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# Note and record

## A record of cheetah (*Acinonyx jubatus*) diet in the Northern Tuli Game Reserve, Botswana

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### Introduction

Cheetahs (*Acinonyx jubatus*) typically prey upon the most available small to medium-sized (23–56 kg) antelope (Hayward *et al.*, 2006). In Botswana, impala (*Aepyceros melampus*) and springbok (*Antidorcas marsupialis*), followed by steenbok (*Raphicerus campestris*) and duiker (*Sylvicapra grimmia*), are the prey species most frequently killed by cheetahs (Klein, 2007). Juvenile eland (*Tragelaphus oryx*), gemsbok (*Oryx gazella*), hartebeest (*Alcelaphus buselaphus*) and kudu (*Tragelaphus strepsiceros*) are also taken (Klein, 2007).

The Northern Tuli Game Reserve (NOTUGRE) in eastern Botswana is naturally delineated by the nonperennial Shashe and Limpopo rivers in the east and south and has relatively porous game fencing along portions of the western and southern boundaries (Fig. 1) (Jackson, McNutt & Apps, 2012). Neither the fences nor the rivers restrict the movement of large carnivores such as cheetahs, lions (*Panthera leo*), leopards (*Panthera pardus*), spotted hyaenas (*Crocuta crocuta*) and African wild dogs (*Lycaon pictus*) onto neighbouring pastoral land (Jackson, McNutt & Apps, 2012). It is thus possible that cheetahs are feeding on livestock outside of the park. However, the diet of the cheetahs in NOTUGRE has not been evaluated. Our study serves to describe the diet of the cheetahs in NOTUGRE using both scats and kill sightings.

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### Methods

Cheetah scats (n = 35) were collected from seventeen known cheetah scent posts within NOTUGRE between September 2012 and October 2013 (Fig. 1). The scats were processed using standard techniques (Melville, Bothma & Mills, 2004; Wilson, 2006; Klare, Kamler & Macdonald, 2011). Ten hairs per scat were extracted for cuticle scale imprints and as many as possible were extracted for cross-sectional analysis (Marker *et al.*, 2003; Bissett, 2004; Van de Ven, Tambling & Kerley, 2013). Hairs were identified to species using Rhodes University's hair reference collection. All identifications were verified by two trained observers. As eland and kudu hairs are very similar, these species were grouped together (*Tragelaphus* sp.) (Marker *et al.*, 2003). The frequency of occurrence of each prey species was calculated by dividing the number of scats which contained that species by the total number of scats (Klare, Kamler & Macdonald, 2011).

Direct observations of cheetah kills (n = 35) by nature guides and other researchers on NOTUGRE between 2012 and 2013 were also included in our diet assessment. Prey preference was calculated using Jacob's Index (Jacobs, 1974). Camera traps (Cuddeback Attack, n = 24 (Non Typical Inc., Green Bay, USA) and Bushnell Trophy Cam, n = 6 (Bushnell Outdoor Products)) collected data for 90 days in 2012 which was used to estimate the relative abundance of prey in the reserve (see Brassine, 2014). Eleven of the species captured on the cameras were considered to be within cheetahs' potential prey base, based on previous research (Hayward *et al.*, 2006). The relative abundance of these eleven species was calculated (Brassine, 2014).

### Results and discussion

Overall, eight species and one species assemblage (*Tragelaphus*) were recorded in the cheetah scats (Table 1). Five species were recorded in the kills (Table 1). Impala was the dominant species identified in both scats and kills. The eland and wildebeest kills were both calves, and one of the

