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Notes and records

Dry season browsing by sable antelope in northern Botswana

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Introduction

The late dry season is a crucial period for grazing ungulates because the nutritional value of the remaining brown grass is lowest then and levels of crude protein and digestible organic matter may fall below the maintenance requirements of herbivores (Owen-Smith, 1982). During this adverse period, mixed feeders like impala (*Aepyceros melampus*) increase the proportion of browse in the form of the leaves of the woody plants they consume (Owen-Smith & Cooper, 1985). Crude protein levels are generally higher and seasonally more constant in foliage of woody plants than in grasses (Owen-Smith, 1982), but the foliage is commonly defended by tannins or spines that restrict consumption by grazers not adapted to cope with them (Cooper & Owen-Smith, 1985, 1986; Cooper, Owen-Smith & Bryant, 1988).

Sable antelope (*Hippotragus niger*) are predominantly grazers and are distributed throughout southern African savannahs (Estes, 1991; Skinner & Chimimba, 2005) where the dry season is prolonged and ambient temperatures are high before the rains begin. Grass quality is especially poor on infertile, sandy soils (Bell, 1984). Sable typically depend on green grass persisting in drainage sump grasslands or in recently burned areas during the dry season (Estes & Estes, 1974; Parrini & Owen-Smith, 2009). However, contrary to previous reports, we observed a substantial amount of browsing by sable in our study area during the dry season. Here, we quantify the contribution made by browse to the diet of sable in our study area.

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Methods

The study area was located on the northern edge of the Okavango Delta in Botswana. An adult female sable in each of three herds was fitted with a GPS collar to facilitate observations. When the herd being observed from a vehicle was foraging, we selected the closest female and watched her feeding from 10 to 50 m away. Beginning on any tenth minute of the hour, we recorded whether this animal was browsing, grazing or performing other activities on every tenth second over a minute (n = 879 1-min observations). Records were pooled within each morning and afternoon observation session so that these sessions represented independent samples (n = 113 ranging in duration from 3 to 13 min). Following initial observations of browsing in late 2009, records representing early wet season conditions were collected from December 2009 through January 2010 (n = 46), mid-dry season conditions through August–September 2010 (n = 36), and late dry season conditions through October–November 2010 (n = 31).

The beginning of a foraging path was identified as the location of the closest observed female to the vehicle on any fifteenth minute of the hour if the majority of the herd was foraging. Foraging paths identified by fresh tracks of the selected sable were typically 25 m in length. We recorded which woody species were available within 5 m of the foraging path with foliage below 2 m above ground. Fresh bite marks were counted on each woody plant. Grouping morning and afternoon foraging paths separately yielded 91 foraging sites assumed to be independent. The availability of each woody species was estimated from the number of foraging sites where it was present divided by the total of foraging sites. The acceptability of each species was estimated as the number of foraging sites where it was browsed once or more divided by the number of foraging sites where it was present (Owen-Smith & Cooper, 1987). Only woody species present in more than 10 foraging sites in at least one season were considered. The proportion contributed by each species was assessed as the number of bites taken from it divided by the total number of bites across all woody plants. Acceptability and

relative browse contributions were not estimated for the wet season because too little browsing occurred then.

Results

Browsing by sable was observed in over half of observation sessions in the dry season of 2010 (Fig. 1) and amounted to about a quarter of feeding time towards the end (Fig. 2). Feeding on sausage tree (*Kigelia africana*) flowers took place frequently during the mid-dry season. Of the seven woody species encountered in ten or more foraging sites in any seasons, Kalahari apple-leaf (*Philenoptera nelsii*) made the greatest dietary contribution, although knobbly combretum (*Combretum mossambicense*) was equally highly acceptable (Table 1). Other commonly available woody species were eaten rarely or not at all. Very little browsing took place during the early wet season.

Discussion

Wilson & Hirst (1977) did not observe any browsing by sable antelope in northern South Africa and reported that browse fragments were infrequent in the rumen contents of sable from other regions of South Africa. Stable carbon isotopes in faeces indicated that C3 (nongrass) plants made no contribution to the year-round diet of sable antelope in Kruger National Park (Codron *et al.*, 2007). In Zimbabwe, browsing by sable amounted to only 0.1% of feeding records made up of newly flushed leaves of camphor bush (*Tarchonanthus camphoratus*) and common wild currant (*Rhus pyroides*) eaten during the hot dry season (Grobler, 1981). Studies summarized by Gagnon & Chew (2000) suggested a mean dicot content of around 10% in the diet of sable in southern Africa. However, a sable antelope shot in the Matetsi region of Zimbabwe had mainly dicotyledonous plant parts in its rumen (Wilson & Hirst, 1977). Our observations indicated that woody plant parts including flowers contributed about a quarter of the diet of sable antelope in northern Botswana during the late dry season. Our impression was that the browse component consumed by sable, including flowers of Kalahari apple-leaf trees, was even greater during the dry season of 2009. Browsing took place at a time of the year when the green leaf content of grasses was generally low and their nutrient content likely to be especially low on the prevalent sandy soils. Sable did not exploit nearby floodplains presenting greener grass, apparently avoiding concentrations of other grazers there (Hensman, unpublished observations). A feature of the extended hot dry season typical of our study region is that many trees and shrubs produce new leaves before the rains commence, offering forage much higher in protein content than available in grasses at this time of the year (Cooper, Owen-Smith & Bryant, 1988; Owen-Smith, 1994).

