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FEEDING HABITS OF THE CAPE MOUNTAIN ZEBRA *Equus zebra zebra* LINN. 1758

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Abstract — The feeding habits of the Cape mountain zebra *Equus zebra zebra* Linn. 1758, were studied in the Mountain Zebra National Park. They were highly selective utilising only seven of 17 available grass species at feeding sites and 26% of plants available. These zebra fed at 40 mm to 80 mm above the ground except when eating seed heads of certain grass species. Protein levels of grasses eaten were above 4% and seasonal movements were associated with mean food quality — there were thus summer grazing and winter grazing areas. Mean crude protein in the faeces fluctuated seasonally.

Introduction

In the Mountain Zebra National Park (MZNP) which is situated about 24 km south-west of Cradock in the Republic of South Africa, the Cape mountain zebra *Equus zebra zebra* Linn. 1758, is afforded special protection. This 6 536 ha park was proclaimed in 1937 and is the stronghold of this endangered species with a population of about 220 being maintained in the area by capture and translocation. The vegetation of the mostly mountainous terrain, and one extensive upland plateau (Rooiplaat) is described in detail by Van der Walt (1980). The area has a mean long term annual rainfall of about 400 mm (range: 200-522) and experiences great extremes in temperatures with hot summer months (October — March; maximum temperature up to 42 °C) and cold winter months (April — September) with frequent snow in higher lying areas.

The highest density of Cape mountain zebra is on the Rooiplaat plateau (Fig. 1) and this area is also used quite extensively by springbok *Antidorcas marsupialis* (300-400), blesbok *Damaliscus dorcas phillipsi* (70-120), black wildebeest *Connochaetes gnou* (100-150) and red hartebeest *Alcelaphus buselaphus* (50-70). These are all grazing species and possible competitors with the zebra. Eland *Taurotragus oryx* (100-150) also use this plateau periodically, especially during January to April.

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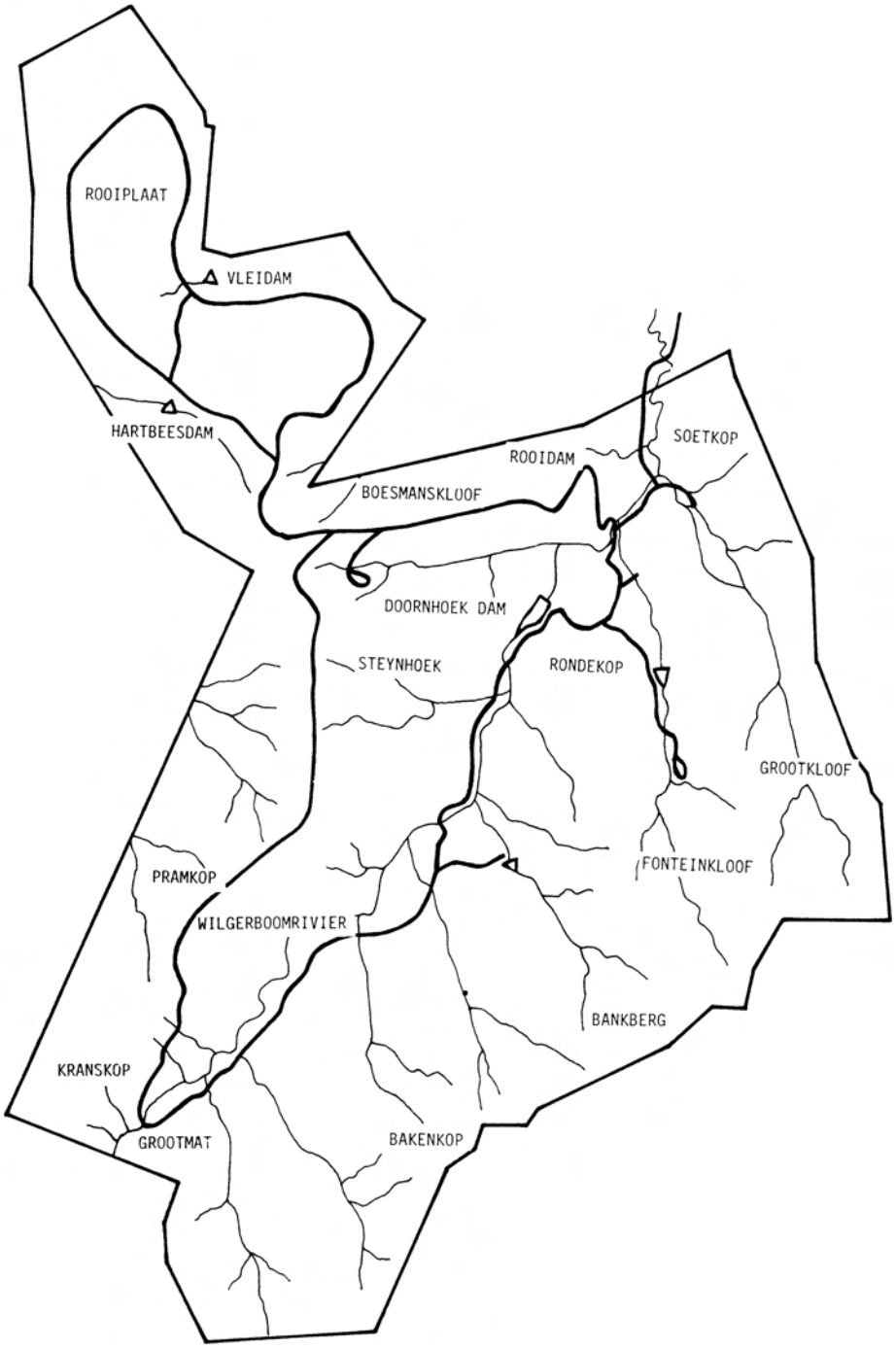

