

# MADOQUA

Vol. 1, No. 6, 1957

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Published by the Management and Research Council of Africa  
for the National Council for Research, South West Africa

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Gedruk deur John Meinert (Edms) Bpk., Windhoek - 4-1165  
Printed by John Meinert (Pty) Ltd., Windhoek - 4-1165

Prys van No. 8: R5,00  
Price of No. 8: R5,00

# MADOQUA

SER. I, No. 8, MAART 1974



GEPUBLISEER DEUR AFDELING NATUURBEWARING EN TOERISME  
VAN DIE ADMINISTRASIE VAN SUIDWES-AFRIKA

PUBLISHED BY THE NATURE CONSERVATION AND TOURISM BRANCH  
OF THE SOUTH WEST AFRICA ADMINISTRATION

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# Size and growth as shown by pre- and post-natal development of the Hartmann zebra *Equus zebra hartmannae*

by

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## ABSTRACT

From a sample of 128 animals the standard samples and measurements were obtained. A description is given of the pre-natal development of the Hartmann zebra foetus. Post-natal development is also given in both size and mass gain. The average mass of the adult female being 276,3 kg while the adult males shows an average mass of 298 kg. No statistical meaningful differences in the growth rate of males and females could be determined.

## I INTRODUCTION

During a study on the behaviour and ecology of the Hartmann zebra in South West Africa permission was obtained to shoot 128 of these animals on private land where they were creating problems. Apart from all the other information and samples taken (Joubert 1974 a, b), the standard measurements of each animal were also obtained. Nothing could be found in the available literature on the development of the zebra. The pre-natal development is represented by a growth curve and table, so as to facilitate the establishment of the age of zebra foeti in the veld. This information is important when trying to determine the breeding season. There is furthermore an increased trend to incorporate game animals with livestock on farms for red meat production. It was felt therefore that the post-natal development information might be a help in ascertaining the optimum cropping age as related to size and body mass of the Hartmann zebra.

## II SCHEDULES FOR PRE-NATAL DEVELOPMENT

During the study 37 Hartmann zebra mares were collected of which 18 were pregnant. A few more mares may have been fertilized but with the blastocyst so small that it was missed during the post mortem. Eighteen embryos and foeti in different stages of development were thus collected. This material was then correlated with the characteristics of the equine foetus as determined by Richter & Gotze (1950). By comparing the state of development of the Hartmann zebra foetus with that of the horse and then comparing the weights and lengths, a strong correlation was found. Although the horse foetus and Hartmann zebra foetus showed the same growth in length, the Hartmann zebra foetus did not gain weight as fast as the horse foetus. Despite this, however, the work by Richter & Gotze (1950) was found to be a valuable guide line. The determination of the period of conception of each embryo was based on their work, using both weight and body-length as parameters. The actual description of the foetus however, was made from the specimens to hand.

In figures 1 and 2 the growth in weight and length of the Hartmann zebra foeti can be seen. According to figure 1 the foetus starts picking up weight at an

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accelerated rate from about eight months. At birth the foetus may weigh 25 kg (n = 5). The increase in body length of the foetus shows a more gentle curve. At birth a foal is on the average 120 cm long (head and body n = 5).

### III POST-NATAL DEVELOPMENT

#### 3.1 Mass

Figure 3 shows the increase in mass in the Hartmann zebra. The female mass gain curve levels off sooner

