Koedoe : *45–58* (1973).

NOTES ON RUMEN CONTENTS OF CAPE BUFFALO *SYNCERUS CAFFER* IN THE ADDO ELEPHANT NATIONAL PARK

by

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and

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Abstract – The oesophagus and rumen contents of 18 Cape buffalo that died during the 1969/70 drought in the Addo Elephant National Park near Port Elizabeth were analysed and are discussed as regards a description, based on quantitative data, of the main vegetation types in the Park. Notes on plant species that were observed being utilised by buffalo are also given.

Introduction

The Addo Elephant National Park is the only area in the Cape Province where Cape buffalo *Syncerus caffer* are still to be found in appreciable numbers.

The grazing habits of the buffalo in a bush clothed area differ in some ways from that which is found in a more open savanna vegetation type. This is mainly due to a difference in plant growthform composition. In the former area a buffalo is forced to utilize the more abundant trees and shrubs due to the near absence or inaccessibility of grass, while in the latter area grass forms by far the staple diet of buffalo. This study was undertaken during the second half of 1970 in order to become acquainted with the grazing preferences buffalo exert upon the available plant species in the Addo Elephant National Park.

The Park was proclaimed in 1931 and is at present 6 852 ha in extent. It is situated about 65 km north of Port Elizabeth and borders the well-known citrus producing area in the Sunday's River valley, to the south of the Suurberg mountain range.

In addition to elephants and buffalo the following large mammals are also conserved in the Park: eland, springbok, red hartebeest, black rhino, kudu and an array of smaller ungulates like duiker, mountain rhebuck and grysbok.

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Topography, Geology and Soils

Topographically this National Park presents a rather undulating landscape with rounded hills of which Suurkop (350 m) is the most prominent. The average altitude of the Park is 150 m.

To the north of the Park drainage is towards the Coerney River (a tributary of the Sunday's River) and on the southern side shallow valleys drain into Caeser's Dam which is part of the irrigation system from Lake Mentz. The drainage of the Park is in the form of a dendritic pattern as is characteristic of the Sunday's River system.

Geologically, the area in which the Park is situated is in a way peculiar. The geological formations are mostly of a marine origin and date back to the Cretaceous, Tertiary and Late Tertiary periods (Toerien, 1972).

The soils of those areas in the Park that are covered predominantly by Karoo bushes are most of a red-brown clay-loam nature with a shortage of humus. In the bushy areas a dark brown granular clay-loam soil with an abundance of humus is found.

Climate

Generally the climate of the Park can be described as mild. The summer months are very hot while mild winters are experienced. A considerable range between day temperatures are furthermore characteristic of the summer months. Light frost can occur during the winter.

The rainfall of the Park is very irregular, averaging 380 mm annually. It occurs mainly during the summer months in the form of thunderstorms. Prolonged droughts are a regular feature.

Vegetation

According to Acocks (1953) the vegetation of the Park is part of the Valley Bushveld. He states that this veld type was formerly a dense, semi-succulent thorny scrub. Dyer (1937) and Liebenberg (1945) maintain furthermore that the prevailing density and height of the shrubs are narrowly related to the rainfall and soil type. Most of the plants possess succulent leaves and twigs and other xeromorphic adaptations.

Two botanical surveys were carried out in the past on the whole Park or only a part thereof by Brynard (1954) and Archibald (1955). In the absence of a recent botanical survey, the results of these surveys have been used for a description of the plant material that is available for consumption by buffalo. This knowledge is imperative in order to see the results obtained in this study in perspective.

The vegetation of the Park can be divided into:

(i) Spekboomveld;
(ii) Grassveld;
(iii) Mixed grass- and karoobush-veld.

(i) *Spekboomveld*

The most dominant shrub in the Park, *Portulacaria afra* (spekboom),

is used to describe this well-known community-type which covers approximately 90 per cent of the entire Park area. In places outside the elephant enclosure the community is virtually impenetrable while within the enclosure the community presents clumps of spekboom mixed with other, often thorny, shrubs and small trees like *Capparis citrifolia*, *Carissa haematocarpa*, *Azima tetracantha*, *Schotia speciosa* and *Euclea undulata*. Interspersed with these clumps are small succulent and karroid shrubs.

