SOME PRELIMINARY FINDINGS ON THE POPULATION STRUCTURE AND STATUS OF THE BLACK RHINOCEROS ·*Diceros bicornis* IN THE HLUHLUWE GAME RESERVE, ZULULAND

by

P. M. HITCHINS
(Natal Parks Board)

The black rhinoceros in the Hluhluwe Game Reserve possess a combination of horn and ear characteristics which enable an observer to recognise individuals when he has become familiar with the animals. By using this technique of identification a total of 161 different animals are known to the author.

During July 1966 and again in December 1966 through January 1967 as many different animals as possible were located; the number of animals in each case was considered to be a sample of the population. The results of these two samples were compared with a sample recorded during 1963.

The first black rhinoceros ground count in Hluhluwe was planned by N. N. Deane (ex-Warden, Hluhluwe Game Reserve) in February, 1961. Another ground count was planned by the author and undertaken during February, 1967. In both cases similar counting techniques were used.

The terms 'adult' and 'immature' rhinoceros are used frequently and in each case is defined as follows: an adult is an animal over 4 years old and an immature is one less than 4 years old (approximately).

STRUCTURE OF POPULATION SAMPLES

Table 1 : Age classes of Black rhinos from three population samples.

SAMPLE		Adult				Immature					Total	Overall sex ratio
		Male	Female	Total	Sex ratio	Male	Female	Un sexed	Total	Sex ratio		
1963	No.	28	31	59	1 : 1.1	5	3	3	11	1 : 0.6	70	1 : 1
	%	40.0	44.3	84.3		7.1	4.3	4.3	15.7			
July 1966	No.	28	26	54	1 : 0.9	7	5	—	12	1 : 0.7	66	1 : 0.9
	%	42.4	39.5	81.9		10.6	7.5	—	18.1			
Jan. 1967	No.	31	24	55	1 : 0.7	4	7	—	11	1 : 1.7	66	1 : 0.9
	%	47.0	36.4	83.4		6.1	10.6	—	16.7			

Immature Animals

With reference to table 1 it can be seen that there is no significant difference between the proportions of immature animals in the three samples which, expressed as percentages, are 15.7%, 18.1% and 16.7% respectively, It might be mentioned in passing that, of a total of 41 animals counted from the air on the 13th January, 1967, seven (17.0%) were immature.

In Table 2 the age classes are subjectively defined, and the ages estimated from field experience.

Table 2 : Proportions of immature rhinos in different age classes.

Sample		CLASS				Total Animals
		up to 1 year	1—2 years	2—3 years	3—4 years	
1963	No.	4	3	4	—	11
	%	36.4	27.3	36.4		
July	No.	2	1	5	4	12
1966	%	16.6	8.3	41.7	33.4	
January	No.	2	3	4	2	11
1967	%	18.2	27.2	36.4	18.2	

In Table 2 the highest percentage of immature animals fall within the age class 2—3 years. In 1963, 63.7% of the calves seen fall within the age groups up to 1 year, and 1—2 years. In July 1966 and January 1967 a greater percentage of immature animals falls within the age groups 2—3 and 3—4 years; 75.1% and 54.6% respectively. The significance of these results cannot be gauged since the samples for July 1966 and January 1967 are relatively small.

In 1963, 50% of the females noted were not accompanied by immature animals. The figures for July 1966 and January 1967 were 46.2% and 45.8% respectively.

Sex Ratios

The sex ratio of adult and immature animals is given in Table 1. The overall sex ratio of all age classes is similar, that is approximately 1 male to 0.9 females.

Mortality

Table 3 : Black rhino deaths in Hluhluwe Game Reserve from October 1954 to 31st December, 1966.

YEAR	Adults			Immature			TOTAL
	Male	Female	Unsexed	Male	Female	Unsexed	
1954 October		1					1
1955	1		1	1		2	5
1956						1	1
1957	2						2
1958	1						1
1959			records not available				
1960			records not available				
1961	15	21	8	4	6	1	55
1962	1	2		1			4
1963	2	1	4	1			8
1964	3		2				5
1965	2	1		1			4
1966	2	2			1	1	6
TOTAL	29	28	15	8	7	5	92

A total number of 92 black rhinos have died between October, 1954 and 31st December, 1966. Of these 20 were unsexed and the remainder have an overall sex ratio of 1 male to 0.9 females, which was similar for adults (1 : 0.9) and immature (1 : 0.8). Immature animals constituted 21.7% of the whole found dead.

It should be mentioned that the high mortality in 1961 occurred during the period 11-7-61 to 21-10-61, when 46 animals died in the northern area of the reserve. The cause of the sudden die-off is as yet unknown.