Fig. 1. Mountain Zebra National Park.

There are also a small number of mountain reedbuck *Redunca fulvorufula* on Rooiplaat but these animals are more common on the mountain slopes.

Although habitat selection of the Cape mountain zebra was investigated by Penzhorn (1982) there was no information available on the actual feeding habits of the species. In order to have a better understanding of the food requirements of these zebra for management purposes, an investigation into this aspect was carried out during 1979 to 1981.

Study area

The Rooiplaat plateau was chosen as the main study area as zebra and various large ungulates were always present. The vegetation consists of rocky plateau grassland, degraded plateau grassland, degraded dwarf shrubland on exposed soil and a small portion of shrubland on stabilised hot shaly slopes (see Van der Walt (1980) for details).

The total area of Rooiplaat is about 1 500 ha and most parts of this plateau are visible from the road. Observations were also carried out on the slopes of the area lying towards Babylons Toren.

Methods

On at least two occasions during the month all zebra on Rooiplaat were counted from the road before 10h00. On each of these trips, at least one family group of zebra was looked at in detail to determine specifically what they were selecting and rejecting at a feeding site. This was achieved by observing a randomly selected family group for 10 to 15 minutes while they were feeding. A metre square aluminium quadrat was then placed on a predetermined feeding site of one of the individuals in the group.

Within the metre square quadrat the following observations were made: grass species, number of grass tufts, number of tufts fed on for each species, number of tufts rejected for each species, subjective assessment of greenness in each species, subjective assessment of stalk to leaf ratio for each species, plant components eaten and the three most important species in terms of bulk (volume) contribution. Twelve bite heights were then measured in millimetres in a vertical line from the ground to determine mean bite height for the feeding site. It was found that 12 bite height measurements was the minimum required for most sites to give a meaningful mean. As the zebra were mostly in *Themeda triandra* or *Eragrostis curvula* grassland, samples of leaves and stems from these species were collected at feeding sites for nutrient analyses. In addition various other grass samples were collected for nutrient analyses to determine their protein content at different times of the year. Fresh faecal samples from family groups under observation were also collected to determine their protein content as an indicator of veld quality (see Erasmus, Penzhorn & Fairall 1978).

When the opportunity presented itself the same feeding observations were made on red hartebeest, springbok and blesbok on Rooiplaat. Unfortunately the black wildebeest were too restless as they should also have been included.

Results

Food selection

The zebra were found to be highly selective feeders and utilised only 26% of plants available at feeding sites and only seven of the 17 grass species present (Table 1). Selection was directed at the greener plant species with a high leaf to stalk ratio and little or no moribund material. In spite of this the zebra were still coarse grazers and utilised both stem and leaf components of selected grasses. This is to be expected from a non-ruminant.