Archibald (1955) made a detailed study of a typical portion of this community with a view to determine the main food species of elephants (*Loxodonta africana*). The Multiple Quadrat Method (Archibald, 1949) was used to determine the frequency of occurrence of species (Table 1).

The canopy height of an undisturbed community is about 5 m above ground level. The ground layer is poorly represented mainly by *Sansevieria* spp., and a few *Crassula* and *Asparagus* spp. Shade loving grasses like *Panicum deustum* and *Stipa dregeana* occur frequently under the shrubs.

(ii) *Grassveld*

Areas in the Park that are dominated by grasses, are known as Grassveld. Only about 129 ha (3–4 per cent of the surface of the Park) can be reckoned as such. The distribution of grassveld areas is markedly related to the occurrence of the Tertiary sediments known as the Alexandria layers (Toerien, 1972). The grasses flourish on the aeolian sand that covers the actual Tertiary deposits.

The centre of distribution of the grassveld community is found around Suurkop from where it peters out interruptedly to the Nuweveld area. Here it is found in isolated patches.

Due to the abundance of grasses which constitutes more or less 90 per cent of the total vegetation cover (Table 2, after Brynard, 1954) this community-type provides excellent grazing to buffalo, as shall be seen from the contents of their rumens (see below). *Themeda triandra* is the most dominant grass, while grasses such as *Digitaria eriantha*, *Eustachys paspaloides*, *Panicum coloratum*, *Aristida diffusa* and *Eragrostis curvula* occur less frequently (Table 3). On Suurkop Karoo-shrubs like *Aster muricatus*, *Pentzia incana*, *Walafrida geniculata* and *Helichrysum* spp. are more widespread than in the lower grassveld areas like Nuweveld.

Archibald (1955) refers to the grassveld areas under consideration as Mixed Shrub and Grassveld and the Bontveld. According to Brynard (1954) it should preferably be classified as grassveld interspersed with clumps of trees, which lends the "bont" (mottled) character to the veld. The trees are mainly *Scutia myrtina*, *Grewia occidentalis*, *Royena* sp. and *Maytenus polyacantha*.

(iii) *Mixed Grass- and Karoo-bushveld*

This community could be regarded as the outcome of a formerly *Portulacaria afra*-community that was subjected to various treatments in

Table I

Analysis of the Spekboom community, November, 1950

Species	Frequency of occurrence of species in a total of 20 quadrats.		
	Quadrat size in square metres		
	1	16	64
Portulacaria afra	15	20	20
Sansevieria thyrsiflora	10	20	20
Azima tetracantha	10	19	20
Asparagus sp.	3	18	20
Capparis citrifolia	2	17	20
Rhoicissus spp.	5	15	20
Euclea undulata	4	15	20
Panicum spp.	5	13	20
Schotia speciosa	3	17	19
Asparagus subulatus	1	10	18
Crassula expansa	2	4	18
Rhus longispina	3	14	17
Sarcostemma viminale	2	9	16
Crassula perforata	–	4	16
Pelargonium peltatum	–	3	15
Crassula cultrata	–	8	14
Cadaba juncea	2	7	13
Gymnosporia spp.	5	10	12
Cincraria lobata	2	5	12
Viscum rotundifolium	1	9	10
Carissa bispinosa	–	5	10
Maerua caffra	–	5	9
Bulbine sp.	–	1	9
Commelina benghalensis	1	5	8
Cryophytum angulare	–	4	8
Asparagus africana	–	3	8
Putterlickia pyracantha	–	2	8
Poa sp.	3	5	7
Asparagus striatus	2	3	7
Rhus sp.	3	3	7
Behnia reticulata	2	2	7
Aizoon glinoides	2	4	6
Asparagus kraussii	–	2	6
Cyphia heterophylla	–	2	6
Plumbago capensis	–	2	6
Scilla sp.	–	1	6

Table 1 (cont.)

