Diet of black rhinoceros (*Diceros bicornis minor*) as determined by faecal microhistological analysis at the Mokopane Biodiversity Conservation Centre, Limpopo Province – a preliminary investigation

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The diet of black rhinoceros (*Diceros bicornis minor*) has been the subject of a number of studies in various regions but information for the central bushveld region is sparse. This communication shows a number of woody species utilized by black rhino in this region and identified by means of microhistological faecal analysis. A total of 18 species were identified from the samples collected.

Key words: black rhinoceros, faecal analysis, diet, Limpopo Province, Central Bushveld.

INTRODUCTION

Identifying key food resources for herbivores across diverse habitats provide valuable insights into diet flexibility, which may contribute towards identifying species conservation opportunities, or alternatively, caution against inappropriate introductions. Despite descriptions of black rhinoceros (*Diceros bicornis minor*) diet across a range of habitats (*e.g.* Kotze & Zacharias 1993; Muya & Oguge 2000; Codron *et al.* 2007; Van Lieverloo *et al.* 2009; Buk & Knight 2010), using a variety of techniques (*e.g.* faecal analysis, direct observations, feeding tracks, carbon isotopes), no such descriptions exist for the Central Bushveld region (Mucina & Rutherford 2006) of South Africa, where the species has been re-introduced. This note reports on the diet of two rhinoceros (one male and one female) introduced to the Mokopane Biodiversity Conservation Centre (MBCC; 24°10′S, 29°01′E), Limpopo Province from KwaZulu-Natal in 1993. At the time of the study, these rhinoceros ranged freely within a 700 ha fenced portion of the centre.

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METHODS

Direct observations were rejected due to the density of the vegetation and the attendant dangers, although a few chance encounters added to species taken by direct observation. We used microhistological analysis of faeces to describe the diets (Sparks & Malechek 1968). The technique assessed the relative proportions of epidermal fragments in the faeces by reference to a collection of the epidermal tissues of potential food items ($n = 100$) identified at the study site. Faecal analysis has been used extensively to describe diets (*e.g.* Landman *et al.* 2008) and the accuracies and biases of the technique are discussed in Holechek *et al.* (1982). Twenty fresh faecal samples were collected from both rhinoceros between May 2007 and April 2008. It was impossible to separate faeces per individual animal. Faeces samples of approximately 2 kg were collected in the field and were dried, ground and stored until analysis. Sample preparation (5 g sub-samples) and analysis followed Landman *et al.* (2008). We treated each faecal sample as an independent observation and identified 100 epidermal fragments to species level per sample. In an attempt to document potential seasonal variations in the diet, we grouped samples collected monthly between May and October ($n = 10$; dry season) and November and April ($n = 10$; wet season), respectively. Of these, seven of the wet season samples were collected in December and January while all dry season months with the exception of August are represented.

RESULTS

We recorded 18 woody shrub and tree species in the diet of rhinoceros at the MBCC (Table 1) and two groups of species not identified to species level. At least 11 other woody species could potentially occur in the diet, but we were unable to discriminate between these items because they lacked unique identifiable features; hence, we grouped these items into three groups using similarities in epidermal features (Table 1). *Vachellia* spp. comprised *Vachellia caffra, V. karroo, V. nilotica and V. tortilis.* Species group 1 consisted of *Clerodendrum glabrum, Diplorhynchus condylocarpon, Flueggea virosa* and *Pappea*

Table 1. Frequency of occurrence of epidermal leaf fragments (first 100 identified) by season identified by microhistological analysis in 20 faecal samples (10 per season) of black rhinoceros at the Mokopane Biodiversity Conservation Centre, Limpopo Province, from May 2007 to April 2008.

