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The diet of bushpigs in a sugar-cane agroecosystem

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Bushpigs, *Potamochoerus porcus*, in a sugar-farming area of Natal, South Africa, were found to be omnivorous, but plant material dominated their diet year round. Sugar-cane stem was the main item identified in faeces collected on farmland during all seasons and in faeces from adjacent forest during winter and spring. Fruits were probably preferred to sugar cane by animals defecating in the forest during summer and autumn.

Bosvarke, *Potamochoerus porcus*, in 'n suikerboerderygebied van Natal, Suid-Afrika, is omnivore maar plantmateriaal oorheers in hulle dieet dwarsdeur die jaar. Suikerrietstamme is geïdentifiseer as die vernaamste item in mismonsters wat op plaasgrond tydens al die seisoene, sowel as in aangrensende bosgebiede gedurende die winter en lente versamel is. Mis van diere in die bosgebiede dui daarop dat hulle gedurende die somer en herfs vrugte bo suikerriet verkies.

Keywords: Agroecosystem, bushpig, crop damage, diet, Suidae

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This study is a first attempt to quantify the diet of bushpigs, *Potamochoerus porcus*, in a sugar-cane agroecosystem. Bushpigs have expanded their range in Natal in recent years, and it has been suggested that agroecosystems may have facilitated this trend by providing abundant food in the form of crops (Walker 1986; Cooper & Melton 1988). Although bushpigs are omnivorous, vegetation usually forms the bulk of their diet (Thomas & Kolbe 1942; Breytenbach & Skinner 1982; Jones 1984).

The study was carried out in the Ntumeni Nature Reserve (28°53'S / 30°24'E) and adjacent sugar-cane farms. Much of the vegetation in the reserve is closed-canopy forest, which includes both deciduous and evergreen trees. Rainfall data and a map of the area are given by Cooper & Melton (1988).

The diet of bushpigs was investigated using faecal

analysis of fresh scats collected in the Ntumeni Forest and adjoining cane fields. The method used was a modification of the frequency of occurrence method of Chamrad & Box (1964) and is similar to that of Moolman & Breytenbach (1976). Scats deposited close together were combined to form single samples. Samples were soaked overnight, then mixed well to obtain food particles of similar size, before being washed on a 2 mm sieve. The coarse fraction retained on the sieve was mixed thoroughly, then spread on a glass tile marked with a 100-point grid. A pin was used to help locate the nearest item to each grid point, thus producing 100 scores per sample. These data are presented as the percentage occurrence (frequency of occurrence expressed as a percentage) of the different food items per sample.

Results were combined for four bimonthly periods because of small sample sizes. The four periods were May and June (autumn), July and August (winter), September and October (spring) and November and December (summer). A non-parametric analysis of variance (Kruskal-Wallis H test, Snedecor & Cochran 1967) was used to test for seasonal differences in diet, because most of the results had a non-normal distribution.

Results of faecal analyses are given in Tables 1 and 2. Faeces collected in the sugar-cane habitat showed significant seasonal variation in the percentage occurrence of the fruits *Harpephyllum caffrum* ($H = 19,81$; $df = 3$; $P < 0,001$) and *Phyllanthus discoideus* ($H = 14,13$; $df = 3$; $P < 0,01$). *P. discoideus* was present in greater amounts in autumn and winter samples, while *H. caffrum* increased during spring and summer. Roots were more common in faeces collected in spring and least common in autumn samples, but very small amounts were involved ($H = 7,97$; $df = 3$; $P < 0,05$). Sugar-cane stem was the principal dietary item identified in faeces from cane fields, in all seasons. The percentage occurrence of cane was highest in autumn and lowest in spring ($H = 8,93$; $df = 3$; $P < 0,05$). Unidentified dicotyledonous vegetation was abundant in samples from all seasons, especially autumn ($H = 18,33$; $df = 3$; $P < 0,001$). No other food items varied significantly between seasons in faeces from the sugar-cane habitat.

