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First quantitative data on the diet of the fennec fox, *Vulpes zerda* (Canidae, Carnivora), in Algeria

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Abstract. The diet of fennec fox has been investigated for the first time from scats collected during one year in three localities of the north-eastern Algerian Sahara: Guemar and Sanderouce (near Oued Souf) and Bamendil (near Ouargla). In Guemar, 160 items in 20 scats were identified including 93 insects (58.1 %), 11 plant fragments (6.9 %) and 38 dates of *Phoenix dactylifera* (23.8 %). In terms of biomass, with 37.4 % plant material was the most abundant, followed by birds (29.9 %) and mammals (14.9 %). In Sanderouce, 491 items in 37 scats were identified including 377 insects (77.1 %), 10 plant fragments (2.0 %) and 29 dates (5.9 %). In terms of biomass mammals (56.6 %) were far more abundant than squamates (15.4 %) and vegetal food (12.8 %). In Bamendil, 1246 items in 57 scats were identified; insects were the most numerous (87.9 %) followed by mammals (only 3.7 %), however the biomass of mammals was the highest (63.5 %) followed by birds (19.8 %) and insects (5.5 %). As was suggested by behavioural records, the diet of the fennec fox was mainly carnivorous, but included a significant amount of vegetal items, particularly dates collected in oases.

Key words: canid, feeding ecology, prey, plant, Sahara, North Africa

Introduction

The fennec fox, *Vulpes zerda* (Zimmermann, 1780) is a typical species of arid environments of North Africa. Although listed as "least concern" by IUCN (Temple & Cuttelod 2009) due to its wide Saharan distribution and large estimated population, this canid is threatened by increasing aridity and consequent reduction of potential food and water supply. Its morphological and physiological adaptations to life in the desert have been studied by some authors (e.g. Gauthier-Pilters 1967, Noll-Banholzer 1979a, b, Maloiy et al. 1982), and Noll-Banholzer (1979a) reported that fennec fox may subsist without water, depending on their nocturnal activity and moisture content of their prey, and tolerate extremely high concentrations of urea in urine. In desert foxes, total evaporative water loss and body size are reduced by comparison with mesic species (Williams et al. 2004), an adaptation to lower the energy demand. Both for water supply and metabolism, prey availability and hunting are limiting factors for fennec fox populations. However, the diet of this species remains poorly known (Asa et al. 2004). According to Loche (1867), Algerian fennec fox prey mainly on jerboas (*Jaculus* spp.), gerbils (*Gerbillus* spp.) and other small rodents, and occasionally eat birds and eggs, and also dates collected on the ground. Gauthier-Pilters (1967) reported additional items: lizards, insects and also some plant material, including fruits such as melon (Anonyme 1960), tubers and roots (Dekeyser 1955). This coarse diet is repeated in most syntheses and field guides (e.g. Dorst & Dandelot 1970, Coetzee 1977, Halternorth & Diller 1977, Osborn & Helmy 1980, Le Berre 1990, Zimen 1990, Nowak 1991, Sheldon 1992, Stuart & Stuart 2008, Sillero-

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Zubiri 2009). Kingdon (1997) suggested that it favours grasshoppers and other desert invertebrates. Dragesco-Joffé (1993) described some hunting behaviour for catching small rodents, digging out lizards and geckos, as well as coleopterans (tenebrionids), and taking ground birds (larks and sandgrouses); grasshoppers are preyed mainly when they outbreak; plant material and fruits are commonly eaten in sub-Saharan areas. Except the unpublished analysis of 21 scats collected in southern Tunisia (Incorvaia 2005), no quantitative analysis of the diet is available.

To better understand the food requirements for maintaining fennec fox populations, we studied three diets from south-eastern Algeria where a large set of reliably identified scats were collected. Occurrence and biomass of prey items were quantified and compared with data from other desert fox species.

Study Area

Oued Souf region extends 600 km south-east to Algiers, in the north of the Eastern Erg (33-34° N et 6-8° E). It is a dry sand extent surrounded by water courses (Voisin 2004). During the study the mean of maximal temperatures was 41.1 °C in August 2007, and the mean of minimal temperatures was 5.3 °C in December 2007. The annual rainfall was 28.5 mm, including 18.9 mm in December and no rain in late spring and early summer. The natural vegetation was dominated by *Malva aegyptiaca* and *Retama retam*. The first site, Guemar, is located in the north (33°32′ N, 6°49′ E, 51 m a.s.l.). The soil, made of sand including small pieces of "lous" (gypsum stone), provide small dune beds called "ghouts" traditionally planted with date-trees (*Phoenix dactylifera*), that shelter some olive groves (*Olea europaea*). The area is also cultivated according to the modern "pivots" for market plants. The second site, Sanderouce, is located in the south-east of Oued Souf region (33°32′ N, 7°00′ E, 84 m a.s.l.). The sand forms extended dunes including some sparse ghouts.