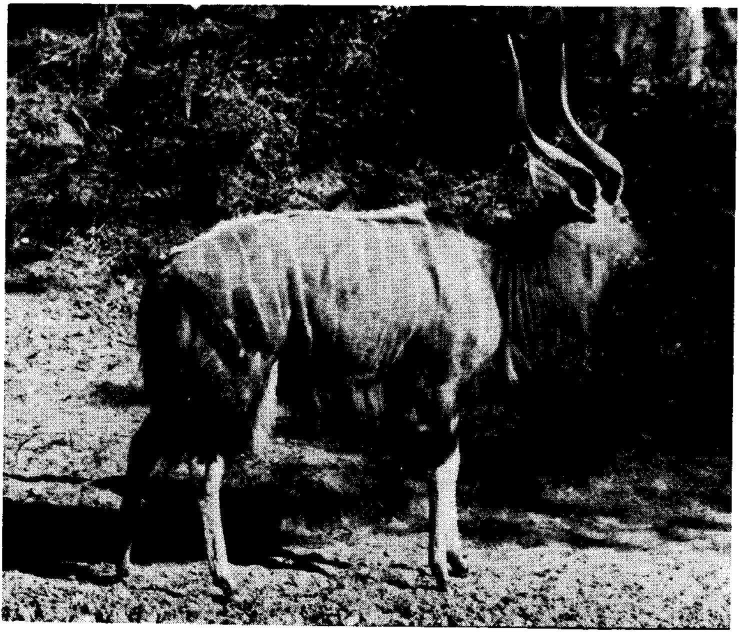
STATUS

Two complete counts of black rhino in Hluhluwe Game Reserve have been carried out—in 1961 and 1967. The same method was employed for both, i.e. a number of counters traversed preselected routes to cover the entire area. The main difference between the two counts was that in 1967 a large densely forested area was omitted from the counts because of the slender chances of rhino being seen there.

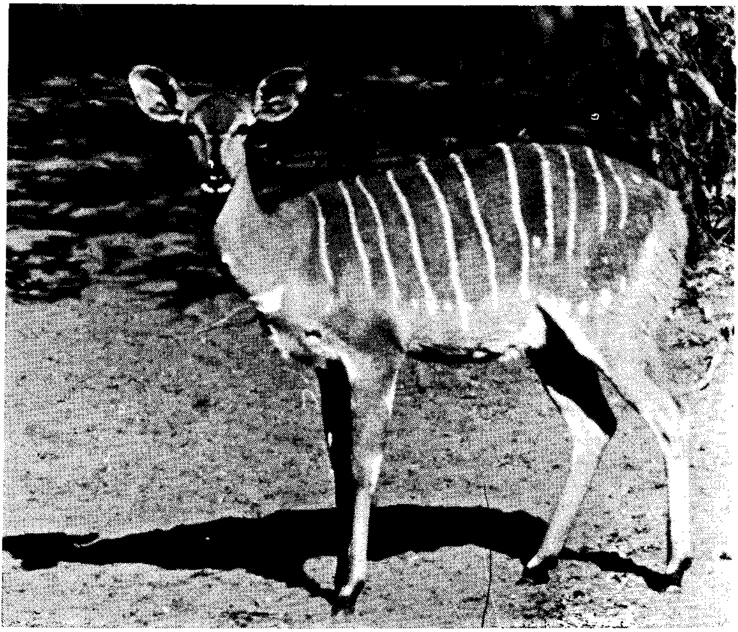
The results of the two counts are shown in Table 4.

Table 4: Results of counts of black rhino in Hluhluwe Game Reserve.

Area	1961	1967
Northern	177	104
Southern	123	122
TOTAL	300	226



Nyala Male Photo: J. Vincent



Nyala Female Photo: J. Vincent

STUDIES ON A POPULATION OF NYALA

by

J. VINCENT, P. M. HITCHINS, R. C. BIGALKE (NATAL PARKS BOARD) AND A. J. BASS (CENTENARY AQUARIUM, DURBAN).

INTRODUCTION

The Nyala *Tragelaphus angasi* Gray is restricted in its distribution to the eastern coastal plain and adjacent hinterland, from southern Malawi, southwards through Moçambique to northern Zululand. Its southernmost limit of distribution, according to historical records, appears to have been the mouth of the Umfolozi river at the southern end of St. Lucia Lake. It was in fact first discovered on the north-eastern shores of the lake in 1849.

In Malawi the species is localised to two small reserves on the lower Shire river, near Chikwawa and Chiromo (Sidney, 1965, p. 289). In Rhodesia it is restricted to the valleys of the Lundi, Nuanetsi, Bubye and Limpopo rivers, along a narrow strip on the border of Moçambique, and to the Zambezi valley in the north-east of the country. In Moçambique itself the northernmost limit of distribution is about Quelimane and the Gorongoza Game Reserve where a few are still said to exist (Sidney, op cit).

In the Kruger National Park it now occurs in the valleys of the Levubu, Shingwidzi, Mphongolo, and Great Letaba rivers and in the region of the Olifants Gorge (Pienaar, 1963, p. 33).