Four fruits showed significant seasonal variation in samples from the forest habitat, with the combined result that fruits were the principal component of faeces during summer. As found for faeces from the cane habitat, *H. caffrum* increased in summer in forest samples ($H = 43,46$; $df = 3$; $P < 0,001$), while *P. discoideus* decreased ($H = 27,63$; $df = 3$; $P < 0,001$). Unidentified seeds ($H = 25,09$; $df = 3$; $P < 0,001$) and the fruits of *Solanum mauritianum* ($H = 24,79$; $df = 3$; $P < 0,001$) were both more common in summer. In contrast, roots and bark showed lower percentages of occurrence in summer samples (roots: $H = 10,87$; $df = 3$; $P < 0,01$; bark: $H = 11,35$; $df = 3$; $P < 0,01$). Sugar-cane stem was highest in scats collected in winter and lowest in summer samples ($H = 22,05$; $df = 3$; $P < 0,001$). Finally, there was a significant seasonal variation in the amount of monocotyledonous leaf and stem in faeces from the forest, with a marked increase in

Table 1 Percentage occurrence¹ of food remains in bushpig faeces collected in the sugar-cane habitat

	Autumn (n = 25)		Winter (n = 47)		Spring (n = 19)		Summer (n = 9)	
	%	(range)	%	(range)	%	(range)	%	(range)
Dicotyledoneae								
Fruit/seeds:								
<i>Ficus</i> sp.	0,7	(0-15)	0,6	(0-8)	0		0	
<i>Harpephyllum</i> <i>caffrum</i>	0,1	(0-1)	1,1	(0-24)	11,3	(0-43)	17,1	(0-51)
<i>Phyllanthus</i> <i>discoideus</i>	7,7	(0-32)	11,5	(0-59)	1,2	(0-9)	0	
<i>Syzygium</i> <i>gerrardii</i>	0		2,0	(0-92)	0		0,2	(0-2)
<i>Psidium</i> <i>guajava</i>	0,9	(0-13)	0,2	(0-5)	0		0	
<i>Solanum</i> <i>mauritanum</i>	1,4	(0-5)	1,3	(0-12)	0,2	(0-2)	2,3	(0-13)
Unidentified								
seeds	4,7	(0-49)	1,0	(0-14)	1,3	(0-25)	0,1	(0-1)
Root	0,3	(0-4)	0,7	(0-8)	1,3	(0-4)	0,7	(0-3)
Bark/wood	2,0	(0-16)	2,6	(0-12)	1,4	(0-5)	1,9	(0-6)
Unidentified								
plant matter	14,8	(0-63)	28,4	(0-90)	45,2	(1-88)	27,4	(0-68)
Monocotyledoneae								
Sugar-cane stem	64,6	(8-100)	46,9	(0-98)	34,9	(2-84)	46,9	(3-93)
Sugar-cane leaf	0,5	(0-10)	1,0	(0-33)	1,0	(0-19)	0	
Unidentified								
leaf/stem	1,6	(0-18)	2,1	(0-15)	1,8	(0-7)	2,3	(0-9)
Animal matter								
Invertebrate	0,6	(0-12)	0		0,2	(0-2)	1,0	(0-2)
Vertebrate	0		0,6	(0-28)	0,3	(0-5)	0	

¹ See text for details.

autumn ($H = 25,38$; $df = 3$; $P < 0,001$).

The mean percentage occurrence of animal matter in faeces was never more than 1% for any season. Fragments of invertebrates were identified as belonging to the following taxa: Malacostraca, Isopoda, Diplopoda, Orthoptera, Isoptera, Coleoptera and Annelida. Vertebrate remains comprised unidentified bone fragments, the teeth, claws and hair of small mammals, feathers and lizard eggs.

Relating proportions of foods in faeces to proportions eaten is especially difficult when studying bushpigs, since the varied plant and animal items taken are particularly likely to undergo differential digestion. Sugar-cane stem suffers from the additional bias of largely being spat out once chewed (Melton & Cooper pers. obs.). However, although comparison of individual dietary items within samples needs to be viewed with caution, trends for differences between seasons of foods eaten can be usefully investigated using this method.

Bushpig in the Ntumeni agroecosystem were omnivorous, but plant material dominated the diet year round. These results agree with those of Breytenbach & Skinner (1982), who rarely found animal matter in faeces, and with Jones's (1984) finding that animal remains

comprised less than 4% of faecal material in any season.