Ouargla basin is a Saharan oasis (Rouvillois-Brigol 1975) in the middle of a large dune area, 800 km south to Algiers where is located the third site, Bamendil (31°58' N, 5°19' E, 220 m a.s.l.). During the study the mean of maximal temperatures was 42.6 °C in August 2007, and the mean of minimal temperatures was 4.8 °C in December 2007. The annual rainfall was 16.4 mm, with no rain for half the months. The study period was particularly windy, the mean speed was 3.95 m/s. The soil, very thin, is mainly sandy.

Material and Methods

The diet of fennec fox was investigated from scats tentatively collected each month between May 2007 and April 2008 (Table 1). Fennec fox scats were easy to distinguish from scats of sympatric carnivores, and they were collected at the mouth of the three dens. Guemar and Sanderouce dens were occupied by a single animal over the year, when a den at Bamendil sheltered a family with four cubs in March 2007 and two cubs in April 2008. Scats of cubs, of smaller size, were not analysed.

Scats were analysed individually after ethanol maceration to sterilise them. After triturating, the contents of each scat were spread in a Petri dish and dried. Bones of vertebrates, chitinous fragments of arthropods and plant fragments were separated according to their form and colour in order to identify preys and count them under a microscope. Prey items were identified with the aid of the reference collection of the Institut National Agronomique in El Harrach (Département de Zoologie agricole et forestière) and of the University of Ouargla, both for invertebrates and vertebrates.

According to most previous mammal diet studies, results were expressed in terms of frequency of occurrence of different food items (% F, the percentage of scats containing a named food taxon) and dietary occurrence of food types (% D, the number of occurrences of a named food taxon as a proportion of the total occurrences of all food taxa). In addition, we calculated the percentage of prey biomass (% B, the weight of a named food taxon as a proportion of the total weight of all food taxa); mean prey weights were obtained through a capture program in the area. Differences among sites were tested by a chi-square test calculated on dietary occurrences of the main prey classes (Fig. 1), followed by a post-hoc test (Neu

Table 1. *Monthly distribution of fennec fox scats collected at the mouth of three dens at three sites of north-eastern Algerian Sahara from May 2007 to April 2008.*

	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Guemar	0	0	0	2	5	5	2	5	0	1	0	0
Sanderouce	0	0	5	0	5	5	5	5	5	1	0	5
Bamendil	5	5	5	5	5	5	5	5	5	5	1	5

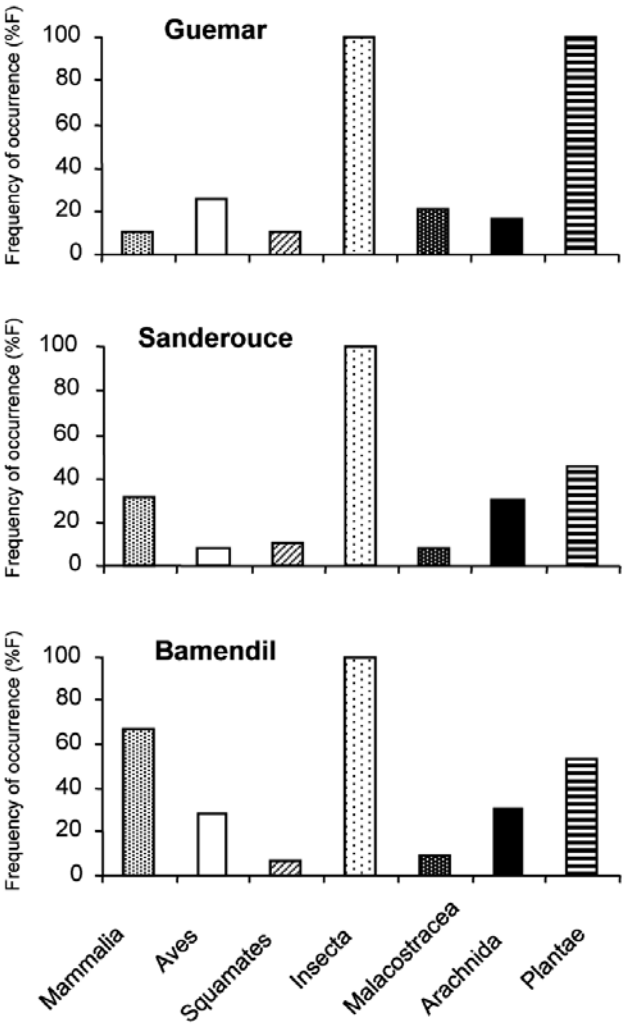

Fig. 1. *Diet of the fennec fox in three localities of north-eastern Algerian Sahara: frequencies of occurrence (percentage of scats containing a named food taxon) of the higher taxa in scats collected from May 2007-April 2008 (Guemar n = 20, Sanderouce n = 37, Bamendil n = 57).*

