* sp., and *Phragmites mauritianus* seed-heads.

May/June: *Cynodon dactylon*, *Urochloa panicoides*, *Eragrostis* sp., *Cyperus* sp.

July/Oct.: *Urochloa balbodes*, *Urochloa mosambicensis*.

Browse plants eaten included *Acacia karroo*, *Dichrostachys glomerata*, *Lippia oatzii*, *Rhus lancea* and *Grewia monticola*.

They have also been seen eating the fruits of *Dichrostachys glomerata* and *Ziziphus mucronata*.

Blue Wildebeest: *Connochaetes taurinus*.

Only two groups of wildebeest were released into the game park. The first herd comprising five males and seven females arrived on 23rd January, 1960, and together with the zebra were the first animals to be introduced into the park. Two of the females died the day after arrival. The second group consisted of five females and these were released on 13th November, 1963. They immediately joined up with the original herd to form one large group. Two of the females died in January, 1964, less than two months after being released in the park. Table 13 gives detail of animals introduced and the number that died.

TABLE 13
Wildebeest introduced into the Matopos and record of deaths.

Date	Males	Females	Total	Date Died	Males	Females	Total
23.1.60	5	7	12	24.1.60	—	2	2
13.11.63	—	5	5	Jan. '60	—	2	2
	5	12	17		—	4	4

All the wildebeest introduced into the park were yearlings and they appeared to have settled down very quickly in their new surroundings.

Breeding:

Five of the six remaining females which were introduced in January, 1960, calved for the first time in December, 1961/January, 1962, when they were exactly three years old. Dates of births are given in Table 14. These five females calved for the second time at the end of 1962 and the calves were born between 20th and 30th December, 1962.

One of the adult females, which arrived in January, 1960, died on 11th March, 1963, when she was just over four years old and before her previous year's calf was weaned. However, the calf was already over two months old and strangely enough did not die. It appeared to have been adopted by one of the other females. After the death of the female only four adult females were left of the seven original ones and at the end of 1963 these four females all calved again for the third successive year. Details of dates of birth are given on Table 14.

Another five females, yearlings, were introduced into the park in November, 1963, and after joining up with the old established herd it became impossible to distinguish between the different animals. By this time the first calves born in December, 1961, were already adults and it was no longer possible to keep records of the original animals.

However, a detailed record was kept of all calves born and between November, 1964 and January, 1965, a total of nine calves were born. As only five calves were born in December 1961/January, 1962, and as there were only four adult females remaining from the original group introduced in 1960, it shows that all the 1961/1962 calves were females and that they all calved for the first time when they were exactly three years old. It also showed that the four remaining 1960 females calved again for the fourth successive year.

Excluding the five females introduced in November, 1963, the original herd of 12 wildebeest (five males and seven females) had increased to 33 animals in four years.

Between November, 1965 and January, 1966, another 11 calves were born and at this stage it was not possible to say which females had calved. Seventeen calves were born in the 1966/67 calving season and 18 in the 1967/68 season. Details of dates of births are given in Table 14 while Fig. 1(c) shows a histogram of calving times. From this data it is clear that as with impala and sable, the wildebeest also has a well defined calving season. Of 69 calves born in the Matopos game park 44 (65 per cent) were born in December with 12 each in November and January.

Ansell (1960) says that in Western Zambia calving is from August to November while in the Luangwa Valley it is mainly November and possibly December. Smithers (1966) says breeding takes place from August to December while Dasmann & Mossman (1962) recorded pregnant females at Henderson's Game Ranch in October-November, and young, which they say were probably born in January or February, were observed in March.

Mortality:

Over the period of study, calves and adults were found dead from time to time but as none of the animals were marked it was not possible to say which animals had died. One of the 1962/63 calves died in February, 1963. None of the 1963/64 calves died and only one of the 1964/65 calves died when it was about 4-5 months old. However, the mortality of the 1965/66 calves was high. Of 11 calves born five (48 per cent) of them died before they were nine months old.

TABLE 14
Wildebeest calves born in the game park.