In Zululand it is common in the Ndumu, Mkuzi, Hluhluwe and Umfolozi Game Reserves, and in False Bay Park, as well as occurring in fair numbers on farms in the Hluhluwe district and in the unallocated State Land known as the Corridor. South of the Umfolozi Game Reserve the Nyala is scarce, but can be found on farms in the Ntambanana district. Indications are that protection in Zululand has enabled the species to extend its range as far south as this. In the nagana game extermination of 1942-50 only 37 animals were shot in and around Umfolozi Game Reserve (N. N. Deane, pers. comm.), yet now it is common there.

Typically, the Nyala seems to prefer more densely bushed areas, although in the Zululand reserves it may often be encountered in quite open country. When disturbed, however, it makes straight for the nearest cover. This habit of venturing out into the open may be due to the lack of predators to which it would fall easy prey.

As yet there has been no published literature on any aspect of the biology of the Nyala. The scope of the present paper is somewhat limited, and it may serve as an introduction to a more comprehensive study.

MATERIALS AND METHODS

A total of some 100 animals shot in a control programme in Hluhluwe Game Reserve in December 1965 and January and February 1966, were made available for study and were examined thoroughly.

As soon as possible after being shot the animal was weighed on a Saltar spring scale of 200lb. or 400lb. capacity, the weight being recorded to the nearest pound. All the standard linear body measurements, as defined by Ledger (1963, p. 19), were taken, with the exception of "length of the hind foot". In this study the measurement of "hind foot" refers to Ledger's measurement of the "hind leg". The procedure adopted was not identical to that described by Ledger, however, in that the carcass was not bled prior to measurements being taken.

In females a record was kept of whether or not they were lactating, and a subjective determination made as to whether this was "slight" or "heavy".

After being skinned the following observations were made on the animal and records kept:

1. Weight of rumen contents (obtained by subtraction of the empty rumen weight from the full rumen weight).
2. Gross examination of rumen contents.
3. Presence or absence of a foetus in females, as seen by gross examination and the sex thereof if possible.
4. State of tooth eruption.

The carcass was then butchered according to the method described by Ledger (1963) to obtain the weight of the dressed carcass and the hindquarter percentage. This consists of dividing the carcass between the 10th and 11th ribs after removal of the head at the atlas joint and the feet at the carpal and tarsal joints. All organs of the thoracic and abdominal cavities are removed with the exception of the kidneys and kidney fat.

The ovaries and testes were preserved for further examination, and the entire skull was cleaned and dried. The method of examination of the ovaries and testes is described under the relevant heading below.

RESULTS

Dentition and Ageing

The dental formula of Nyala is typical of the Bovidae, namely deciduous: $\frac{0.0.3.0.}{3.1.3.0.}$; permanent: $\frac{0.0.3.3.}{3.1.3.3.}$

Since Nyala apparently have no well-defined breeding season, and since no information is available from known-age specimens, it is not possible at this stage to determine the ages at which the various teeth erupt or are replaced. However, a system of grouping the specimens into classes according to the state of tooth eruption and wear has been devised. The classes are defined as follows:

class a. Up to and including complete deciduous dentition.

class b. M_1 erupting, incisiforms and premolars deciduous.

class c. M_1 erupted, M_2 erupting, incisiforms and premolars deciduous.

class d. M_1 and M_2 erupted, M_3 erupting, incisiforms and premolars replacing.

class e. Incisiforms permanent, premolars permanent or replacing, M_3 erupting.

Because of the wide overlap in the replacement of the premolars, it was not possible to break down class d any further.

Class O is the first of the "adult" tooth wear classes, namely animals with complete permanent dentition and with none of the molar cusps worn smooth.

The other adult tooth wear classes are defined as follows:

class 1. Posterior cusp of M_3 worn smooth.

class 2. Anterior cusp of M_1 worn smooth.

class 3. Posterior cusp of M_1 worn smooth—and older.

Wear on the premolars did not follow a regular sequence, and it was thus not possible to use this criterion to distinguish any more classes.

Figure 1 shows diagrammatically the order of eruption and replacement of teeth.

Insufficient material from young animals was available to determine just when in class a the second and third deciduous premolars erupted, or whether they were in fact already present at birth. It will be seen from the figure that the time of replacement of the premolars, particularly Pm_2, varies considerably between individuals in relation to the eruption of the molars.

Wear on the first permanent incisors can be quite closely correlated with the adult classes as defined by wear on the molars. The parameter used is the "area", obtained by measuring the greatest width and the length of the cutting surface, and calculating the product. The method of measuring is shown in Figure 2, use being made of vernier slide calipers.