et al. 1974) to identify the significant contributions to the chi-square; the level of significance was p = 0.05.

Results

In Guemar, insects and plant material were present in all 20 scats (Fig. 1), while birds and mammals were only present in 26 % and 11 % of scats respectively. A total of 160 items were identified (Appendix), including 93 insects, 11 plant fragments, and 38 dates of *Phoenix dactylifera*. Coleoptera (n = 49), mainly Tenebrionidae (n = 23, including at least 12 *Pimelia* sp.) and Scarabeidae (n = 19, with 10 *Hybocerus* sp.), were the most numerous, followed by Hymenoptera (Formicidae, n = 17, including mainly *Pheidole* sp., *Messor* sp. and *Cataglyphis* sp.), Blattaria (n = 9) and Orthoptera (n = 7). Isoptera (n = 6), Lepidoptera (n = 3), Dermaptera and Diptera (n = 1 each) were also recorded. Birds (n = 5), mammals (n = 4 rodents) and squamates (n = 2), Isopoda (n = 4) and arachnids (n = 3), including one *Scorpio maurus*, were also recorded (Fig. 2). In terms of biomass (Fig. 3), vegetal food was the most abundant, followed by birds, mammals, insects and squamates, other prey are negligible.

In Sanderouce, insects were also present in all 37 scats (Fig. 1), and plants in only 46 % followed by mammals (32 %) and arachnids (30 %). A total of 491 items were identified including 377 insects (Fig. 2), 34 isopods, 16 arachnids, 10 plant fragments and 29 dates. The most numerous prey were Coleoptera (n = 183), including Tenebrionidae (n = 97), with *Pimelia* spp. (n = 30), *Trachyderma hispida* (n = 20), *Mesostena angustata* (n = 11) and *Asida* sp. (n = 10), and Scarabeidae (n = 56). Isoptera (n = 90) were more abundant than Orthoptera (n = 50), including mostly Gryllidae and few Acrididae, and Hymenoptera (n = 35), which were Formicidae, mainly *Cataglyphis* sp. and *Camponotus* sp. Arachnida were Scorpionida (n = 7), including *Androctonus australis*, Solpugida (n = 6) and Aranea (n = 3). Mammals (n = 13 rodents, including one *Gerbillus gerbillus*), squamates (n = 7) and birds (n = 3), were minor prey. However, in terms of biomass (Fig. 3) mammals were far more abundant than squamates, plant material and insects. Plastic goods were found in two scats.

In Bamendil, insects were also present in all 57 scats (Fig. 1), and mammals were recorded in 67 % followed by plant material (53 %), arachnids (31 %) and birds (28 %). A total of 1246 items were identified including 1095 insects (Fig. 2), and only 46 mammals, 42 plant material, 32 arachnids and 19 birds. This large amount of insects was dominated by Isoptera (n = 780), probably as the consequence of digging a termitary. Coleoptera (n = 155) were also numerous, with Tenebrionidae (n = 48, including 20 *Pimelia* sp. and 7 *Trachyderma hispida*), Scarabeidae (n = 34, mainly 21 *Rhizotrogus* sp.) and Curculionidae (n = 13, including *Hypera* sp. and *Coniocleonus* sp.). Orthoptera were also abundant, either Ensifera (n = 40), including *Gryllotalpa gryllotalpa* and *Brachytrupes megacephalus*), or Caelifera (n = 31), including Acrididae (*Schistocerca gregaria*, *Anacridium aegyptium*) and Pamphagidae. Hymenoptera were represented by Formicidae (n = 57) including *Monomorium* sp., *Pheidole* sp., *Tapinoma* sp., *Camponotus* sp. and *Messor* sp. Two Odonatoptera, two Heteroptera and one Mantoptera were also identified, together with Blattaria (n = 18)