Season	Date calves born	No.	Season	Date calves born	No.	
Dec. 1961- Jan. 1962	28.12.61	2	Nov. 1965- Jan. 1966	11.11.65	1	
	4.1.62	1		17.11.65	1	
	14.1.62	1		26.11.65	1	
	24.1.62	1		28.11.65	1	
	Total	5		2.12.65	1	
Dec. 1962	Between 20.12.62 and 30.12.62	5		Dec. 1966- Feb. 1967	7.12.65	1
					8.12.65	1
					10.12.65	1
					13.12.65	2
	Total	5			10.1.66	1
Nov./Dec. 1963	29.11.63 6.12.63 15.12.63	1 2 1	Total		11	
			2.12.66		1	
			4.12.66		2	
			5.12.66		1	
	Nov. 1964- Jan. 1965	19.11.64 20.11.64 23.11.64 30.11.64 1.12.64 10.12.64 18.1.65 21.1.65	1 1 4 1 1 1 1		7.12.66	1
9.12.66				2		
10.12.66				1		
11.12.66				1		
Nov. 1967- Jan. 1968		19.11.64 20.11.64 23.11.64 30.11.64 1.12.64 10.12.64 18.1.65 21.1.65	1 1 4 1 1 1 1	12.12.66	1	
	13.12.66			1		
	15.12.66			2		
	17.12.66			1		
	Nov. 1967- Jan. 1968	19.11.64 20.11.64 23.11.64 30.11.64 1.12.64 10.12.64 18.1.65 21.1.65	1 1 4 1 1 1 1	3.1.67	1	
11.1.67				1		
9.2.67				1		
Total				17		
Nov. 1967- Jan. 1968		19.11.64 20.11.64 23.11.64 30.11.64 1.12.64 10.12.64 18.1.65 21.1.65	1 1 4 1 1 1 1	29.11.67	1	
	5.12.67					
	17.12.67			8		
	17.12.67					
	Nov. 1967- Jan. 1968	19.11.64 20.11.64 23.11.64 30.11.64 1.12.64 10.12.64 18.1.65 21.1.65	1 1 4 1 1 1 1	30.12.67	4	
1.1.68				1		
3.1.68				2		
5.1.68				2		
Nov. 1967- Jan. 1968		19.11.64 20.11.64 23.11.64 30.11.64 1.12.64 10.12.64 18.1.65 21.1.65	1 1 4 1 1 1 1	Total	18	

Several adult animals were found dead and a large adult male had to be destroyed in March, 1966, as it was found with a broken leg.

By June, 1968, when the field work of this project ceased there were two main herds of wildebeest in the park. One consisted of 49 animals while in the second there were only 15 and there were also many lone bulls and a few groups of three or four old bulls.

Feeding:

Wildebeest in the Matopos park appear to prefer *Urochloa* spp. more than any other grass and there are dozens of records of this grass being eaten. The species eaten included *U. boldodes*, *U. panicoides* and *U. mosambicensis* and in addition they

also ate large quantities of *Digitaria brazzae*, *D. gazensis* and *D. pentzii*. Other grasses eaten included *Cynodon dactylon*, *Hyparrhenia dissoluta*, *H. filipendula*, *Tricholaena monachne*, *Rhynchelytrum repens* and *Pogonarthria squarrosa*.

In some places in the park where large amounts of *Aristida congesta* and *A. barbe-collis* occur these two grasses are also eaten extensively. Various species of *Setaria* are eaten in the park as are *Themeda triandra*, *Panicum maximum* and *Heteropogon contortus*.

There are no records of wildebeest in the Matopos National Park having eaten anything else other than grass.

Bushbuck, *Tragelaphus scriptus*.

This species is not common in the Matopos National Park and there are only five different sight records of bushbuck. A pair was often seen near the Imadzi hill and another pair inhabited some thickets at the base of the rocky outcrops near Whitewaters dam. Other records are from Maleme dam, Mtsheleli dam and the Whovi river.

Bushbuck tend to stick to thickets and even in places where they are common they still remain secretive and do not often venture far out into the open. Therefore it is suggested that the species is more common in the Matopos than is often believed. There are no feeding or breeding records of bushbuck from the Matopo hills.

Kudu, *Tragelaphus strepticros*.

The only kudu actually released into the fenced game park was a young male that was reared by the former Ranger at Whitewaters, Mr. Ted Pearson. This kudu immediately joined up with a small herd of impala and has remained in their company ever since being released in 1966.