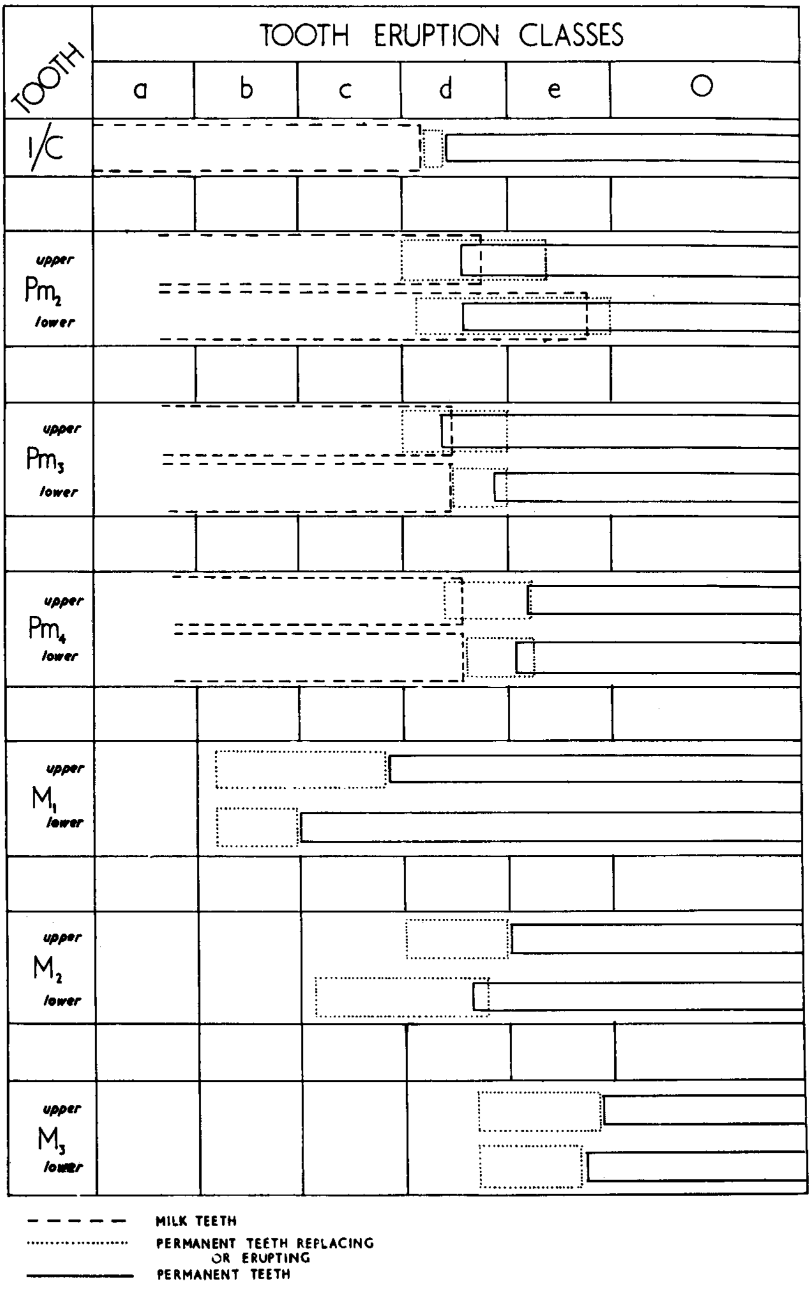


Fig. 1. Showing the order of eruption and replacement of teeth.

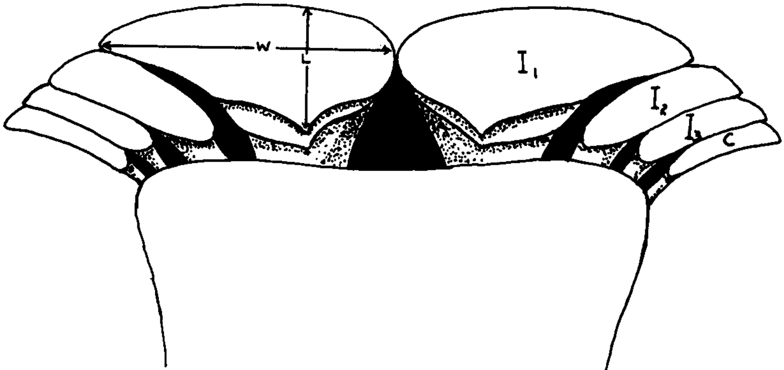


Fig. 2. Showing the method used to measure the length and width of I_1.

Results of tests on these measurements are shown in Table 1. Because of the large difference in relative sizes of the teeth in males and females, they are treated separately. Unfortunately, the small sample of males precluded the use of any tests of significance.

Attempts were made to correlate further measurements such as the widths of the occlusal surfaces and heights above the gum line of the molariform teeth, length of the tooth row, length of the lower jaw, and combinations of some of these, but no correlations could be found.

Table 1. Breakdown of 50 female and 11 male adults to show the distribution in the age-classes used of the mean "incisor area". (n=number in sample.)