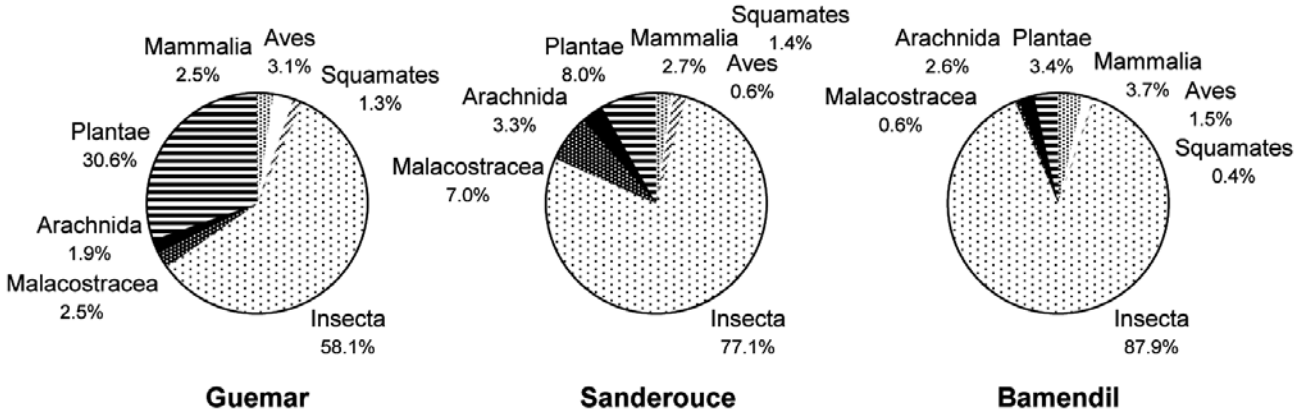

Fig. 2. *Diet of the fennec fox in three localities of north-eastern Algerian Sahara: dietary occurrence (number of occurrences of a named food taxon as a proportion of the total occurrences of all food taxa) of the higher taxa in scats collected from May 2007-April 2008 (Guemar n = 160 food items, Sanderouce n = 491, Bamendil n = 1246).*

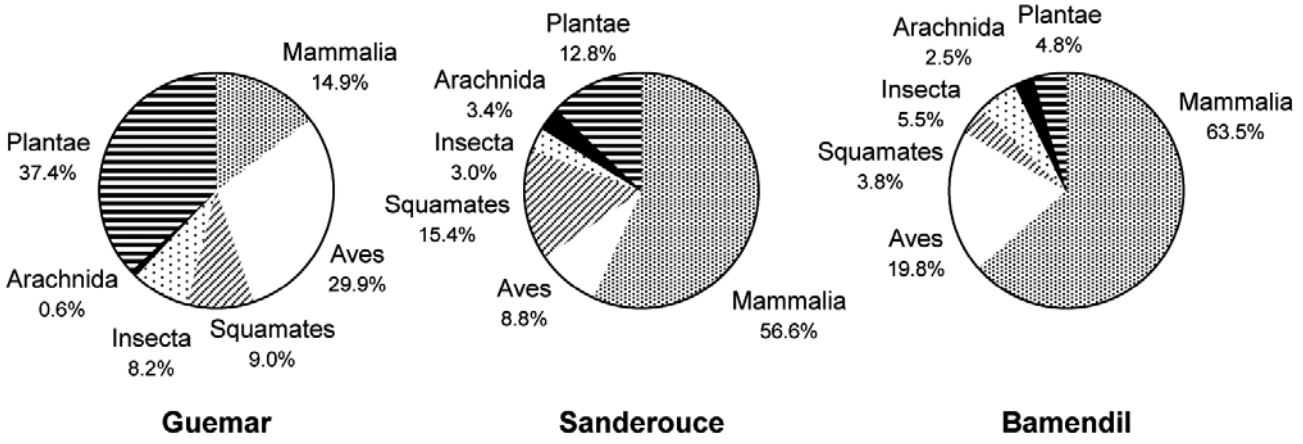

Fig. 3. *Diet of the fennec fox in three localities of north-eastern Algerian Sahara: prey biomass (weight of a named food taxon as a proportion of the total weight of all food taxa) of the higher taxa in scats collected from May 2007-April 2008 (Guemar n = 20, Sanderouce n = 37, Bamendil n = 57).*

and Diptera (n = 6). Mammals were mainly rodents, including *Mus spretus*, *Mus musculus*, *Gerbillus tarabuli*, *Meriones* sp. and *Psammomys obesus*, however two Chiroptera were also preyed. Plant material included 27 dates, and at least 7 fragments of cultivated plants. Arachnids were mainly Scorpionida (n = 14, including the two previously identified species), and also Solpugida (n = 7), Aranea and Acari (n = 4 each). In terms of biomass (Fig. 3), mammals were dominant followed by birds and insects.