In addition to this animal there are a few records of naturally occurring kudu in the National Park. Two males, two females and a sub-adult female were often seen near Mpopoma dam by Mr. Osborne, the Ranger at Whitewaters. He says that this herd has been seen both in and out of the park and the fence did not prevent them from moving about.

A large adult male was also seen near Bambata cave on 19th February, 1968, and the writer once saw two females and an adult male near Mesilume dam. As with the former species kudu were not common in the Park and it is doubtful if there are more than a couple of dozen specimens left in the Matopo hills. There is also a report of two females and a calf seen in May, 1968, near the Imadzi hill (Tebbit, pers. comm.).

Eland, *Taurotragus oryx*.

Eland calves were introduced into the game park on 17th March, 1960, when four males and four females were received from the Wankie National Park, and within two months, two females and a male died. The next group of one male and three females arrived from Wankie and within a week of being released in the park all four were dead. A year later another six eland were caught in Wankie National Park and transported to the Matopos Park. It was only a matter of four months and four of them died. More eland were received in November, 1963, and the final two arrived on 24th October, 1964. Both these died the following day.

Of 22 eland introduced into the Matopos game park 14 (64 per cent) died soon after arrival. Table 15 gives details of all animals released in the game park and the number which died. The percentage of deaths is exceptionally high and it is not known

TABLE 15
Eland released into the game park and number that died.

Date released	Males	Females	Total	Date of death	Males	Females	Total	% of no. of deaths
17.3.60	4	4	8	Mar. and Apr., 1960	1	2	3	37%
22.7.61	1	3	4	*	1	3	4	100%
24.7.62	1	5	6	Within 4 months	—	4	4	66%
15.11.63	—	2	2	29.11.63	—	1	1	50%
24.10.64	—	2	2	25.10.64	—	2	2	100%
	6	16	22		2	12	14	63.6%

* All 4 died within one week.

what has caused this high mortality. One of the possibilities is that the animals were too young when released.

Breeding:

The first two calves to be born in the Park were to the females which were released in March, 1960. One calf was born on 18th September, 1962, and the second on 15th October, 1962. The females were both just over three years old when their first calves were born and as the gestation period is known to be about nine months, these females must have mated when they were approximately 27 months old. The same two females calved again in August, 1963, and again for the third successive year in 1964.

In September, 1965, the same two females calved again and the remaining female which arrived in July, 1962, calved for the first time as did the remaining female from the 1963 group.

Unfortunately the last two females both lost their calves within a month of birth.

The 1960 females calved again for the fifth successive year in 1966 but this time the calves were born in October, roughly a month later than previous years. The 1962 female calved again for the second successive year and this time her calf was stillborn. Her 1965 calf died when less than one month old. The 1963 female, which lost her 1965 calf, produced her second calf in 1966 for the second successive year.

The fifth calf born in 1966 was to a female born in the Matopos on 23rd September, 1963, and she produced her first calf when she was exactly 38 months old.

By the calving period of 1967 when it was expected that about eight to nine calves would be born it was a shock to see that only three calves were actually produced. These were also much later than usual and were born in November. Full details of all calf births are given in Table 16, while Fig. 1(d) shows a histogram of 18 births. Two of the births occurred in August, six in September, five in October and five in November. There were no out-of-season births. Ansell (1960) says that in Zambia calving is probably throughout the year while Smithers (1966) gives a peak about August/September but can be extended from July to November.

While this study was being conducted in the Matopos National Park the writer was also conducting various research projects on the eland herd at Manyoli Eland Research Station in the Lowveld of Rhodesia. Twenty-four calves were born during the three full years of 1965, 1966 and 1967 as follows:—

May, 1; June, 2; July, 5; August, 7; September, 4; October, 4; and December, 1.

TABLE 16
Record of eland calves.