	Class	n	Mean area (sq. mm.)	S.D.	V(%)	% sign. of diff.	Range
♀♀	0	7	109.3	18.5	16.9		76.5—134.7
						> 99.5 < 99.9	
	1	27	80.6	20.8	25.8		52.0—144.8
						> 95.0 < 99.0	
	2	8	68.5	10.0	14.6		49.1— 79.3
						> 99.5 < 99.9	
	3	8	46.4	11.5	24.8		30.5— 63.8
♂♂	0	2	131.8	11.6	8.8		123.6—140.0
	1	8	111.6	19.3	17.3		89.0—149.9
	2	0	—	—	—		—
	3	1	76.2	—	—		—

Reproduction

In males the testes were weighed on a beam balance to the nearest tenth of a gram after the tunica vaginalis and the tunica albuginea had been removed; their diameter was measured using vernier slide calipers, and smears were made of the testis and cauda epididymus for microscopic examination. For each of the smears an arbitrary measure of sperm abundance was used, namely "none, few, or many". The results are shown in Table 2, for immature animals only. All adult males had "many" sperm in the epididymus and "few" in the testis.

Table 2. To show weights and diameters of testes, and relative abundance of spermatozoa in the testis and cauda epididymus of immature animals. In order to clarify the classes the body weights and horn lengths are also given for each animal.

No. of specimen	Class	Av. wt. of Testes (gm)	Av. diam. of Testes (mm)	Sperm abundance		Body wt. (lb)	Horn length (cm)
				T.	E.		
1657	a	2.5	10.8	None	None	67	0
1533	c	4.7	14.0	None	None	82	4.8
1605	?	9.6	18.8	None	None	109	21.3
1583	d	11.6	21.0	Few	Few	140	22.8
1539	e	12.4	21.8	Few	Many	118	21.9
1519	e	13.9	21.0	Few	Many	126	22.2
1613	e	17.0	21.8	Few	Many	150	31.0
1596	e	17.2	22.8	Few	Many	152	16.1

It is evident from Table 2 that sperm is first present in class d, whilst by class e the animal is apparently sexually mature. However, because of competition with older males in the natural state, it is doubtful if these young males actually take any active part in mating. Nevertheless young males of this age may still be seen running with their mothers.

Preserved ovaries were sectioned at approximately 1 mm. intervals, and the presence of corpora lutea of pregnancy, corpora albicantia, gravid follicles and developing follicles, was determined by examination.

Results of the gross examination of the animals for signs of lactation and pregnancy, together with those of the examination of the ovaries are summarised in Table 3, and illustrated in Figure 3.

Table 3. A brief summary of the reproductive activity of Nyala females from Dec. 1965—Feb. 1966.

Class	n	Preg.	Lact.	Preg. & Lact.	Neither	C.L.	C.A.	Foll.
a	0							
b	0							
c	0							
d	1	0	0	0	1	0	0	1
e	7	1	0	0	6	5	0	4
0	9	0	5	0	4	·4	6	8
1	22	11	12	4	3	20	7	14
2	5	2	3	2	2	3	3	4
3	9	4	3	2	4	8	5	7

n=number in sample.
C.L.=Corpora lutea.
C.A.=Corpora albicantia.
Foll.=Follicles.