Analysis of the Spekboom cummunity, November, 1950

Cynodon dactylon	1	3	5
Stipa dregeana	–	1	5
Crassula lycopodioides	–	–	5
Aster sp.	–	4	4
Commelina africana	1	3	4
Ptaeroxylon obliquum	1	3	4
Crassula turrita	–	1	4
Chenopodium sp.	1	2	3
Crassula rosularis	–	1	3
Cynanchum sarcostemmatoides	–	1	3
Delosperma No. 35	–	1	3
Abutilon sonneratianum	–	–	3
Delosperma No. 70	1	2	2
Atriplex sp.	–	2	2
Jasminum angulare	–	2	2
Delosperma No. 53	1	1	2
Aloe africana	–	1	2
Euphorbia burmanni	–	1	2
Fockea edulis	–	1	2
Galenia pubescens	–	1	2
Grewia occidentalis	–	–	2
Solanum qudrangulare	–	–	2
Crassula spathulata	1	1	1
Asparagus sp.	–	1	1
Crassula portulacea	–	1	1
Gymnosporia capitata	–	1	1
Ceropegia carnosa	–	–	1
Euclea sp.	–	–	1
Eragrostis brizoides	–	–	1
Ipomea ficifolia	–	–	1
Oxalis sp.	–	–	1
Senecio sp.	–	–	1
Average number of species per quadrat	4,6	16,05	26,7
Total number of species in area sampled			71

Table 2

The species composition (August, 1954) in terms of the percentage basal cover of the Nuweveld area between Bean's Corner and Middelkop

Species	% *Basal Cover*
Perennial Grasses	
Aristida diffusa	0,10
Cymbopogon plurinodis	0,80
Digitaria eriantha	1,90
Eragrostis obtusa	0,90
Eustachys paspaloides	0,10
Panicum coloratum	0,10
Sporobolus fimbriatus	0,20
Themeda triandra	8,00
Annual Grasses	
Cynodon incompletus	1,10
Karoo Shrubs	
Aster muricatus	0,40
Chrysocoma tenuifolia	0,20
Helichrysum sp.	0,10
Hibiscus sp.	0,10
Pentzia incana	0,20
Walafrida geniculata	0,30
Total	14,50

the past to encourage the growth of the grasses. However, due mainly to the resulting selective grazing which was thereby induced, the development of grasses was largely arrested.

This community occurs in the north-eastern sector of the Park (the Woodlands area) and also near the south-western corner near Caeser's Dam on the Korhaanflats. The total surface of this community amounts to some 600 ha.

The community is largely dominated by the palatable spiny Karoo-shrubs, namely *Ruschia* sp. (Tables 4, 5, 6, after Brynard, 1954). Other palatable to semi-palatable karoo-shrubs of frequent occurrence are *Aster muricatus*, *Pentzia incana*, and *Walafrida geniculata*. All these karoo-shrubs are, however, not considered to be good grazing material for buffaloes. Perennial grasses like *Digitaria eriantha*, *Sporobolus fimbriatus*, *Eragrostis curvula*, *E. obtusa*, *Panicum coloratum*, *Setaria neglecta* and *Themeda triandra* are widely scattered while annual grasses like *Cynodon incompletus*, *Phalaris minor* and *Microchloa caffra* are commonly found after a wet period.

Widespread shrubs and trees such as *Euclea undulata*, *Capparis citrifolia* *Maytenus* spp., *Portulacaria afra* and *Schotia speciosa* in these areas serve as evidence of a formerly dense, semi-succulent thorny scrub.