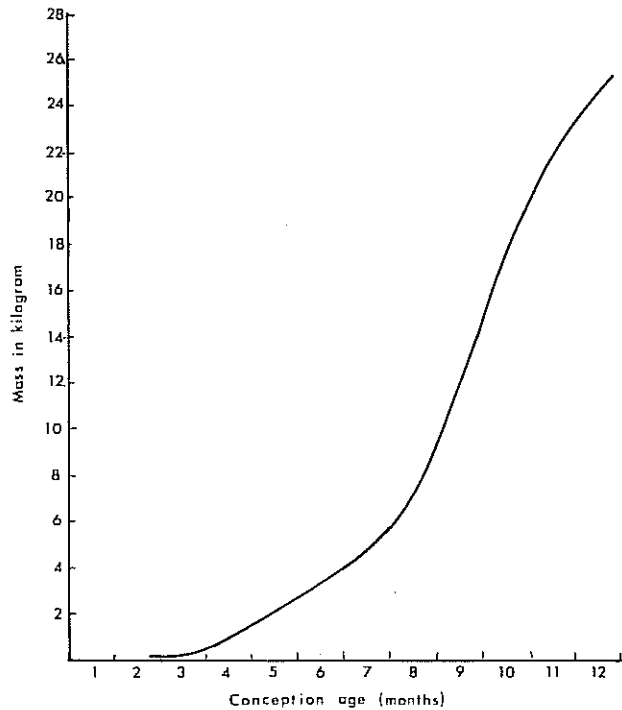


Figure 1. Prenatal increase in mass of *Equus zebra hartmanniae*.

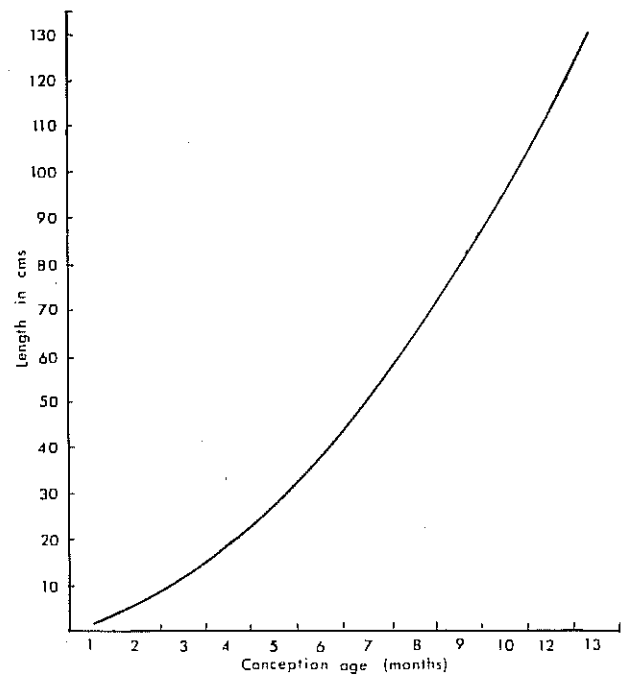


Figure 2. Prenatal increase in length of *Equus zebra hartmanniae*.

than the curve showing the male mass gain. No such marked dimorphism could be determined in the body measurements and skeletal growth of the two sexes. As can be seen from tables 2 and 3 the only measurement that does show some difference is that of body circumference which is larger in the male by an average of 5,6 cm. The average mass of the adult female, older than four years, is 276,3 kg (n = 23), with the 10 largest females showing an average of 279,8 kg. The maximum mass recorded for a female was 322,1 kg. The males only reach their maximum mean mass from (approximately) the age classes XI to XII i.e. from about seven years of age (Joubert, 1972). The average mass of adult males, older than four years, is 298 kg (n = 22). The average mass however, of the ten largest males older than seven years is 343,2 kg. The maximum mass recorded for a male was 371,9 kg.

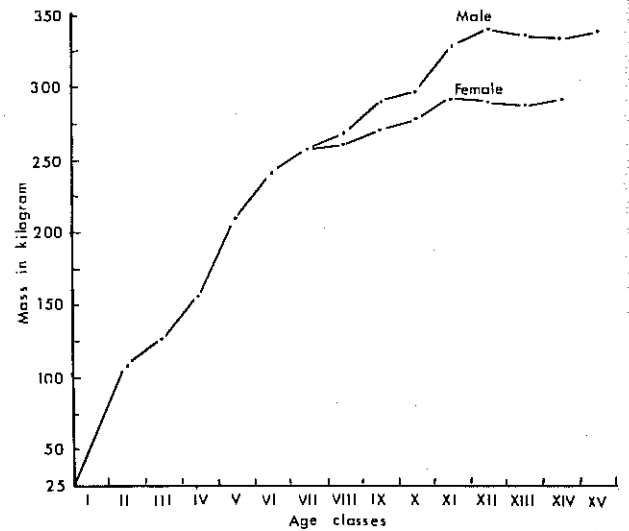


Figure 3. Postnatal mass gain in *Equus zebra hartmanniae*.