Table 1

Cape Mountain Zebra grass species selection in the Mountain Zebra National Park (1979-1980)

Grass species	Total tufts	Eaten	%	d	f
Themeda triandra	415	269	64,8	11,2	28
Eragrostis curvula	281	15	5,3	7,6	32
Cymbopogon plurinodis	44	25	56,8	1,2	11
Heteropogon contortus	40	22	55,0	1,1	8
Setaria neglecta	29	16	55,2	0,8	2
Digitaria eriantha	11	3	27,2	0,3	4
Enneapogon scoparius	11	6	54,5	0,3	1
Microchloa caffra	180	0	0	4,9	13
Aristida congesta	19	0	0	0,5	5
Tragus koeleroides	293	0	0	7,9	31
Eragrostis capensis	4	0	0	0,2	2
Aristida diffusa	10	0	0	0,4	3
Merxmuellera disticha	8	0	0	0,2	5
Cynodon incompletus	2	0	0	0,1	1
Eustachys paspaloides	13	0	0	0,3	3
Eragrostis chloromelas	2	0	0	0,1	1
E. obtusa	5	0	0	0,1	3
TOTAL	1 367	356	26,0	36,9	—

(Data from 38 one metre square quadrats at feeding sites from July 1979 to June 1980).

d = density per square metre.

f = frequency of occurrence in 37 quadrats.

Using the definition of Petrides (1975) for principal and preferred foods, *Themeda triandra* must be considered as both a principal and preferred food for zebra in the park. Other preferred species (some of them seasonal) were *Cymbopogon plurinodis, Heteropogon contortus, Setaria neglecta* and *Enneapogon scoparius* (small sample). *Digitaria eriantha* was eaten occasionally and although *Eragrostis*

curvula had the highest frequency of occurrence, it was only used significantly during May to July when the seed heads were eaten. *Themeda triandra* had the highest overall bulk contribution and highest density at feeding sites, particularly on Rooiplaat.

Grasses rejected by zebra were (a) low growing and small stalky species such as *Microchloa caffra, Aristida congesta, Tragus koeleroides, Cynodon incompletus, Eustachys paspaloides* and *Eragrostis obtusa;* and (b) stalky or very course grasses such as *Aristida diffusa, Merxmuellera disticha* and *Eragrostis chloromelas.*

Red hartebeest showed much the same trend although they appeared more restricted in what they utilised (Table 2). The springbok and blesbok were able to make use of the lower growing species but also indicated a preference for *T. triandra.* There was certainly direct competition from these three grazers with the zebra for this species of grass. How this competition actually affected the zebra was apparent when the bite heights were measured and compared.

Table 2

Food (plant) selection by three grazing species in the Mountain Zebra National Park which associate with Cape Mountain Zebra

Plant species	RH (n=7)	SB (n=6)	BB (n=2)
Themeda triandra	109/66	30/20	10/10
Eustachys paspaloides	4/4	—	—
Digitaria eriantha	9/2	6/6	4/4
Cynodon incompletus	—	678/264	—
Eragrostis curvula	68/0	26/4	31/0
E. obtusa	—	1/1	—
Tragus koeleroides	56/0	115/0	24/0
Microchloa caffra	31/0	24/0	—
Aristida congesta	5/0	3/0	4/0
Merxmuellera disticha	3/0	—	—

RH = red hartebeest SB = springbok BB = blesbok

16/10 = 16 tufts present in sample of which 10 have been utilised by the relevant species.

n = number of feeding sites sampled.

Feeding heights

The majority of zebra bite heights fell between 40 mm and 80 mm above the ground and they rarely fed below 30 mm (Table 3). This also applied to the red hartebeest which were therefore in direct competition with zebra for their favourite and main source of food *Themeda triandra.* The zebra could, however, make use of food components at higher levels as can be seen from the table in question. The hartebeest were more sedentary and thus probably suffer at the cost of the zebra but the situation could be reversed if alternative grazing was not available.