Even restricted to the main classes, the three diets were very different ($\chi^2 = 259.3$, df = 12, $p < 0.001$) with significantly larger numbers of plant material in Guemar, Isopoda in Sanderouce and insects in Bamendil, and significantly smaller numbers of plant material and Isopoda in Bamendil, and insects in Guemar. In terms of biomass, differences were also recorded, with mammals dominating in Sanderouce and Bamendil, whereas plant material and birds were the most abundant in Guemar.

Discussion

Although significant differences were recorded in the diet of fennec fox, the main items, i.e. insects (mainly Coleoptera), small mammals and plant material, were identified in our three localities of the north-eastern Algerian Sahara. Fennec fox seemed to adapt its feeding ecology to local, and probably seasonal, prey availability and abundance (e.g. opportunistic preying on Isopoda in Sanderouce or Isoptera in Bamendil). According to Dorst & Dandelot (1970) and Kingdon (1997), Larivière (2002) wrote that "fennecs mostly feed on grasshoppers and locusts, but also eat other insects (including those that secrete noxious fluids), rodents, birds, lizards, and roots". Indeed insects, found in all scats, proved to be the most numerous

prey in our study, as well as in Incorvaia's analyses (2005) from southern Tunisia. However, as in this previous study, the main prey were Coleoptera, if we exclude the outstanding consumption of Isoptera in Bamendil. Tenebrionidae, with a large number of *Pimelia* sp., beyond Scarabeidae, were probably dug out, as it was reported by Dragesco-Joffé (1993). Orthoptera, mainly Gryllidae, were far less abundant in the three diets. The large amount of Acrididae reported by previous authors, including Incorvaia (2005), was probably due to outbreaks of desert locust (*Schistocerca gregaria*). Hymenoptera, mainly Formicidae, were also regularly eaten, and insects only made up a small biomass and should be considered of minor importance for energy intake. The consumption of Isopoda, first record, and arachnids, already reported by Le Berre (1990) and Incorvaia (2005), was also regular but incidental, even if biomass of Arachnida was not negligible. Among them Solpugida and Scorpionida were the most abundant, and for the first time some prey were identified at the species level: *Galeodes arabs*, *Scorpio maurus* and *Androctonus australis*. Contrary to Haltenorth & Diller (1977) no snail has been recorded in fennec diet.

Small rodents were listed in the diet by all previous authors, however they are cited as the second main prey items only by Coetzee (1977), Stuart & Stuart (2008) and Sillero-Zubiri (2009). Indeed, they are rarer prey than insects, but their presence is based on teeth and bone fragments, an analysis of hairs would probably increase at least the frequency of occurrence. However, their biomass is dominant. Contrary to Loche (1867) and Dragesco-Joffé (1993) we did not find any evidence of jerboa, which may have been concealed among the large number of unidentified specimens. Our results confirmed predation on *Gerbillus* and *Meriones*, and report for the first time *Psammomys obesus* in the diet, as well as the two species of mice living in the area (Brahmi et al. 2010). Squamates, which are sometimes listed prior to rodents (Gauthier-Pilters 1967, Haltenorth & Diller 1977, Kingdon 1997), were incidental prey but can constitute up to 15.4 % of biomass in Sanderouce. Unfortunately no specific identification was possible to compare our data with Dragesco-Joffé (1993) and Sillero-Zubiri (2009) who listed *Acanthodactylus*, *Stenodactylus* and *Scincus albifasciatus*.

Birds were listed as the second group of prey after insects by Qumsiyeh (1996), and even if their dietary occurrence is low, they formed a significant biomass in Guemar and Bamendil, in the vicinity of oases particularly attractive for passerines, including swallows and not only larks, a prey already listed by Sillero-Zubiri (2009).

Plant material, which was reported common in the diet from the Sahelian zone (Dragesco-Joffé 1993), was present in all scats in Guemar and half scats in Sanderouce and Bamendil. According to previous records, this plant material was either stems of Poaceae, which could facilitate digestion, or roots and small tubers, and dates of *Phoenix dactylifera*, already reported by Loche (1867), which provide a valuable amount of energy. In southern Tunisia, Incorvaia (2005) obtained 25 % of vegetal dry matter in scats, without any dates, proving that ingestion of plants is not incidental.

Lastly, the ingestion of plastic goods in one diet, together with the presence of mice, *Mus musculus* and *M. spretus*, and cultivated plants confirm that the fennec fox can forage around human settlements as reported by Stuart & Stuart (2008).