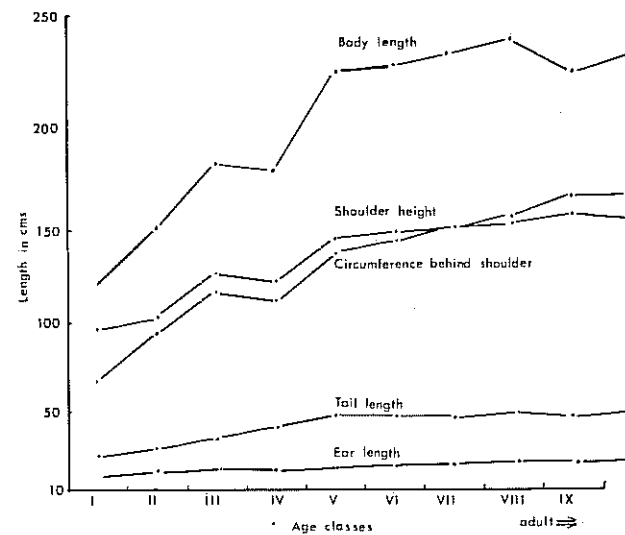


Figure 4. Growth in postnatal body dimensions of *Equus zebra hartmanniae*.

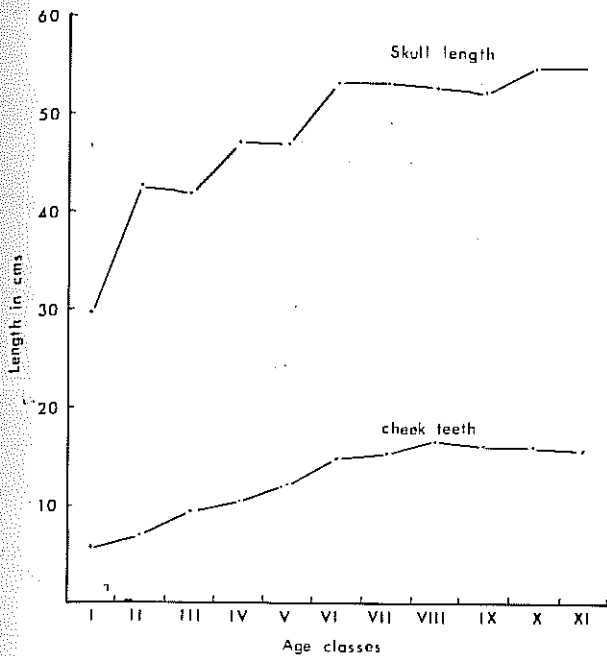


Figure 5. Growth of the skull and cheek teeth of *Equus zebra hartmannae*.

### 3.2 Body measurements and skeletal growth

Body measurements and growth are depicted in figures 4 and 5. No statistical meaningful differences in the growth rate of males and females could be determined. Even the actual differences in the maximum measurements were slight. As can be seen from figure 4 the tail and ears are the first extremities to reach their full length. In contrast to the mass gain the skeletal growth has been almost completed at age class VI — thus at 2½ years. The increase in

body measurements from here onwards is slight. As can be seen from figure 5 the same is true for the increase in skull length, as well as the length of both pre-molars and molars combined.

### IV ACKNOWLEDGEMENTS

I am extremely grateful for the hospitality and cooperation I received from the farmers of the Khomas Hochland. A special word of thanks is also due to Mr C. G. Coetzee for critically reading through the paper, Mr H. Böhme for preparing the figures and to my wife for typing the original manuscript.

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Table 1. Size and characteristics of the *Equus zebra Hartmannae* foetus during pregnancy.