Congeneric roan antelope (*Hippotragus equinus*) have been recorded consuming more browse than any other grazer during the dry season (Hashim, 1987; Owen-Smith, 1997). Both roan and sable depend on quite tall, fibrous grasses (Wilson & Hirst, 1977; Knoop & Owen-Smith,

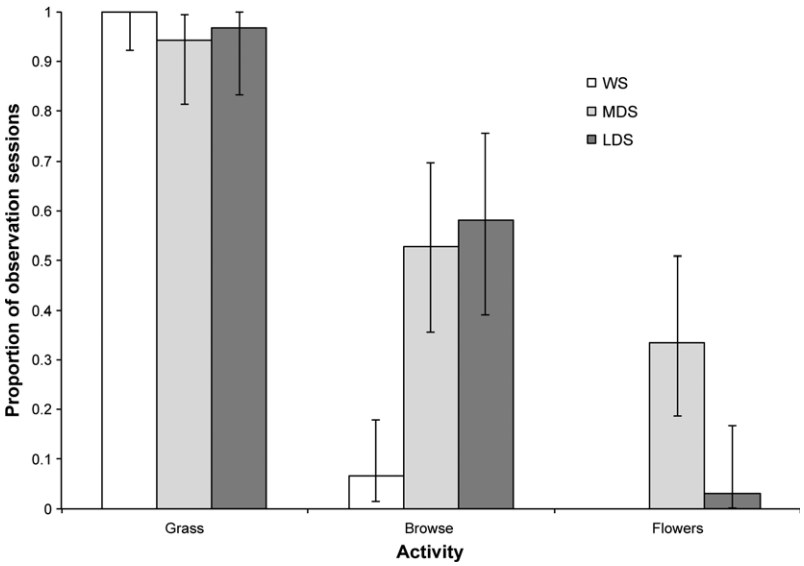

Fig 1 The proportion of observations sessions in which grazing, browsing or feeding on fallen flowers by sable was recorded during the wet season (WS, December–January), mid-dry season (MDS, August–September) and the late dry season (LDS, October–November). Vertical bars represent 95% binomial confidence intervals

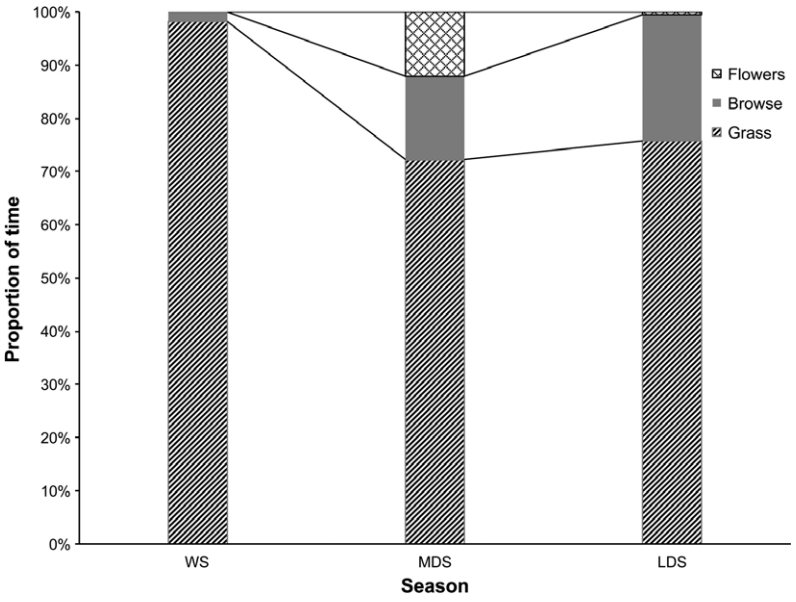

Fig 2 Proportion of foraging time spent grazing, browsing or consuming fallen flowers by sable antelope in the wet season (WS, December–January), mid-dry season (MDS, August–September) and late dry season (LDS, October–November) months

Table 1 Seasonal availability, acceptability and proportion of browse consumed by sable from woody species

	Availability			Acceptability		Proportion of browse consumed	
Browse species	WS	MDS	LDS	MDS	LDS	MDS	LDS
Philenoptera nelsii	0.22	0.60	0.53	0.44	0.65	0.78	0.89
Combretum mossambicense	0.30	0.23	0.18	0.25	0.71	0.18	0.11
Croton megalobotrys	0.39	0.09	0.08	0.20	0.00	0.02	0.00
Terminalia sericea	0.61	0.26	0.42	0.07	0.06	0.01	0.00
Colophospermum mopane	0.22	0.38	0.26	0.05	0.00	0.01	0.00
Diospyros lycioides	0.70	0.32	0.16	0.00	0.00	0.00	0.00
Gymnosporia senegalensis	0.00	0.21	0.08	0.00	0.00	0.00	0.00

Wet season (WS) = December 2009 through January 2010; mid-dry season (MDS) = August through September 2010 and; late dry season (LDS) = October through November 2010.

2006; Macandza, Owen-Smith & Cain, 2012). Heitkonig (1993) found that roan antelope have an unusually high digestive passage rate for a grazer, which could facilitate processing lignified fibre in browse as well as in these grasses. We surmise that sable antelope share a similar dietary adaptation, although studies of their digestive adaptation are lacking.

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