Fennec fox appear to be opportunistic omnivores, preying on many insects and taking most energy from small vertebrates, and fruits in the oases. This diet is very similar to the diet of other plain desert foxes, such as Blanford's fox *Vulpes cana* and Rüppell's fox *V. rueppellii*, contrary to the diet of foxes living in deserts and semi-arid regions, such as corsac fox *V. corsac* and kit fox *V. macrotis*. Both later species mainly prey on the most common rodents (or lagomorphs) in their home range (McGrew 1979, Sillero-Zubiri 2009), such as *Ochotona* (55 % of occurrence) and voles (22 %) for corsac fox (Wozencraft 2008), *Dipodomys* (80 % of occurrence), *Lepus* and *Sylvilagus* (50 to 90 %) for kit fox (Egoscue 1962, Laughrin 1970 in McGrew 1979, Morrell 1972). However, according to Sillero-Zubiri (2009), birds, lizards, snakes, and insects are also frequently consumed by corsac fox, especially in summer, as well as small amount of vegetation. Then, the diet looks more omnivorous and opportunistic, as it is for the two plain desert foxes and fennec fox.

Blanford's fox, which is parapatric with fennec fox, is described as insectivorous and frugivorous (Ilany 1983, Geffen et al. 1992) as the diet in Israel mostly includes insects (98.1 and 92.5 % of occurrence in two localities) and plant material (67.9 and 63.9 % respectively). As for the fennec fox, Coleoptera, Orthoptera and Formicidae were the most numerous, far beyond Scorpionida and vertebrates, and plant material included dates and Poaceae, but mainly fruits of two caperbush species (Geffen et al. 1992). In Balochistan (Roberts 2005), this fox also prey upon lizards (*Phrynocephalus* spp.) and gerbils (*Gerbillus* spp).

The diet of Rüppell's fox, which is partly sympatric with fennec fox (and Blanford's fox), proved to be significantly different between regions and localities. In Oman (Lindsay & Macdonald 1986), Rüppell's fox preyed upon rodents (71.0 % of occurrence), lizards (51.0 %), invertebrates (46.0 %, but only 7.3 % of volume), grass (32.0 %) and birds (10.0 %). In Egypt (Kowalski 1988), insects were the bulk of the diet (71.4 to 81.0 % of occurrence), together with birds (57.6 to 100 %) and dates (3.6 to 63.4 %). including Coleoptera (37.3 to 71.4 %) and Orthoptera (9.5 to 35.7 %). Small mammals (7.1 to 14.3 %) were minor prey, as well as lizards (0 to 4.6 %). Except the outstanding, and probably incidental, bird content, this diet is very similar to fennec fox. According to Dragesco-Joffé (1993), the two fox species tend to be mutually exclusive, Rüppell's fox living in sandy areas in the vicinity of rocks and not far from water (less than 20 km) when fennec fox can live in hyperarid zones of the Sahara. This paratopy should be investigated as well as the resource partitioning in the same area.

As we noticed in fennec fox, both desert foxes consume human garbage, which confirms the opportunistic feeding behaviour of the three species, which probably adapt to the available and most abundant prey species. These carnivores are trophic generalists and likely exist because they are sufficiently flexible to include a number of infrequent food items that sum into an important source of energy, at least during some periods (Polis 1991). Also, it seems that fennec fox is not threatened by the increasing aridity of the Sahara as long as some vertebrates and arachnids will be able to live in this desert, even this fox will benefit by its extension.

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Appendix. *Diet of the fennec fox in three localities of north-eastern Algerian Sahara (May 2007-April 2008): identified taxa, number of individuals (N) and percent dietary occurrence values (% D).*

Class	Order/Family	Taxa	Guemar n = 20 scats		Sanderouce n = 37 scats		Bamendil n = 57 scats	
			N	% D	N	% D	N	% D
Euarthropoda		Euarthropoda ind.	0	0	0	0	1	0.08
Malacostracea	Isopoda	Isopoda ind.	4	2.50	34	6.92	7	0.56
Arachnida		Arachnida sp.	0	0	0	0	2	0.16
	Scorpionidae	Scorpionidae ind.	0	0	5	1.02	9	0.72
		Scorpio maurus	1	0.63	0	0	2	0.16
	Buthidae	Buthidae ind.	0	0	0	0	1	0.08
		Androctonus sp.	0	0	1	0.20	1	0.08
		Androctonus australis	0	0	1	0.20	1	0.08
	Aranea	Aranea ind.	1	0.63	3	0.61	3	0.24
	Dysderidae	Dysderidae sp.	1	0.63	0	0	1	0.08
	Solpugida	Solpugida ind.	0	0	3	0.61	3	0.24
	Galeodidae	*Galeodes* sp.	0	0	0	0	1	0.08
		Galeodes arabs	0	0	3	0.61	3	0.24
	Acari	Acari sp.	0	0	0	0	3	0.24
	Oribatidae	*Oribates* sp.	0	0	0	0	1	0.08