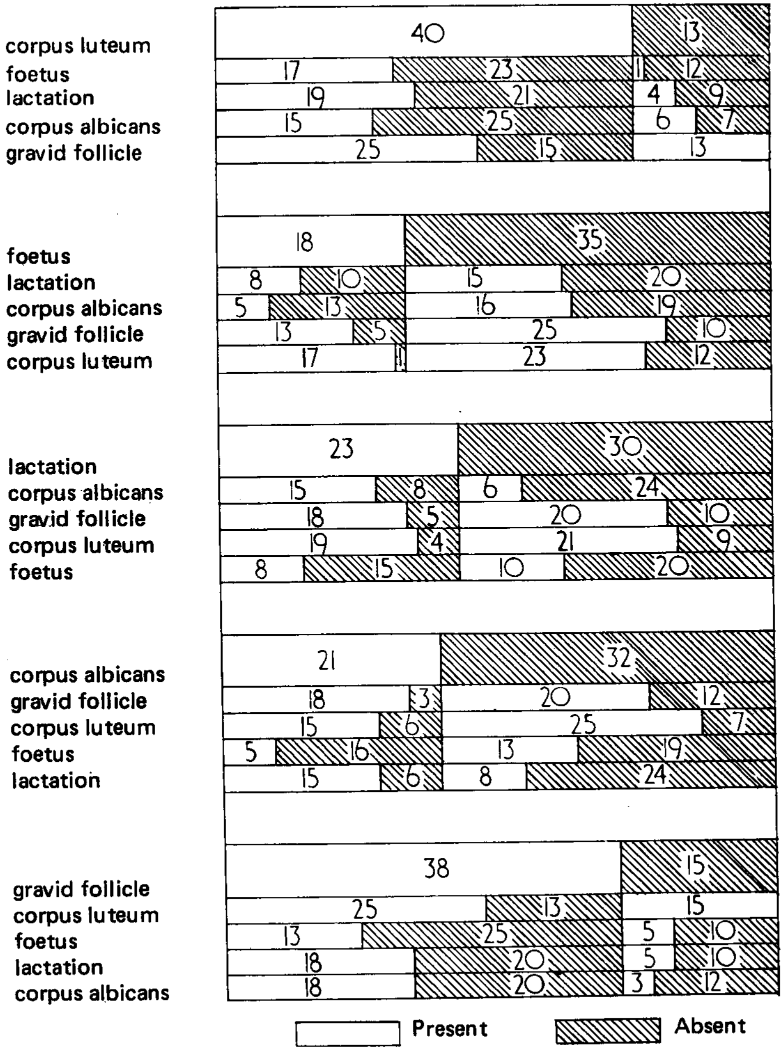


Fig. 3. Illustrating the reproductive activity of 53 adult Nyala females. The numbers indicate the numbers of individuals in which the particular feature was present or absent. Example: of the 40 animals in which corpora lutea were present 19 were lactating and 21 not; and of the 13 in which corpora lutea were absent, 4 were lactating and 9 were not.

Apparently, since two gravid follicles were present in one ovary of the animal from class d, ovulation takes place either late in tooth eruption class d or early in class e. A single foetus in class e confirms this, although it is possible that there were others not detected in view of the fact that 5 of the 8 animals in this class had corpora lutea of pregnancy. This foetus was very small—sitting height 1.1 cm., weight 0.05 gm. (The "sitting height" of a foetus is explained by Ansell (1965 : p. 109).)

What appeared to be two corpora albicantia in animals of class e could have been regressing corpora lutea of ovulation, which develop if fertilisation of the oocyte does not take place. Such a phenomenon may be explained by the possibility put forward by Teer et al. (1963, p. 34) that the first oestrus cycles of deer in the United States do not always result in fertilised oocytes. It was in fact impossible to distinguish between the regressing corpora lutea of ovulation just described, and corpora albicantia (scars of corpora lutea from previous cycles). For this reason the counts of the latter may not be entirely reliable.

It is interesting to note too that 8 of the 18 animals visibly pregnant were also lactating, in spite of the fact that the foetus was quite large in two instances. The largest weighed over 82 gm. (just under 3 oz.), and the lactation in this animal was recorded as "slight". In another animal lactation was "heavy" and the foetus weighed 37 gm. (nearly 1½ oz.).

The important conclusion to be drawn from this is that lactation does not have the effect of suppressing ovulation, i.e. there is no lactation anoestrus. This may however, not be a general rule for, of the 10 other animals visibly pregnant but not lactating, 3 had embryos weighing less than 15 gm., and only 3 had corpora albicantia or luteinised structures that could have been regressing corpora lutea of ovulation.

On the other hand this could point to a high mortality rate among young animals, resulting in a large proportion of the females ceasing to lactate prematurely. The species does have the habit of leaving its young hidden for long periods when they could easily fall prey to eagles, jackals, hyaenas, or baboons.

Pienaar (1963) states that in the Kruger National Park, "The lambing season extends from July to November with a peak during August—October. Young lambs have been recorded at Pafuri during April and May". In Zululand, all observations indicate that there is no particular breeding season and that lambs are dropped throughout the year. There may actually be a peak , but this has not been established. Certainly the results of the present study show a wide range of foetal ages during the 2½-month period, as seen in Table 4.

Table 4. To show the range of foetal weights for each of the three months covered by the study.

Month	Max. wt.	Min. Wt.	Median wt.	foetuses No. of
Dec.	4540 gm	1 gm	1078.25 gm	10
Jan.	4994 gm	9.95 gm	478.30 gm	12
Feb.	4256 gm	0.30 gm	91.15 gm	12

The overall sex ratio of recognisable foetuses was 16♀♀ : 12♂♂ with 7 unrecognisable.

Figure 4 (page 14) shows the range of sizes of foetuses obtained from animals shot on the same day.

Body Weights and Measurements

a. *Horns:* Horns are present in the male only. They appear first in tooth eruption class c, for of the 2 animals in this class, one had horns 0.6 cm long, and the other horns 4.9 cm long. Average horn lengths for the various classes are shown in Table 5.

Table 5. Average lengths of horns of the various tooth eruption and wear classes of Nyala, together with shoulder heights for comparison.

Class	n	Mean horn length (cm)	Range	Mean shoulder height (cm)	Range
a	0	—	—	—	—
b	2	—	—	67.6	63.7— 71.5
c	2	2.8	0.6— 4.9	80.5	80.3— 80.6
d	2	22.4	21.9—22.8	92.2	92.1— 92.2
e	5	22.2	16.1—31.0	93.1	90.0— 99.2
0	4	45.2	39.9—49.0	102.6	99.0—109.2
1	11	58.8	51.2—63.5	111.9	101.0—120.8
2	0	—	—	—	—
3	1	63.5	—	108.0	—

These figures seem to indicate that growth of the horns during the immature stages is rather erratic, and also that they continue to grow until quite late, if not throughout the animal's life. The tendency for the animals to rub their horns, and to dig them into damp soil may have the effect of slowing down the actual growth rate. The reason for this habit is not clear.

b. *Weights:* The total body weight was recorded as soon after death as possible, and may be taken to represent the liveweight. Averages for all classes are given in Table 6.