Table 3

Bite heights of four grazing species in the Mountain Zebra National Park, (observations given to the base of 300 for comparative purposes) 1979-1980

Bite height	Number of observations per class to base of 300			
(10 mm classes)	Springbok	Blesbok	Hartebeest	Zebra
1	32	0	0	0
2	173	108	0	0
3	83	142	2	1
4	11	17	26	11
5	0	25	98	44
6	0	0	62	66
7	0	8	51	53
8	0	0	35	35
9	0	0	6	25
10	0	0	5	22
11	0	0	3	12
12	0	0	0	12
13	0	0	0	4
14	0	0	0	2
15	0	0	0	4
16	0	0	0	3
17	0	0	0	2
18	0	0	0	3
19	0	0	0	1
n =	88	36	180	418

(n = number of bite heights actually measured.)

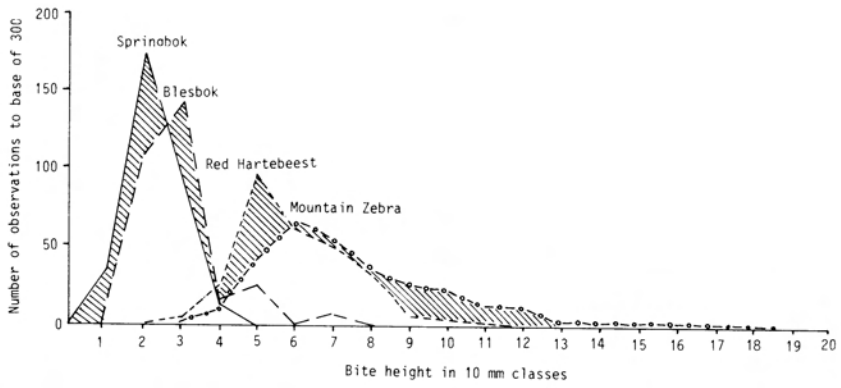

Fig. 2. Feeding levels of four large grazers on Rooiplaat, Mountain Zebra National Park.

The feeding heights of zebra during observations when they were selectively feeding on *Eragrostis* seed heads during May to July are not included in Table 3. These ranged from 310 mm to 480 mm above the ground. During one observation period a zebra was seen to use the hoof in a chopping motion to dislodge parts of an *Eragrostis curvula* tuft.

The springbok showed a distinct peak at the 10 mm to 20 mm level above the ground when feeding on grass (Table 3). This was because they selectively fed on new shoots of grass as they emerged, particularly *Cynodon incompletus*. The blesbok similarly showed a peak at a very low level (10 mm to 30 mm) above the ground. Although this was a small sample, supplementary observations at other blesbok feeding sites indicated the same situation.

The mean monthly bite height for zebra varied little except in May and June when the ones on Rooiplaat were feeding on *Eragrostis curvula* seed heads (Table 4). It will be seen from the table that zebra numbers fluctuated on Rooiplaat seasonally. It was evident from this that plateau areas such as Rooiplaat were used as summer grazing areas and the sweet mountain slopes and lower lying areas for winter grazing. This movement tied in well with variation in temperatures but even more so with differences in protein values of food plants.

Table 4

Mean bite height for Cape Mountain Zebra in the Mountain Zebra National Park on a monthly basis from July 1979 to June 1980

Month	Mean bite height (mm)	SD of mean	RP Zebra
July	70,74	11,9	23
August	78,48	12,4	32
September	65,21	18,6	34
October	96,38	15,0	46
November	75,42	33,0	72
December	62,49	4,7	82
January	50,55	3,7	50
February	76,47	21,5	68
March	78,54	24,5	70
April	76,09	24,9	57
*May	228,3	130,6	57
*June	116,9	60,2	43

* Feeding on seed heads of *Eragrostis curvula.*

RP Zebra = mean number of zebra counted on Rooiplaat during the month.

Food quality

High protein levels in grasses were found in the MZNP but only on a seasonal basis. When grasses are green during or immediately after the summer rains the protein values are high, but during the dry months these drop by as much as 50% (Table 5). What was important for zebra in the MZNP was that some grass species which were palatable *(Heteropogon contortus, Setaria neglecta* and *Digitaria eriantha)* retained a mean dry crude protein content of more than 4%. These three species were commonly found on mountain slopes and lower lying rocky areas which were utilised in winter. There were also other grasses such as *Enneapogon scoparius* on the mountain slopes which were utilised in winter. This species had a mean dry crude protein of 4,3% at one feeding site during June 1980.