Insecta	Odonata	Odonata ind.	0	0	0	0	1	0.08
	Libellulidae	Libellulidae ind.	0	0	0	0	1	0.08
	Blattaria	Blattaria ind.	0	0	1	0.20	2	0.16
	Polyphagidae	*Heterogamodes* sp.	5	3.13	5	1.02	8	0.64
	Blattidae	Blattidae ind.	2	1.25	1	0.20	0	0
		Blatta sp.	0	0	0	0	2	0.16
		Blatta orientalis	2	1.25	0	0	2	0.16
		Periplaneta americana	0	0	0	0	4	0.32
	Mantodea	*Iris* sp.	0	0	0	0	1	0.08
	Isoptera	Isoptera ind.	6	3.75	90	18.33	780	62.70
	Dermaptera	Dermaptera sp.	0	0	6	1.22	0	0
	Labiduridae	*Labidura riparia*	1	0.63	0	0	0	0
	Orthoptera	Ensifera ind.	0	0	1	0.20	0	0
	Tettigoniidae	Tettigoniidae ind.	1	0.63	0	0	0	0
	Gryllotalpidae	*Gryllotalpa sp.*	0	0	0	0	1	0.08
		Gryllotalpa gryllotapa	0	0	0	0	10	0.8
	Gryllidae	Gryllidae ind.	0	0	4	0.81	11	0.88
		Brachytripes megacephalus	3	1.88	23	4.68	16	1.29
		Gryllus sp.	0	0	2	0.41	0	0
		Gryllus compestris	0	0	1	0.20	0	0
		Gryllus bimaculatus	0	0	1	0.20	0	0
		Gryllulus sp.	0	0	2	0.41	2	0.16
		Gryllomorpha sp.	1	0.63	2	0.41	0	0
		Caelifera ind.	0	0	1	0.20	0	0
	Acrididae	Acrididae ind.	2	1.25	11	2.24	14	1.13
		Thisiocetrus adspersus	0	0	1	0.20	4	0.32
		Tropidopola cylindrica	0	0	1	0.20	0	0
		Schistocerca gregaria	0	0	0	0	1	0.08
		Ancridium aegyptium	0	0	0	0	1	0.08
	Pamphagidae	Pamphagidae ind.	0	0	0	0	11	0.88
	Heteroptera	Heteroptera ind.	0	0	1	0.20	0	0
	Reduviidae	Reduviidae ind.	0	0	1	0.20	0	0
		Reduvis sp.	0	0	0	0	1	0.08
	Lygeaidae	Lygeaidae ind.	0	0	0	0	1	0.08
	Coleoptera	Coleoptera ind.	1	0.63	2	0.41	37	2.97
	Cicindellidae	*Cicindella* sp.	1	0.63	0	0	1	0.08
		Cicindella flexuosa	0	0	1	0.20	0	0
	Carabidae	Carabidae ind.	0	0	4	0.81	7	0.56
		Anthia venator	0	0	0	0	1	0.08
		Anthia sexmaculata	0	0	3	0.61	0	0
		Megacephala euphratica	0	0	0	0	1	0.08
		Scarites sp.	1	0.63	0	0	3	0.24
	Harpalidae	*Harpalus* sp.	0	0	1	0.20	1	0.08
	Scarabaeidae	Scarabaeidae ind.	0	0	38	7.74	3	0.24
		Scarabaeus sp.	0	0	2	0.41	2	0.16
		Pentodon sp.	2	1.25	2	0.41	4	0.32
		Hybocerus sp.	10	6.25	12	2.44	4	0.32
		Rhizotrogus sp.	7	4.38	2	0.41	21	1.69
	Cetonidae	*Cetonia* sp.	0	0	0	0	1	0.08
	Dynastidae	*Phylognathus* sp.	0	0	7	1.43	0	0
	Tenebrionidae	Tenebrionidae ind.	7	4.38	7	1.43	13	1.05
		Pimelia sp.	12	7.50	7	1.43	16	1.29
		Pimelia angulata	0	0	22	4.48	4	0.32
		Pimelia grandis	0	0	1	0.20	0	0

