other species and are frequently seen in African plains exhibits at zoos.

In South Africa an unknown number are being kept as pets, while they are also kept at a small number of international zoos. South African zoos keeping bat-eared foxes include Cango, Bester Birds, Hartebeespoort Dam, World of Birds, Bloemfontein Zoological Gardens, Johannesburg Zoological Gardens, Emerald, and Monkey Den.

Current or planned research projects

H. Wright (Warwick University, UK) is studying the behavioural ecology of monogamy in the bat-eared fox in Kenya.

N. Jordan (Department of Zoology, Cambridge University, UK) is planning a research project in the south-western Kalahari.

Gaps in knowledge

There is a conspicuous lack of information about both abundance and population trends in this species across its range. In southern Africa, little is known about dispersal of young and the formation of new breeding pairs. The causal factors for differences in home range size in different localities, group size and changes in density as a function of food availability are poorly known. In the Serengeti, behavioural evidence on group and pair formation and the existence of 'super families', consisting of one male and up to three closely-related breeding females, raises interesting questions about regular inbreeding between males and their daughters from several generations (see Maas 1993a).

Core literature

Lamprecht 1979; Maas 1993a,b; Maas and Macdonald 2004; Mackie 1988; Mackie and Nel 1989; Malcolm 1986; Nel 1978, 1990, 1993; Nel *et al*. 1984.

Reviewers: James R. Malcolm, Patricia D. Moehlman.
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6.7 Cape fox *Vulpes chama* (A. Smith, 1833)

Least Concern (2004)

C. Stuart and T. Stuart

Other names

Afrikaans: silwervos, silwerjakkals, draaijakkals; **English:** silver fox, silver jackal; **French:** le renard du Cap; **German:** Kapfuchs; **Spanish:** zorro chama, zorro del Cabo; **Indigenous languages**: Xhosa: uGqeleba (South Africa); Heikum San: !khama|girib; Herero: ombánji-ururápa (Namibia); Ovambo: ombánji-kalulúng, karurúnga (Namibia); Tswana: leSie, thósê, thlósê, khanína (Botswana, South Africa).

Taxonomy

Canis chama A. Smith, 1833. S. Afr. Quart. J. 2: 89. Type locality: "Namaqualand and the country on both sides of the Orange river", determined by Shortridge (1942: 41) as "Port Nolloth, Little Namaqualand" [South Africa, *c.* 29°15'N, 16°52'E].

Chromosome number not known.

Description

The smallest canid and only true fox occurring in southern Africa, the Cape fox has a slender build and a black-tipped bushy tail. Males are approximately 5% larger than females (Table 6.7.1). The overall coloration of the upperparts is grizzled silver-grey, with the lower limbs, head and back of the long ears reddish-brown to pale tawny-brown. There is some freckling of white hairs on the face with the greatest concentration being on the cheeks; the fronts of the ears are also fringed with white hairs. A narrow dark patch above and between the eyes and at the tip of the muzzle may be present. The upper chest is fawny-red, with the underparts coloured off-white to pale fawn, often with a reddish-brown tinge. The upper region of the front legs is reddish-yellow, paler as one descends to the paws, with a dark brown patch on the backs of the thighs of the hind legs. Overall, the body pelage is soft, with a dense underfur of wavy hairs (averaging about 25mm in length) overlaid by a thick guard coat, with individual hairs averaging 45mm in length; the latter are predominantly black in colour but with light-coloured bases and banded silver. Slightly longer black tactile hairs are scattered through the body coat. During the moulting period, from October to December, much of the guard coat is lost, giving the foxes a rather dull and 'naked' appearance. The upper surfaces of the paws are pale fawn to reddish, with the claws of the front feet being sharp, curved and averaging 15mm around the curve. There is pronounced hair growth between the foot-pads. The tail is very bushy with individual

Table 6.7.1. Body measurements for the Cape fox from the former Cape Province, South Africa (Stuart 1981).

HB male	554mm (450–610) n=21
HB female	553mm (510–620) n=15
T male	348mm (300–406) n=25
T female	338mm (250–390) n=17
HF male	131mm (123–140) n=20
HF female	126mm (115–140) n=17
E male	98mm (90–110) n=22
E female	97mm (87–105) n=17
WT male	2.8kg (2.0–4.2) n=17
WT female	2.5kg (2.0–4.0) n=11

Chris and Tilde Stuart

Cape fox, age and sex unknown. Anakanirab, Central Namib-Naukluft Park, Namibia, 1993.

hairs reaching 55mm in length. The tail hairs have buffy-white bases and are broadly black or dark brown towards the tips. From a distance, the overall impression is of a black to very dark-brown tail, although close at hand the tail has a paler appearance. Females have one pair of inguinal and two pairs of abdominal mammae. The skull is narrow and elongated (average total length is 115mm), with a narrow rostrum and a rather weak zygomatic arch. The bullae are large in relation to the size of the skull. The canines are long, slender and strongly curved and the two upper molars are broad as an adaptation to crushing. The dental formula is 3/3-1/1-4/4-2/3=42.

Subspecies Monotypic (Meester *et al.* 1986).