Table 3

Species composition (August 1954) in terms of percentage basal cover of the Suurkop Plateau

Species	% *Basal Cover*
Perennial Grasses	
Aristida diffusa	0,40
Cymbopogon plurinodis	0,20
Danthonia disticha	0,25
Digitaria eriantha	0,90
Ehrharta calycina	0,20
Eragrostis curvula	0,35
E. obtusa	0,10
Eustachys paspaloides	0,95
Panicum coloratum	0,60
P. deustum	0,35
Sporobolus fimbriatus	0,05
Themeda triandra	7,35
Unidentified	0,25
Annual Grasses	
Cynodon incompletus	0,20
Sedges	
Scirpus sp.	0,05
Karoo Shrubs	
Aster muricatus	0,06
Euphorbia sp.	0,05
Galenia sarcophylla	0,15
Helichrysum sp.	0,05
Lepidium bursapastoris	0,05
Shrubs	0,10
Total	12,66

Material and Methods

During 1969 and the first eight months of 1970 the Park experienced a very pronounced and enduring drought, which was only relieved by showers towards the end of August 1970. These unfavourable climatic conditions inevitably led to losses in the buffalo population that amounted to approximately 75 animals.

Basically two methods were employed to get an indication of the specific plant species buffalo prefer to graze in the Park namely:

(i) A detailed macroscopical analysis of the oesophagus and rumen contents of fresh buffalo carcasses that became available during the drought mentioned above. The contents of these organs were dried and thereafter stored in plastic bags for future identification.

Table 4

Species composition (August, 1954) in terms of percentage basal cover of the Woodlands Dam area

Species	% *Basal Cover*
Perennial Grasses	
Digitaria eriantha	1,00
Eragrostis obtusa	0,30
Microchloa caffra	0,05
Setaria neglecta	0,05
Sporobolus fimbriatus	0,10
Themeda triandra	0,05
Karoo Shrubs	
Aster muricatus	0,30
Crassula lycopodioides	0,10
Galenia sarcophylla	0,55
Helichrysum sp.	0,10
Pentzia incana	1,80
Pteronia sp.	0,20
Ruschia spp..	2,90
Sutera pinnatifida	0,05
Tritonia securigera	0,10
Walafrida geniculata	0,55
Annuals	
Commelina africana	0,40
Cynodon incompletus	0,60
Oxalis stellata	0,05
Other	
Acacia karoo	0,05
Sansevieria thyrsiflora	0,05
Unidentified spp.	0,05
Total	9,40

(ii) An observational method whereby some live animals were observed when grazing or browsing.

Results and Discussion

A list of identified genera and species of plants which has been found in the oesophagus and rumen contents of 18 buffalo, is shown in Table 7. This information is by no means a complete statistical valid evaluation of the food preferences of buffalo in the Park, but serves as a background for investigation.

The results obtained are furthermore only indicative of the rumen contents of buffalo after a dry climatic spell. A different set of results

Table 5

Species composition (August, 1954) in terms of percentage basal cover of the Olifantskloof area

Species	% *Basal Cover*
Perennial Grasses	
Digitaria eriantha	0,10
Eragrostis obtusa	0,20
Setaria neglecta	0,10
Karoo Shrubs	
Aster muricatus	1,20
Euryops spathaceus	0,10
Galenia sarcophylla	0,30
Pentzia incana	1,30
Ruschia spp..	2,10
Walafrida geniculata	1,60
Annuals	
Commelina africana	0,30
Cynodon incompletus	3,90
Oxalis stellata	0,40
Other	
Amaryllis sp.	0,10
Cotyledon campanulata	1,60
Lycium sp.	0,20
Sansevieria thyrsiflora	0,10
Total	13,60

could be expected after a rainy period. To verify the results shown in Table 7 and to provide additional data the plants grazed by buffalo were noted (Table 8).

The quantitative work done by Brynard (1954) and Archibald (1955) have revealed that approximately 46 plant families occur within the boundaries of the Addo Elephant National Park. Of these families only 15 were encountered within the rumens (Table 7) while another 10 were observed being utilized by buffalo (Table 8), giving an overall total of 25 families utilized by the buffalo.