		Pachychila sp.	1	0.63	4	0.81	0	0
		Trachyderma hispida	0	0	20	4.07	7	0.56
		Mesostena angustata	0	0	11	2.24	1	0.08
		Prionotheca coronata	0	0	5	1.02	0	0
		Asida sp.	1	0.63	10	2.04	4	0.32
		Zophosis zuberi	1	0.63	0	0	0	0
		Phylax sp.	1	0.63	4	0.81	1	0.08
		Erodius sp.	0	0	1	0.20	1	0.08
		Blaps sp.	0	0	5	1.02	1	0.08
	Curculionidae	Curculionidae ind.	1	0.63	4	0.81	6	0.48
		Coniocleonus sp.	0	0	2	0.41	1	0.08
		Coniocleonus excoriatus	0	0	1	0.20	2	0.16
		Hypera sp.	0	0	0	0	4	0.32
	Histeridae	Histeridae ind.	0	0	4	0.81	1	0.08
	Nitidulidae	*Carpophilus hemipterus*	0	0	0	0	1	0.08
	Dytiscidae	Dytiscidae ind.	0	0	1	0.20	0	0
	Buprestidae	*Julodis* sp.	0	0	0	0	3	0.24
	Staphylinidae	Staphylinidae ind.	0	0	0	0	1	0.08
	Cantharidae	Cantharidae ind.	0	0	0	0	1	0.08
	Chrysomelidae	Chrysomelidae ind.	0	0	0	0	1	0.08
	Cerambycidae	Cerambycidae ind.	3	1.88	0	0	0	0
	Hymenoptera	Hymeroptera ind.	0	0	1	0.20	2	0.16
	Formicidae	Formicidae ind.	2	1.25	1	0.20	2	0.16
		Pheidole sp.	5	3.13	1	0.20	11	0.88
		Pheidole pallidula	1	0.63	0	0	1	0.08
		Messor sp.	5	3.13	15	3.05	5	0.40
		Messor structore	0	0	0	0	1	0.08
		Camponotus sp.	1	0.63	6	1.22	7	0.56
		Cataglyphis sp.	1	0.63	2	0.41	2	0.16
		Cataglyphis bombycina	2	1.25	6	1.22	2	0.16
		Monomorium sp.	0	0	0	0	11	0.88
		Tetramorium sp.	0	0	0	0	2	0.16
		Crematogaster sp.	0	0	1	0.20	3	0.24
		Tapinoma sp.	0	0	2	0.41	10	0.80
	Diptera	Cyclorrhapha sp.	0	0	0	0	5	0.40
	Calliphoridae	*Lucilia* sp.	1	0.63	0	0	1	0.08
	Lepidoptera	Lepidoptera ind.	3	1.88	4	0.81	1	0.08
Squamata	Squamata	Squamates ind.	2	1.25	7	1.43	2	0.16
	Lacertidae	Lacertidae ind.	0	0	0	0	3	0.24
Aves		Aves ind.	5	3.15	3	0.61	15	1.20
	Passeriformes	Passeriformes ind.	0	0	0	0	2	0.16
	Hirundinidae	Hirundinidae ind.	0	0	0	0	2	0.16
Mammalia	Mammalia	Mammalia ind.	0	0	0	0	1	0.08
	Chiroptera	Chiroptera ind.	0	0	0	0	2	0.16
	Rodentia	Rodentia ind.	2	1.25	6	1.22	14	1.12
	Muridae	*Mus* sp.	0	0	1	0.20	2	0.16
		Mus spretus	2	1.25	1	0.20	7	0.56
		Mus musculus	0	0	0	0	1	0.08
	Gerbillidae	Gerbillidae ind.	0	0	0	0	6	0.48
		Gerbillus sp.	0	0	2	0.41	4	0.32
		Gerbillus gerbillus	0	0	1	0.20	0	0.08
		Gerbillus tarabuli	0	0	0	0	4	0.32
		Psammomys obesus	0	0	0	0	2	0.16
		Meriones sp.	0	0	2	0.41	3	0.24

Plantae		Plantae ind.	6	3.75	10	2.04	6	0.48
	Fabaceae	*Vicia faba*	1	0.63	0	0	1	0.08
	Arecaceae	*Phoenix dactylifera*	38	23.75	29	5.91	27	2.17
	Poaceae	Poaceae ind.	3	1.88	0	0	2	0.16
		Avena ind.	1	0.63	0	0	1	0.08
		Hordeum vulgare	0	0	0	0	4	0.32
	Linaceae	*Linum* sp.	0	0	0	0	1	0.08
Plastic goods			0	0	2	0.41	0	0
Total			160		491		1246	