Date	Calves	Notes
18.9.62	1 male	Mother introduced in March, 1960.
15.10.62	1 male	Mother introduced in March, 1960.
8.8.63	1	1960 female calved again for second time.
23.8.63	1	1960 female calved again for second time.
12.9.64	1 male	1960 female calved again for third time.
17.9.64	1 female	1960 female calved again for third time.
19.9.65	1	1960 female calved again for fourth time.
23.9.65	1	1960 female calved again for fourth time.
26.9.65	1	1962 female calved for first time.
11.10.65	1	1963 female calved for first time.
19.10.66	1	1960 female calved for fifth successive year.
21.10.66	1	1960 female calved for fifth successive year.
29.10.66	1	1962 female calved for second time.
11.11.66	1	1963 female calved for second time.
16.11.66	1	A female calf born on 23.8.63 calved for first time
Nov., '67	1	
Nov., '67	1	
Nov., '67	1	
Total	18	

This shows an extended breeding season during the dry season but with a peak from July to October. This peak in calving appears to be slightly earlier than that of the Matopo hills.

Feeding:

Observations on the food and feeding habits of the eland were carried out over a period of 3½ years and a list of the main plants eaten is given in Table 17, together with months during which the plants were eaten. As explained earlier, while this study was being conducted similar work on the domesticated eland herd was also being carried out. Each month feeding preference studies were conducted in order to establish feeding patterns. Details of this study are at present in the process of being evaluated and will be published shortly.

The eland herd in the Matopos were comparatively tame and with a pair of 7 x 50 binoculars detailed observations were made. It was found that in January, 26 different plants were eaten while in June only nine different plants were recorded as eaten. This does not mean that eland ate only nine different plants in June; it merely indicates that fewer plants were eaten compared with December.

Some plants such as *Combretum apiculatum* were eaten in very large quantities and very often eland almost stripped every leaf off the tree on which they were feeding. The branches of this tree were often extensively damaged.

C. apiculatum were recorded being eaten for every month of the year excepting September. The next most favoured food of the Matopos eland was *Colophospermum mopane*. Green leaves were eaten extensively from the time they flushed in about October/November until about March/April. Eland even ate the dry leaves and continued feeding on them until all the leaves had fallen from the trees.

Dichrostachys glomerata and *Ziziphus mucronata* also formed a major part of the eland's diet in the rainy season (December-March) while the eland were very fond of the various species of *Grewia* that occurred in the park, especially *Grewia flavescens*.

TABLE 17
Plants eaten by eland.

Plants	MONTHS											
	J	F	M	A	M	J	J	A	S	O	N	D
<i>Croton gratissimus</i>	X	X		X				X		X		
<i>Acacia karroo</i>	X	X	X	X			X			X	X	
<i>Acacia rehmanniana</i>		X		X	X					X	X	X
<i>Combretum hereroense</i>		X		X			X					
<i>Combretum zeyheri</i>	X	X		X			X		X	X		
<i>Combretum imberbe</i>					X		X					
<i>Colophospermum mopane</i>	X	X	X	X	X	X	X			X	X	X
<i>Rhus lancea</i>	X	X	X					X				
<i>Euclea divinorum</i>				X	X	X	X	X	X			
<i>Euclea undulata</i>				X	X	X	X	X	X			X
<i>Gynandropsis gynandra</i>	X	X								X		
<i>Borreria scabra</i>			X	X								X
<i>Lippia oatzii</i>	X	X		X					X			X
<i>Elephantorrhiza</i> sp.		X					X					
<i>Trumpfetta</i> sp.	X	X								X	X	
<i>Indigofera flavovirens</i>	X		X									
<i>Combretum stenophyllum</i>	X	X			X	X						
<i>Combretum apiculatum</i>	X	X	X	X	X	X	X	X		X	X	X
<i>Grewia flavescens</i>	X	X	X	X	X				X	X	X	X
<i>Grewia cordata</i>	X	X		X		X				X	X	X
<i>Grewia monticola</i>	X	X	X	X			X		X		X	
<i>Phragmites mauritianus</i>				X								
<i>Dichrostachys glomerata</i>	X	X	X	X	X	X	X				X	X
<i>Diplorhynchus condylocarpon</i>		X	X		X			X	X		X	
<i>Terminalia sericea</i>		X	X			X			X		X	X
<i>Terminalia randii</i>	X	X						X			X	
<i>Zizyphus mucronata</i>	X	X	X	X	X		X	X	X		X	X
<i>Burkea africana</i>	X	X	X				X			X	X	X
<i>Dombeya rotundifolia</i>	X	X	X	X			X		X	X		
<i>Paropsia brazzeana</i>		X			X					X		
<i>Salix subserrata</i>	X	X		X					X		X	
<i>Flueggea virosa</i>	X	X	X		X				X			
<i>Ximenia caffra</i>		X		X	X				X		X	X
<i>Pterocarpus rotundifolius</i>	X		X					X			X	
<i>Kirkia acuminata</i>		X		X	X	X	X	X	X		X	X
<i>Cassia abbreviata</i>	X		X	X				X		X		
Dry grass (sp. indet.)		X	X		X		X	X				
Green grass (sp. indet.)	X								X	X	X	X
Small legumes, grass and herbs									X	X	X	X
<i>Sclerocarya caffra</i>	X	X	X		X					X	X	
<i>Lonchocarpus capassa</i>	X	X		X			X		X			