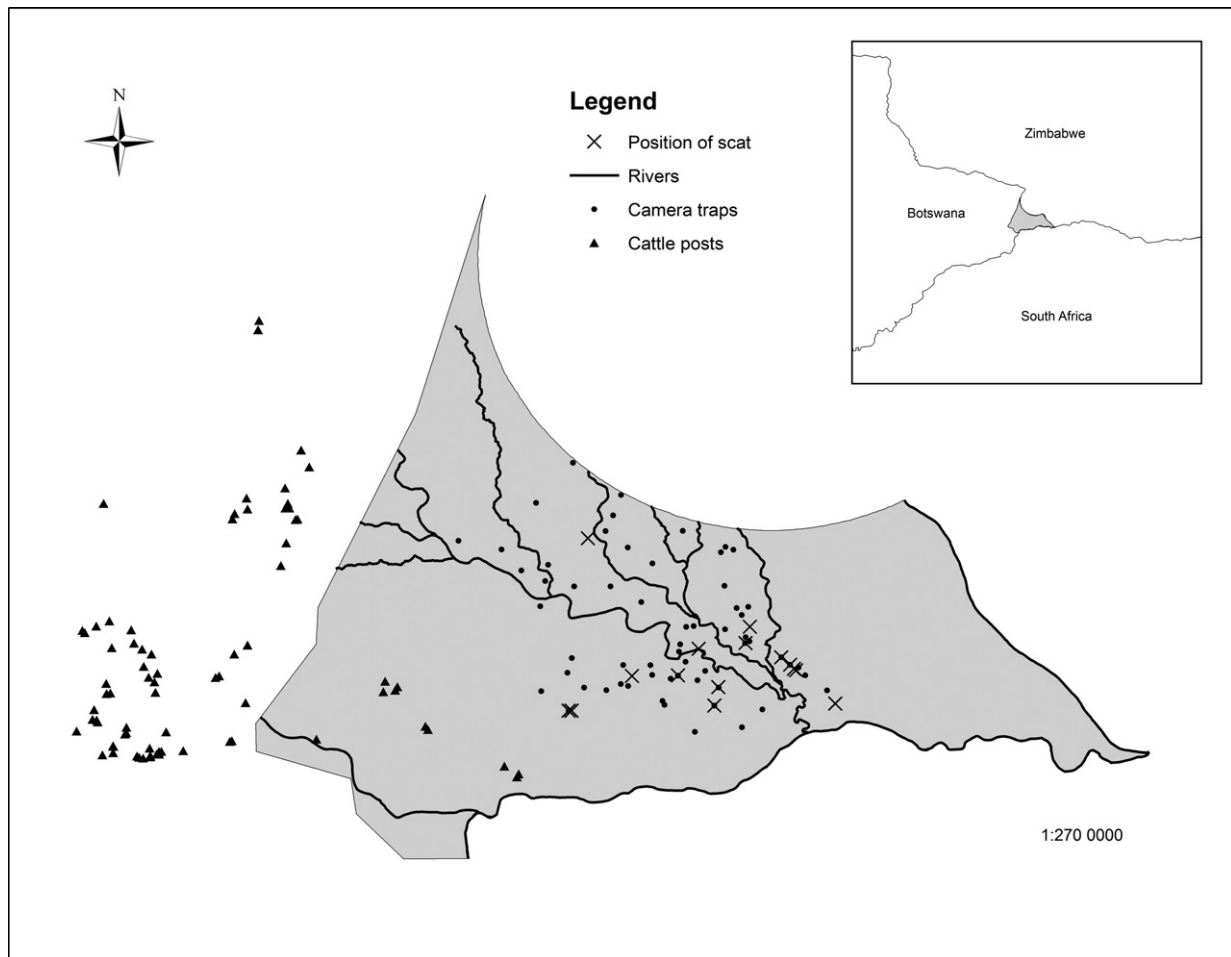


Fig 1 A map of Northern Tuli Game Reserve showing the positions of the cattle posts, camera traps and where scats were collected

kudu kills was identified as a juvenile. Two of the impala kills were lambs.

The dominance of, and preference for, impala in the diet is not surprising given the similar results of previous studies and observations in South Africa and Botswana (Pienaar, 1969; Klein, 2007) (Fig. 2). *Tragelaphus* sp. was the second most abundant prey item in the scats, and kudu was the second most abundant species killed (Table 1). Impala, eland and kudu were among the most common prey species captured by the camera traps on the reserve (Table 1). The tendency of cheetahs to prey upon the more abundant species lessens the cost of hunting as the cheetahs can hunt opportunistically rather than having to search for less common prey (Hayward *et al.*, 2006). The camera traps captured giraffes (*Giraffa camelopardalis*) more than any other potential prey species (Table 1).

While cheetahs have been recorded feeding on giraffe calves, this is unusual and this species is generally avoided due to its size (Pienaar, 1969; Hayward *et al.*, 2006).