Table 5

Dry protein values of selected grass species when green (March) and very dry (June) in the Mountain Zebra National Park during 1980

Grass species	March % protein	June % protein
Digitaria eriantha	8,19	4,06
Heteropogon contortus	7,39	4,22
Setaria neglecta	13,65	7,09
Cymbopogon plurinodis	8,48	5,29
Themeda triandra	6,28	3,45
Eragrostis curvula (leaves, stems)	5,99	3,37
E. curvula (seed heads)	—	6,34

Table 6

Mean monthly dry protein values of Eragrostis curvula *and* Themeda triandra *on Rooiplaat (Mountain Zebra National Park) during 1979 and 1980*

Month	*Eragrostis curvula* X % dry protein	*Themeda triandra* X % dry protein
July	2,95	2,21
August	3,16	2,19
September	3,50	4,51
October	4,46	3,61
November	3,40	5,87
December	4,83	4,14
January	3,94	3,69
February	4,04	3,28
March	5,99	7,20
April	4,35	4,27
May	4,15	3,36
June	3,37	3,45
May — October	3,60	3,20
November — April	4,42	4,74

The zebra remaining on Rooiplaat during the winter months fed mainly on *Eragrostis curvula* seed heads which had a mean dry protein value of 7,23% in May and 6,34% in June 1980. Winter feeding was thus a more selective process on grass species or components which were less abundant but of an acceptable (>4%) protein content. The two main grass species on Rooiplaat showed higher mean protein levels in summer (Table 6).

Dry protein values of faeces did not correlate with rainfall (Table 7) and indicated that food quality was fairly stable throughout the year.

Table 7

Monthly rainfall on Rooiplaat (Mountain Zebra National Park) for 1979/1980 season and dry protein of faeces (as an indicator of veld quality)

Month	Rainfall (mm)	% dry protein in faeces
July	38,0 (S)	—
August	12,5	—
September	18,0 (S)	6,28
October	63,5	5,89
November	11,5	5,63
December	32,5	8,06
January	15,5	5,83
February	61,5	6,15
March	53,0	7,90
April	13,4	5,70
May	3,8	5,33
June	3,0	9,10

(S) indicates snow having fallen during the month.

Discussion

The most important finding from the study is that the Cape mountain zebra is a climax grazer, feeding at a fairly high level off the ground. This method of feeding serves to trim the grass tuft by removing much of the bulk growth and preventing the build up of moribund material. If the low level grazers were allowed to increase to the extent that the mean grass height (of the palatable species) was kept below that of the mean zebra feeding height, it would be detrimental to the population. This kind of grazing competition for different heights has been found with other species (see Grobler 1981).

The Cape mountain zebra also showed a preference for grass of high protein content. With non-ruminants the apparent digestibility of crude protein is markedly depressed by the crude fibre content (Glover & Duthie 1958). There appears to be little difference in digestive efficiency of the Hartmann mountain zebra *Equus zebra hartmannae* and the domestic horse *Equus caballus*. If anything, the ability of the

zebra to digest cellulose (crude fibre) is somewhat lower (Joubert & Louw 1977). Zebra are thus able to cope as course grazers but still appear to need a mean protein content of more than 4%.

The drop in protein content on the Rooiplaat plateau contributed to the seasonal movement of the zebra in the park. The percentage protein in the faeces fluctuated throughout the year showing a range of 5,33 to 9,10 (mean 6,69%). Springbok faeces have a higher protein content than zebra in the park but show the same seasonal pattern and quantitative differences seem to reflect real differences in the type of feed available or eaten by each species (Erasmus *et al.* 1978).

Such differences may not always be due to selection for different plant species but for different plant components. Springbok can select for the nutritious growth points in grasses while the zebra are more likely to take the coarser parts at a higher level.

Penzhorn (1982) suggests that the zebra in the park may make use of dwarf shrubs in the winter months as these retain a high protein level. In the present study there was no evidence to suggest that they made any use of dwarf shrubs. The conclusion from the present study is that the Cape mountain zebra is a selective grazer which feeds at a level well above the ground on perennial grasses.

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