The plant species that were identified from the rumens of buffalo (Table 7), indicate to a marked degree that the buffaloes in the Addo Park could rather be considered browsers than grazers. The majority of species, excluding the grasses, that occurred in 50 per cent or more of the rumens e.g. *Portulacaria afra*, *Capparis sepiaria*, *Schotia afra*, *Sideroxylon inerme* and *Azima tetracantha* are all frequently found in the well-known Spekboomveld described above. Some other species that occurred less commonly in the rumens e.g. *Sansevieria* spp., *Asparagus* cf. *racemosus*,

Table 6

Species composition (August, 1954) in terms of percentage basal cover of the Korhaanflats area

Species	% *Basal Cover*
Perennial Grasses	
Digitaria eriantha	0,95
Eragrostis curvula	0,05
E. obtusa	0,20
Panicum coloratum	0,75
Setaria neglecta	0,10
Sporobolus fimbriatus	0,30
Themeda triandra	0,20
Annual Grasses	
Cynodon incompletus	2,25
Karoo Shrubs	
Aster cf. *muricatus*	0,20
Galenia sarcophylla	0,70
Limeum sp.	0,05
Pentzia incana	0,50
Ruschia spp.	2,45
Trifolium cf. *africanum*	0,05
Walafrida geniculata	0,15
Other	
Bulbine sp.	0,05
Duvalia sp.	0,15
Euphorbia sp.	0,10
Lasiocorys capensis	0,10
Lycium sp.	0,10
Portulacaria afra	0,05
Sansevieria thyrsiflora	0,05
Unidentified	0,35
Total	9,85

Viscum rotundifolium, *Scutia myrtina*, *Putterlickia pyracantha*, *Cassine aethiopica*, *Maytenus putterlickoides*, *Rhoicissus digitata*, *Rapanea gilliana*, *Sideroxylon inerme* and *Euclea undulata*, are furthermore almost exclusively found within the dense bush communities in the Park (Table 1). Therefore, seeing that the buffalo apparently devotes most of its time to browsing in the dense bush rather than in less dense vegetation, it is possible that the majority of grass species which occurred in 100 per cent of the rumens consisted predominantly of shade-loving grasses e.g. *Panicum deustum* and *Stipa dregeana*.

The 100 per cent occurrence of the family Gramineae in the rumens

Plant Family	Genus and species	Buffalo (Field Number)																	
		8	9	10	13	15	16	18	28	29	30	31	32	35	36	37	39	42	43
*12. Gramineae	Gen. et. sp. indet.	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
25. Liliaceae	*Sansevieria* sp.																×		
	Asparagus striatus						×											×	
	A. cf. *racemosus*															×			
42. Loranthaceae	*Viscum rotundifolium*								×		×		×					×	×
50. Polygonaceae	*Polygonum* sp.		×				×												
55. Aizoaceae	*Mesembryanthemum* sp.											×							
	Ruschia sp.			×			×	×	×								×		
	Lampranthus sp.		×		×		×	×					×	×		×		×	×
56. Portulacaceae	*Portulacaria afra*	×	×		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
70. Capparidaceae	*Capparis sepiaria*	×				×		×	×	×	×	×	×			×		×	×
85. Leguminosae	*Schotia afra*	×			×	×	×	×	×	×	×	×	×	×		×	×	×	
	S. myrtina											×							
	Medicago dentiantata						×												
90. Zygophyllaceae	cf. *Zygophyllum* sp.		×																
103. Celastraceae	*Putterlickia pyracantha*												×					×	
	Cassine aethiopica						×				×	×							×
	Maytenus putterlickoides						×				×							×	
111. Vitaceae	*Rhoicissus digitata*					×		×			×	×	×					×	×
147. Myrsinaceae	*Rapanea gilliana*											×						×	×
150. Sapotaceae	*Sideroxylon inerme*					×	×		×		×	×	×			×	×	×	×
151. Ebenaceae	*Euclea undulata*				×						×	×							×
153. Salvodoraceae	*Azima tetracantha*	×				×		×	×		×	×	×			×		×	×