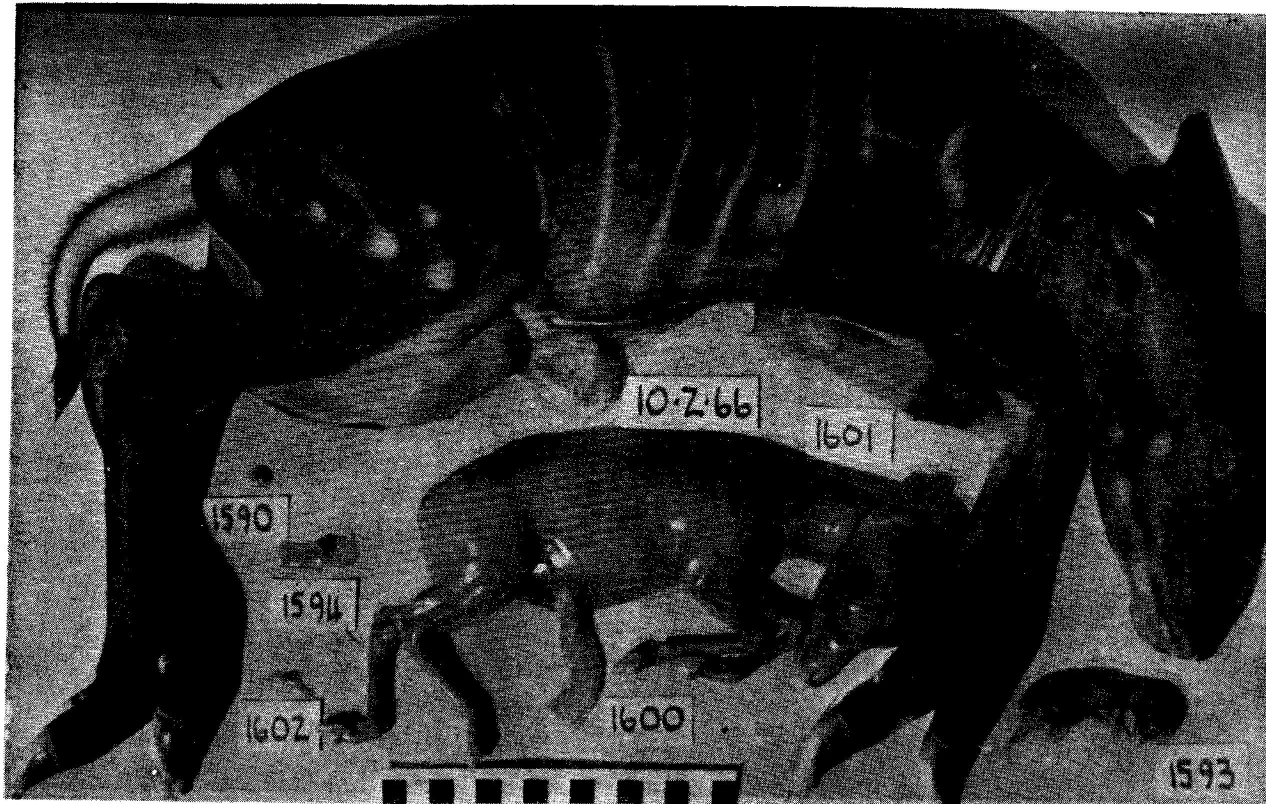


Fig. 4. Six foetuses from animals shot on the same day, showing the range of sizes from a barely perceptible spot (No. 1602) to an almost full-term foetus (No. 1601). The scale is in centimetres.

Table 6. Average liveweights, dressed carcass weights, dressing out percentages and hindquarter percentages for all tooth eruption and wear classes of Nyala.

Class	Sex	n	Wt. (lb) Mean	Range	Dressed wt. (lb)	Dressing out %	H.q. %
a	♂	0	—	—	—	—	—
	♀	0	—	—	—	—	—
b	♂	2	56	44— 67	35	63.3	57.0
	♀	0	—	—	—	—	—
c	♂	2	81	79— 82	49	60.3	58.8
	♀	0	—	—	—	—	—
d	♂	2	143	140—145	86	60.5	53.7
	♀	0	—	—	—	—	—
e	♂	5	136	118—152	82	60.1	56.5
	♀	8	117	99—128	73	62.1	58.0
0	♂	4	167	151—178	102	61.1	55.9
	♀	7	122	113—142	76	59.8	58.0
1	♂	11	239	189—281	145	58.8	52.2
	♀	30	142	118—171	85	60.0	57.2
2	♂	0	—	—	—	—	—
	♀	9	140	130—156	84	59.8	56.4
3	♂	1	309	—	204	66.0	50.0
	♀	9	146	127—164	85	58.1	56.4

The average linear body measurements for each class and for the two sexes are given in Table 7.