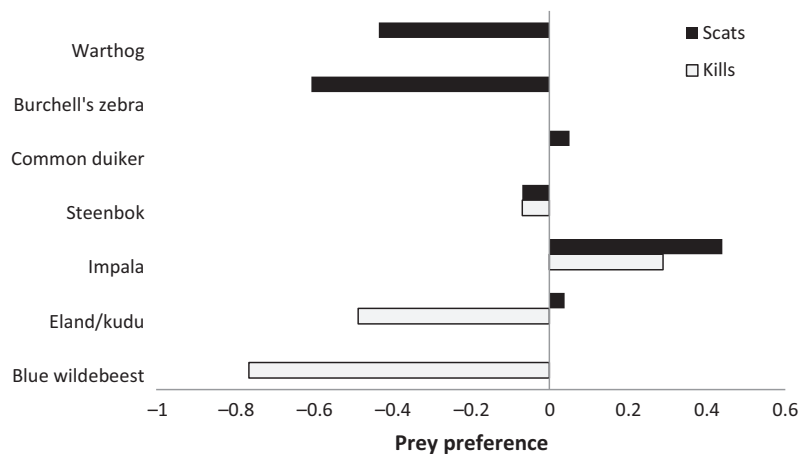
Given that scats were collected from known scent posts, it is possible that there was a bias towards male cheetahs (Eaton, 1970; Marnewick, Bothma & Verdoorn, 2006). Kill sightings, on the other hand, were reported from similar numbers of males and females (males = 30 sightings; females = 41 sightings). The higher incidence of *Tragelaphus* species in the scat data may be a product of the male bias in this sampling technique. In contrast to solitary females, males tend to hunt in coalitions which may allow them to take down larger prey (Schaller, 1972; Caro, 1994; Bissett, 2004).

Livestock hairs were not recorded in scats or observed as cheetah kills. The cheetahs' movement patterns in and out of the park are not well understood, but as there are a

**Table 1** The number of cheetah scats (n = 35) which contained hairs from each prey item, the frequency of occurrence of prey from cheetah scats, number of observed cheetah kills (n = 35) and the relative abundance (%) of prey in Northern Tuli Game Reserve, Botswana

	No. of scats	Frequency of occurrence	Number of kills	Relative abundance (%) <sup>a</sup>
Impala ( <i>Aepyceros melampus</i> )	27	77.1	23	21.7
Kudu ( <i>Tragelaphus strepsiceros</i> )	16	45.7	5	9.8
Eland ( <i>Tragelaphus oryx</i> )			1	10.1
Steenbok ( <i>Raphicerus campestris</i> )	5	14.3	5	3.6
Common duiker ( <i>Sylvicapra grimmia</i> )	3	8.6	–	0.3
Bushbuck ( <i>Tragelaphus sylvaticus</i> )	1	2.9	–	–
Burchell's zebra ( <i>Equus quagga</i> )	2	5.7	–	9.2
Springhare ( <i>Pedetes capensis</i> )	2	5.7	–	–
Warthog ( <i>Phacochoerus africanus</i> )	1	2.9	–	2.3
Blue wildebeest ( <i>Connochaetes taurinus</i> )	0	–	1	9.0

<sup>a</sup>Species captured on camera traps that were considered as potential prey (n = 983) for cheetahs were impala, warthog, kudu, common duiker, eland, giraffe (*Giraffa camelopardalis*) (relative abundance = 34.2%), steenbok, Burchell's zebra and blue wildebeest. Bushbuck and springhares were not captured on the camera traps but were present in the diet.

**Fig 2** The prey preferences (Jacob's Index) of cheetahs based on kill sightings and scat data from the Northern Tuli Game Reserve, Botswana

number of cattle posts immediately adjacent to and within the reserve, we would expect that cheetahs feeding on livestock would occasionally deposit scats within the reserve (Fig. 1). It seems that the incidence of livestock predation by cheetahs is low in this area. Indeed, farmers adjacent to the reserve seldom see cheetahs and report that cheetahs are responsible for very few of their livestock losses (0.44%) (Brassine, 2014). Winterbach *et al.* (2015) identified the Northern Tuli area as low-risk for human–predator conflict due to the high abundance of natural prey. Similarly, Boast *et al.* (2016) found that free-ranging cheetahs in north-west Botswana had a clear preference for natural prey over livestock. While our study suggests

that the cheetahs of NOTUGRE seldom prey on livestock, a more extensive diet study is needed to give a definitive answer.

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