* Number of family according to Phillips (1951)

investigated, stresses the grazing habit of buffalo. The grassveld in the Suurkop and Nuweveld areas is probably a major grazing resource that contributes to this figure. From Table 7 it is evident that the mixed grass- and karoobush-veld, described above, are not often utilized by the buffalo. *Ruschia* sp., the dominant component of these areas, occurred in

Table 8

Plants observed utilized by buffalo

*12.	Gramineae	*Phalaris minor, Hordeum murinum, Bromus willdenowii, Lolium loliaceum, Eragrostis obtusa, E. curvula, Digitaria eriantha*
22.	Commelinaceae	*Commelina* sp.
25.	Liliaceae	*Asparagus striatus, Aloe africana, Albuca* sp.
50.	Polygonaceae	*Polygonum aviculare, Emex australis*
51.	Chenopodiaceae	*Chenopodium murale*
55.	Aizoaceae	*Aptenia cordifolia, Galenia pubescens, G. secunda, G. sarcophylla*
56.	Portulacaceae	*Portulacaria afra*
70.	Capparidaceae	*Capparis sepiaria, Maerua cafra*
85.	Leguminosae	*Medicago hispida, Schotia afra*
98.	Euphorbiaceae	*Euphorbia caterviflora, E. mauritanica*
101.	Anacardiaceae	*Rhus refracta*
103.	Celastraceae	*Putterlickia pyracantha,* cf.*Maytenus polyantha, Cassine aethiopica, Maytenus undatus*
111.	Vitaceae	*Rhoicissus digitata*
112.	Tiliaceae	*Grewia robusta*
113.	Malvaceae	*Malva parviflora*
150.	Sapotaceae	*Sideroxylon inerme*
153.	Salvodoraceae	*Azima tetracantha*
160.	Boraginaceae	*Ehretia rigida*
173.	Plantaginaceae	*Plantago lanceolata*
180.	Compositae	*Cotula* cf. *coronopifolia, C. anthemoides, Aster* cf. *bergerianus, Arctotheca calendula, Lactuca* sp. (cf. *tysonii*), *Platycarpha glomerata*

* Number of family according to Phillips (1951).

only 28 per cent of the rumens, while species of *Mesembryanthemum* and *Lampranthus* were identified in six per cent and 50 per cent of the rumens. Annual grasses e.g. *Phalaris minor, Hordeum murinum, Bromus wildenowii* and *Lolium loliaceum* are also utilized (Table 8).

It is of interest to note that the species preferred by the buffaloes are

also favoured by the elephants, as can be seen from Table 1. The diet of these animals seems to be of a digestible and palatable nature, if the chemical composition of some species like *Portulacaria afra*, *Schotia afra*, and *Euclea undulata*, that are favoured by them, is considered. Aucamp (1972) did some work on the feeding value of these species. The protein content of most of these shrubs is considered to be generally high, while the fibre and lignin content is low. Ether extracts are also of a low value.

Summary

An attempt has been made to enlighten the relatively unknown grazing habits of a relict Cape buffalo population in the Addo Elephant National Park.

The vegetation is a low, dense, dry forest. The majority of plants possess succulent leaves and twigs and other xeromorphic adaptations. On the basis of physiognomy the vegetation has been divided into:

(i) Spekboomveld;

(ii) Grassveld;

(iii) Mixed grass- and karoobush-veld.

A broad description of these community-types is given, based on some quantitative surveys done by Brynard (1954) and Archibald (1955).

Two methods were employed to get an indication of the specific plant species buffalo prefer to graze, namely a detailed macroscopical analysis of the oesophagus and rumen contents of fresh buffalo carcasses that became available during the 1969/70 drought, and an observational method whereby some live buffalo were observed when grazing or browsing.

Of the approximately 46 plant families that have been recorded in the Park, 15 were encountered within the rumens while another 10 were observed being utilized by buffalo.

The plant species that could be identified within the rumens of the buffalo indicate that the buffaloes in the Park could rather be considered browsers than grazers.

The food preferences of buffalo correspond closely to that of the Addo elephants. The diet of these animals seems to be of a digestible and palatable nature.

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