Other species of *Grewia* eaten are given in Table 17 together with the main plants which formed the major part of their diet.

During the dry season (April-September) *Kirkia acuminata*, *Euclea divinorum* and *E. undulata* were eaten in large quantities. The leaves of *Kirkia acuminata* at that time of the year were often dry and had already fallen from the trees. Eland often fed on the pockets of dry leaves which accumulated between the rocks of the rocky outcrops. During November and December when the leaves were green and fresh the branches of *Kirkia acuminata* were often broken by eland who used their horns a great deal to break the branches.

The leaves of the two species of *Euclea* were still very green in the dry season and were eaten readily by eland. *Grewia* leaves were stripped off the branches by the eland by running the closed mouth along the large thin branches and in that way no leaves were left on them.

The fresh young leaves and in fact the entire plants of the various species of *Dolichos* sp. and *Vigna* sp. were eaten in large quantities just before and during the rains. These species often grew on the rocky outcrops and eland were seen on many occasions high up on the hills amongst the rocks. Other plants eaten on the rocky outcrops included *Salix subserrata*, *Elephantorrhiza* sp. and the leaves of the small shrub *Triumfetta* sp.

The fruits and leaves of *Ximenia caffra* and *Sclerocarya caffra* were also eaten when available.

Buffalo, *Syncerus caffer*.

The first group of buffalo arrived from Wankie National Park on 24th July, 1962, and consisted of two males and eight females. All animals were believed to be yearlings. A second group of yearlings, one male and three females, were released into the Matopos game park on 15th November, 1964. One of the females had to be destroyed after it had fallen down a rocky crevice and badly damaged itself. Table 18 gives details of animals introduced and mortality.

TABLE 18
Buffalo released into the game park.

Date	Males	Females	Total	Notes
24.7.62	2	8	10	1 female destroyed 21.3.65.
15.11.64	1	3	4	
	3	11	14	

Breeding:

Six calves were born in January/February, 1966, to the females which were introduced in July, 1962, and when they were approximately 4½ years old. Table 19 gives details of dates of birth.

TABLE 19
Buffalo calves born in Matopos.

Date calves born	No.	Date calves born	No.	Date calves born	No.
20.1.66	1	30.11.66	1	9.3.68	1
29.1.66	2	25.1.67	1	11.3.68	2
30.1.66	1	29.3.67	1	19.3.68-	
5.2.66	1	2.4.67	2	22.3.68	2
25.2.66	1	12.7.67	2	1.5.68	1
				4.5.68	2
Total	6	Total	7	Total	8

Another one of the 1962 females calved in November, 1966, well out of season compared with the first six calves. The six females which calved in January/February, 1966 calved again in 1967 but the births were scattered over several months. For instance, one calf was born in January, 1967, one in March, two in April and two in July.

By 1968 it was not possible to identify the various females and it was therefore impossible to say which females had calved. However eight calves were born during the year, five of these in March and three in May.

By June, 1968, at the time of completion of the field work the original 14 buffalo which were all yearlings when introduced, had increased to a herd of 34 animals in six years. Other than the one female which had to be destroyed, none of the adults died and even the calves all survived.

When the second herd was introduced into the park in 1964 they immediately joined up with the original group to form one herd.