Table 7. Mean linear body measurements and weight of stomach contents of each tooth eruption and wear class of Nyala. (All measurements in cm. and weights in lb.)

Class	Sex	n	Head	Body	Tail	Girth	Hind foot	Ear	Height	Rumen contents	
										Mean (lb.)	Range (lb.)
a	♂	0	—	—	—	—	—	—	—	—	—
	♀	0	—	—	—	—	—	—	—	—	—
b	♂	2	23.8	75.4	29.1	66.1	36.8	14.2	67.6	3.5	3—4
	♀	0	—	—	—	—	—	—	—	—	—
c	♂	2	27.0	90.8	35.2	74.5	40.3	15.6	80.5	6.5	6—7
	♀	0	—	—	—	—	—	—	—	—	—
d	♂	2	32.1	104.9	40.4	97.6	45.3	18.4	92.2	13.5	12—15
	♀	0	—	—	—	—	—	—	—	—	—
e	♂	5	33.1	104.6	38.4	89.1	45.3	17.4	93.1	15.2	11—19
	♀	8	31.2	102.0	37.0	85.7	42.5	17.2	88.2	9.0	0—12
0	♂	4	35.1	107.4	42.4	96.7	47.6	18.4	102.6	12.4	12—21
	♀	7	30.0	104.3	38.4	78.9	41.7	17.3	87.3	11.6	9—13
1	♂	11	38.6	111.6	46.1	112.5	48.4	18.5	111.9	27.0	19—33
	♀	30	32.4	102.6	38.4	92.3	41.6	17.5	91.7	11.8	0—19
2	♂	0	—	—	—	—	—	—	—	—	—
	♀	9	32.1	110.2	39.0	90.6	42.0	17.3	92.2	13.6	0—21
3	♂	1	31.0	131.0	?	121.0	49.0	19.0	108.0	27.0	—
	♀	9	32.6	109.6	39.0	86.8	42.2	17.5	94.0	16.4	9—25

Stomach Contents and Feeding Habits

The average weight of the stomach contents and the range in each class are shown in Table 7.

Pienaar (1963) gives the feeding habits of Nyala as "delicate browsing . . . . and some grazing". This is generally accepted as being true, and gross examination of the stomach contents showed that about 70% of the feeding is on woody and herbaceous material (browsing), whilst the remaining 30% is on grasses (grazing).

Plants and the parts eaten, positively identified from the stomach contents, are as follows:

Woody species	*Trichilia emetica*	Fruit
	Ziziphus mucronata	Leaves
	Spirostachys africana	Leaves*, fruit
	Dichrostachys cinerea	Leaves
	Rhoicissus tridentata	Leaves, stem
	Acacia karroo	Leaves*
	A. nilotica	Leaves, seed pods*
	Maytenus senegalensis	Leaves
	Sclerocarya caffra	Leaves, fruit*
	Euclea sp.	Leaves
	E. schimperi	Leaves
	E. divinorum	Leaves
	Ficus sp.	Fruit
	Capparis tomentosa	Fruit
	Cordia caffra	Leaves
	Ehretia rigida	Leaves
	Dovyalis caffra	Leaves
	Hibiscus calycinus	Leaves
	Sida rhombifolia	Leaves, fruit
	Diospyros sp.	Leaves
Herbaceous species	*Acalypha glabrata*	Leaves
	Solanum sp.	Fruit
	Lippia javanica	Leaves
Grasses	*Dactyloctenium australe*	

Those parts marked with an asterisk (*) were most frequently encountered.

Other species have been observed being eaten, or identified from rumen contents by other observers. Amongst the grasses are *Panicum maximum, Eragrostis curvula,* and *Urochloa mossambicensis.*

Parasites

Parasites which have been collected and identified from Nyala include the following:

Ticks	*Rhipicephalus evertsii*
	R. appendiculatus
	R. maculatus
	Amblyomma hebraeum
	Boophilus decoloratus
Hippoboscid fly	*Echestyphus pardoxus* (Dixon, 1964)
Nematodes	*Ostertagia harisi* (from Oesophagus)
	Gongylonema verucosum (from small intestine)
Trematodes	*Paramphistomum microbothrium* (from reticulum)
	Paramphistomum sp. (from rumen)
	Calicophoron calicophoron (from rumen) (Dixon, 1964)
	Cotylophoron jacksoni (from rumen) (Dixon, 1964)

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Footnote: Subsequent to the preparation of this paper, some interesting observations on breeding have been kindly supplied by Mr. H. H. Mockford of Pafuri. The details are that a female Nyala, born on 5th June, 1962, gave birth to her first offspring on 13th February, 1964, and to subsequent offspring on 27th November, 1964 and 3rd October, 1965.

This animal was free to roam with wild animals but, having been hand-reared, was sufficiently tame to remain in the vicinity and enable these observations to be made.