Sugar cane was the main identified item in farm samples at all times. Fruit and seeds dominated forest samples in summer and autumn, while sugar cane was the principal component during winter and spring. Viljoen (1980) and Lawes, Henzi & Perrin (in press) quantified fruit production in the nearby Ngoye forest (28°50'S / 31°32'E). Both found fruits to be more abundant between December and May. In contrast, sugar cane is harvested all year in this area, resulting in an approximately constant availability of both young and mature cane (Greenfield pers. comm.). Given these patterns of food availability, it appears that fruits were preferred to sugar cane by animals defecating in the forest in summer and autumn. Although cane was the principal identified dietary item year round in farmland scats, damage to sugar cane was much greater in winter and the forest probably represented the main diurnal resting site for individuals venturing into cane fields (Cooper & Melton 1988). It therefore seems likely that animals defecating in the cane were carrying out most of their feeding in that habitat, but movements into cane fields would have decreased in summer.

H. caffrum and *P. discoideus* were the species of fruit

Table 2 Percentage occurrence¹ of food remains in bushpig faeces collected in the Ntumeni forest

	Autumn (n = 15)		Winter (n = 42)		Spring (n = 48)		Summer (n = 26)	
	%	(range)	%	(range)	%	(range)	%	(range)
Dicotyledoneae								
Fruit/seeds:								
<i>Ficus</i> sp.	0		0,6	(0-9)	2,0	(0-23)	0,1	(0-2)
<i>Harpephyllum</i> <i>caffrum</i>	0,3	(0-3)	4,4	(0-84)	2,3	(0-32)	35,1	(0-82)
<i>Phyllanthus</i> <i>discoideus</i>	24,5	(0-80)	16,8	(0-88)	14,6	(0-88)	0,1	(0-2)
<i>Psidium</i> <i>guajava</i>	0		0,5	(0-22)	0		0	
<i>Solanum</i> <i>mauritianum</i>	0,9	(0-11)	1,9	(0-15)	0,1	(0-1)	20,1	(0-84)
<i>Albizia</i> <i>adanthifolia</i>	0,1	(0-1)	0,3	(0-10)	0		0	
Unidentified								
seeds	0,7	(0-4)	2,1	(0-71)	0,2	(0-4)	3,5	(0-19)
Leaf	0		0		2,5	(0-36)	0	
Root	2,9	(0-30)	2,1	(0-11)	2,1	(0-11)	0,3	(0-3)
Bark/wood	4,4	(0-19)	5,3	(0-24)	3,9	(0-26)	1,7	(0-9)
Unidentified								
plant matter	24,3	(0-51)	22,7	(2-64)	44,2	(6-91)	27,2	(3-68)
Monocotyledoneae								
Sugar-cane stem	18,7	(0-82)	39,0	(0-93)	24,9	(0-87)	9,5	(0-77)
Sugar-cane leaf	1,9	(0-24)	0,2	(0-8)	1,0	(0-49)	0,1	(0-3)
Unidentified								
leaf/stem	21,1	(0-100)	4,2	(0-19)	2,2	(0-14)	1,8	(0-8)
Animal matter								
Invertebrate	0,1	(0-1)	0,1	(0-1)	0,1	(0-2)	0,5	(0-3)
Vertebrate	0,1	(0-1)	0		0		0,1	(0-1)

¹ See text for details.

most commonly taken by bushpigs. Lawes *et al.* (in press) found *H. caffrum* to be the principal fruit eaten by Samango monkeys, *Cercopithecus albogularis*, in the Ngoye Forest. These workers ascribed this finding to the fact that *H. caffrum* fruits were available throughout the year and had a high energy content (Viljoen 1980), factors which probably also played a role in the bushpigs' choice. Many seeds were intact after passage through the bushpig's gut, which means that, as suggested by Breytenbach & Skinner (1982), this animal could be a major dispersal agent for a number of forest trees. In contrast, Ghiglieri, Butynski, Struhsaker & Leland (1982) emphasized that many seeds were destroyed when fruits were eaten by bushpigs in their Uganda study area. Our findings of guava, *Psidium guajava*, and bugweed, *S. mauritianum*, seeds in scats suggest that bushpigs may be important in the spread of these alien problem plants in Natal.

Conclusions as to whether farmland alone can provide adequate and abundant food for bushpigs year round must await more detailed studies which include the quantification of movements as well as diet.

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