Feeding:

Very few observations are available of the plants eaten by the buffalo but it appears that *Panicum maximum* and three species of *Urochloa* are their preferred grasses. They have also been recorded eating quantities of *Cynodon dactylon*, *Heteropogon contortis*, *Pennisetum* sp. and the reed *Phragmites mauritianus*.

Browsing was observed on a number of occasions and the leaves of *Grewia flaves-cens*, *G. cordata* and *G. monticola* were eaten from time to time. In addition the buffalo in the Matopos were very fond of *Lippia oatzii*, *Colophospermum mopane* and *Rhus lancea*. *Acacia karroo* and *A. rehmanniana* were also eaten occasionally.

CONCLUSION AND DISCUSSION

The Matopo hills were almost completely denuded of the larger game species and with the exception of a few herds of sable, some reedbuck and the odd kudu, most of the other animals were exterminated. Of the smaller antelope, klipspringer, duiker and steenbok managed to survive in fair numbers.

With the establishment of the area as a National Park and the creation of a small fenced game park within this National Park, a unique opportunity arose for the introduction of various game species. The presence of various game species in the rock art of the Matopo hills obviously had an influence on the Park's staff when decisions were made as to what species should be introduced into the park.

However the presence of the animals in the rock art did not necessarily mean that the species occurred in the Matopo hills as it is well known that the painters often travelled considerable distances when hunting. The animals they painted on the walls of the caves and shelters may well have been seen some miles away in the *Acacia* veld surrounding the hills.

Most of the animals released in the Matopos were captured in the Wankie National Park about 250 miles north of the Matopos and nearly all were captured by using ropes and chasing them with landrovers. The animals were then kept in pens at Wankie for several days, often considerably longer, before being transported to the Matopos.

Records of animals released and all subsequent deaths were recorded by the various officers working in the area from the time the operation started in January, 1960, to the time the writer arrived in Rhodesia in January, 1965. No details were kept of the condition the animals were in when they arrived but from the high mortality rate of some species, e.g. impala, eland, etc. it was thought that many animals were in poor

condition when they were released. This, coupled with the long journey by vehicle and the sudden change of environment, helped to weaken them even further. As a possible result of all this, several animals, so it was generally believed, were killed by leopards which were at that time common in the park. As a direct result of animals being found dead and some partly eaten by leopards, a few leopards were destroyed by Parks staff.

When the writer arrived to fill a post with the Research Branch of the Department of National Parks & Wildlife Management in January, 1965, he immediately realised the possibilities of research into the rate of reproduction etc., on a known game population. Detailed studies were commenced at once and the food and feeding habits of the various species in the park were also studied. As a result of the studies on leopard it was found that the main food of the species in the Matopos was the Red Rock Hare, *Pronolagus crassicaudatus* and the Rock Dassie, *Procavia capensis*.

The food of the eland was studied in more detail than the other species in the park as the writer was also investigating feeding preferences of the department's domesticated eland herd at Manyoli. This herd was kept on a game ranch in the Beitbridge area of Rhodesia and each month for a period of about two years detailed studies were carried out. The results of that work are at present being evaluated and will be published elsewhere.

Some species did very well in the park and once sexual maturity was reached, they bred extremely well. For example, the wildebeest, buffalo, sable and impala have done very well and their numbers have increased tremendously. On the other hand, several species have not done so well. The giraffe and eland are only doing reasonably well, while the zebra have not bred at all. The square-lipped rhino from Zululand have now settled down perfectly well and four calves have been born since their arrival.

Other interesting research projects included the age of sexual maturity and the gestation periods of some species. Very few records are available for warthog, bush-pig, kudu, reedbuck and bushbuck while a vast amount of data has been obtained on klipspringer, steenbok and duiker. Detailed studies on these three species are continuing and results will be published at a later date.

As a result of the writer being transferred to the National Museums of Rhodesia, the project of the studies on the larger mammals was discontinued and the results of the 3½ years work presented in this paper. It is hoped that the work will continue and the data now available in this paper be used for future studies on the population.

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The writer would also like to thank Mr. John Tebbit, M.B.E., Regional Warden in charge of the Park, for his continued advice and for allowing the study to be conducted. He has also checked the accuracy of the dates on which animals were originally released in the Park and has supplied much useful data on the history of the National Park.

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