Gestation period	Mass (kg)	Length (cm)	Remarks
1 month		± 2	The form of the young animal can just be made out.
2 months	± 0,027	5-7	Although still small, certain features viz. the head, body and legs are recognizable.
3 months	± 0,125	10-15	The reproductive organs are visible. The body is still transparent to a certain extent and the ribs can still be seen. The mouth can be opened and the tongue is fully developed.
4 months	± 1,0	13-23	Although the body is still naked, hairs can be seen on the upper and lower lips.
5 months	± 2,7	20-35	The nasal cavities and pinnae are formed.
6 months	± 3,6	35-60	Hairs on lips, nose, eyebrows and eyelashes.
7 months	± 4,5	40-70	Hairs on lips, nose, eyelids and tip of tail.
8 months	± 8,6	50-80	The mane starts to form.
9 months	± 13,6	60-90	Hair short and thin on body; darker and lighter bands discernible.
10 months	± 18,1	70-130	Mane and tail well-developed, complete coverage of hair on body. Hairs short.
11 months	± 21,6	76-140	Long woolly hair coverage over the body.

Table 2. Body measurements (cm) and mass (kg) of the 10 largest adult males older than seven years.

	Ear	Shoulder height	Body circ.	Body length	Tail	Front Fetlock joints	Circ. f. hoof	Hind Fetlock joints	Circ. hind hoof	Mass
	23,5	144,5	166,0	236,0	47,0	41,0	37,5	53,0	37,5	355
	23,0	142,5	154,0	224,0	55,0	43,0	39,5	52,0	39,5	350
	23,5	141,5	160,3	230,0	51,0	42,5	38,8	53,0	38,5	345
	24,0	148,0	172,0	248,0	49,0	42,0	39,0	55,0	39,5	386
	23,0	146,0	156,0	218,0	48,0	42,0	39,0	54,0	38,0	372
	22,4	145,5	157,0	226,5	50,0	44,5	37,5	52,5	37,5	331
	24,0	145,5	150,0	235,8	47,0	44,0	38,5	53,8	37,5	358
	23,5	149,5	152,5	244,5	48,3	37,6	35,5	54,5	37,2	322
	24,5	140,5	149,0	222,5	50,5	43,0	36,0	53,0	36,0	282
	22,2	142,0	163,0	235,2	49,3	44,0	37,3	49,5	38,5	331
n	10	11	11	11	11	11	11	11	11	11
Total	253,6	1445,5	1579,8	2320,5	495,1	423,6	378,6	530,3	379,5	3432
mean	23,4	144,5	157,9	232,0	49,5	42,3	37,8	53,0	37,9	343,2
range	2,5	9,0	23,0	30,0	8,0	6,4	4,0	5,5	3,5	104

Table 3. Body measurements (cm) and mass (kg) of the 10 largest Hartmann zebra females older than four years.

	Ear	Shoulder height	Body circ.	Body length	Tail	Front Fetlock joints	Circ. f. hoof	Hind Fetlock joints	Circ. hind hoof	Mass
	24,5	142,0	171,5	263,0	51,4	44,0	36,5	54,0		317
	23,5	135,0	148,0	243,0	48,5	44,5	37,8	52,2	36,8	322
	22,4	140,2	150,7	215,0	49,5	43,0	34,4	52,0	34,4	267
	23,5	143,5	150,5	214,0	46,0	42,0	32,9	55,5	33,0	285
	23,2	132,6	137,2	230,0	51,2	40,2	34,2	52,2	34,2	231
	22,0	141,2	142,0	242,0	49,7	42,5	36,5	52,5	36,3	276
	22,5	143,5	165,0	228,0	49,0	41,0	36,5	50,5	36,0	281
	22,8	146,5	152,4	226,0	50,1		36,1			285
	23,0	139,5	155,5	223,5	47,4	40,5	38,0	51,0	38,0	258
	23,4	146,5	145	230	50,3	43,0	38,3	50,5	37,3	267
n	10	10	10	10	10	9	10	9	8	10
Total	230,8	1410,5	1517,8	2314,5	493,1	380,7	361,2	468,4	286,0	279,8
mean	23,0	141,0	151,7	231,4	49,3	42,3	36,1	52,0	35,7	279,8
range	2,5	13,9	34,3	49,0	5,4	4,3	5,4	3,5	5,0	91