	Wet season (Nov–Apr)				Dry season (May–Oct)			
	Total fragments	Sample size	% of sample	S.E.	Total fragments	Sample size	% of sample	S.E.
Woody plant species								
Dichrostachys cinerea	193	7	19.3	6.0	3	5	0.3	0.2
Lannea discolor/Grewia monticola	140	10	14.0	5.2	399	9	39.9	8.2
Group 1*	131	10	13.1	4.1	109	10	10.9	2.3
Group 2#	29	4	2.9	1.0	5	4	0.5	0.4
Unidentified (same species)	23	5	2.3	2.2	71	4	7.1	3.1
Schotia brachypetala	19	7	1.9	0.9	6	2	0.6	0.3
Strychnos pungens	18	2	1.8	1.7	121	4	12.1	6.5
Acacia burkei	16	2	1.6	1.1	0	–	–	–
Unidentified	12	8	1.2	0.3	29	10	2.9	0.6
Acacia spp.	9	2	0.9	0.3	6	5	0.6	0.3
Calpurnia aurea	3	2	0.3	0.2	1	1	0.1	–
Commiphora africana	3	1	0.3	–	3	1	0.3	–
Commiphora schimperi	3	3	0.3	0.2	1	1	0.1	–
Tarchonanthus camphoratus	3	1	0.3	–	0	–	–	–
Carissa bispinosa	1	1	0.1	–	9	3	0.9	0.5
Combretum spp.	1	1	0.1	–	0	–	–	–
Ehretia rigida	1	1	0.1	–	9	1	0.9	–
Grewia spp.	1	1	0.1	–	0	–	–	–
Euclea crispa	0	–	–	–	3	2	0.3	0.2
Euclea undulata	0	–	–	–	148	2	14.8	9.9
Englerophytum magalismontanum	0	–	–	–	4	1	0.4	–
Unidentified – not in reference collection	0	–	–	–	4	2	0.4	0.3
Ximenia caffra	0	–	–	–	1	1	0.1	–
Forbs	256	10	25.6	5.5	11	6	1.1	0.6
Grasses	138	10	13.8	3.6	57	9	5.7	1.0

**Clerodendrum clabrum, Diplorhynchus condylocarpon, Flueggea virosa* and *Pappea capensis.*

#Gymnosporia polyacantha, Kirkia wilmsii, Searsia pentheri, Sclerocarya birrea subsp. *caffra* and *Ziziphus mucronata.*

capensis. Species group 2 consisted of *Gymnosporia polyacantha, Kirkia wilmsii, Searsia pentheri, Sclerocarya birrea* subsp. *caffra* and *Ziziphus mucronata.* It is likely that forbs were under-represented in faecal samples and the leafiness of *Euclea undulata* has led to its over-representation in the dry season samples. Direct observations made during *ad hoc* encounters with the animals recorded six species that were not recorded in the faeces; these included *Datura stramonium, Euphorbia ingens, Grewia flavescens, Lantana rugosa, Mundulea sericea, Securidaca longepedunculata* and *Solanum* spp. These observations were all single observations and could not be quantified but do add to the list of species taken and confirm the limitations of this type of analysis. *Euclea undulata* (14.8%) and *Dichrostachys cinerea* (19.3%) were the most frequent food items from the dry and wet seasons, respectively. The group comprising *Grewia monticola* and *Lannea discolor* were particularly prevalent in the diet during the dry season. Not surprisingly, forbs comprised an appreciable proportion of the diet during the wet season (Table 1).

Black rhinoceros in the MBCC utilized species consistent with descriptions of rhinoceros diet elsewhere (*e.g.* Kotze & Zacharias 1993; Muya & Oguge 2000; Buk & Knight 2010). However, it is also likely that the limited number of species utilized reflects our limited sampling effort and inability to distinguish between food items; the latter further illustrating the limitations of the faecal analysis technique (*e.g.* Holechek *et al.* 1982). Furthermore the presence of sticks and twigs in black rhino diet is omitted with this method although the assumption can be made that sticks and twigs of the same species as leaves will be present in the diet. Notwithstanding the limitations of our study, it has contributed towards expanding our understanding of the diet of black rhinoceros.

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