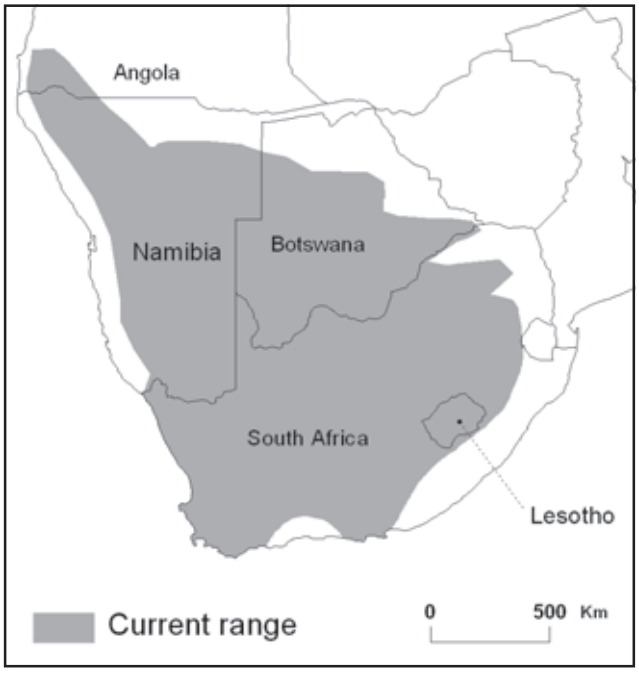
Similar species Bat-eared fox (*Otocyon megalotis*): distinguishable on grounds of coloration and the conspicuously large ears.

Current distribution

The species is widespread in the central and western regions of Southern Africa (Figure 6.7.1), reaching to about 15°N in south-western Angola (Crawford-Cabral 1989). It occupies mainly arid and semi-arid areas, but in parts, such as the fynbos biome of South Africa's Western Cape province, the species enters areas receiving higher precipitation and denser vegetation. The species has expanded its range over recent decades to the south-west where it reaches the Atlantic and Indian Ocean coastlines (Stuart 1981). Expansion through South Africa's Eastern Cape province has been documented (Coetzee 1979). Status in Swaziland is uncertain, but they may occur in the south-west (Monadjem 1998), as the species occurs in adjacent regions of north-western KwaZulu-Natal (Rowe-Rowe 1992); possible occurrence in Lesotho (Lynch 1994). Previous records of its occurrence in western Zimbabwe (Roberts 1951; Coetzee 1977) and Mozambique (Travassos Dias 1968) have not been substantiated, and it is considered unlikely that these records are valid.

Range countries Angola, Botswana, Lesotho (?), Namibia, South Africa, Swaziland (?) (Shortridge 1934; Smithers 1971; Crawford-Cabral 1989; Skinner and Smithers 1990; Lynch 1994; Monadjem 1998).

Figure 6.7.1. Current distribution of the Cape fox.



Relative abundance

Generally common to fairly abundant across much of its range, although problem animal control activities have resulted in population reductions in some areas. Estimates are only available for South Africa's Free State province where an average density of 0.3 foxes per km² was estimated with a total population of 31,000 individuals (Bester 1982). Annual offtake resulting from problem animal control programmes averaged roughly 16% up to 1985, with no obvious declines in overall populations (Bester 1982). Range and numbers have increased in the south-west and east of South Africa (Coetzee 1979; Stuart 1981). Estimated population sizes or numbers are not available, but it is thought that populations are currently stable across their entire range.

Habitat

They mainly associate with open country, including grassland, grassland with scattered thickets, and lightly wooded areas, particularly in the dry Karoo regions, the Kalahari and the fringes of the Namib Desert. They also penetrate moderately dense vegetation in lowland fynbos in the Western Cape, as well as extensive agricultural lands where they lie up in surviving pockets of natural vegetation during the day and forage on arable and cultivated fields at night (Stuart 1981). Along the eastern flank of the Namib Desert, Namibia, they occupy rock outcroppings and inselbergs, ranging out onto bare gravel plains at night (Stuart 1975). In Botswana, they have been recorded from *Acacia*-scrubland, short grassland and especially on the fringes of shallow seasonal pans, as well as cleared and overgrazed areas (Smithers 1971; Skinner and Smithers 1990). In the central Karoo of South Africa, they occupy the plains as well as the low rocky ridges and isolated rock outcroppings. In the Free State, Lynch (1975) found that they were most abundant in areas receiving less than 500mm of rainfall, although in KwaZulu-Natal they have been recorded between 1,000 and 1,500m above sea level, where rainfall is roughly 720–760mm (Rowe-Rowe 1992).

Food and foraging behaviour

Food The Cape fox takes a wide range of food items, including small rodents (murids), hares, reptiles, birds, invertebrates and some wild fruits (Bothma 1966a, 1971d; Smithers 1971; Lynch 1975; Stuart 1981; Bester 1982; Kok 1996). A sample of the contents of 57 stomachs collected across much of western and central South Africa (former Cape Province) showed that rodents were by far the most important mammal prey items; beetles (larvae and adults) and grasshoppers comprised the majority of invertebrate intake (Stuart 1981). Other dietary studies, involving stomach analysis of specimens obtained from Botswana (n=23, Smithers 1971), Free State (n=58, Lynch 1975; n=192, Bester 1982), the former Transvaal province (n=66, Bothma 1971d) and South Africa in general (n=37, Bothma 1966a) have revealed similar trends. Birds and reptiles are occasionally included in the diet but these do not appear to be important. The largest wild prey species recorded include hares (*Lepus* spp.) and springhares (*Pedetes capensis*) (Lynch 1975). Prey utilisation seems to reflect prey availability and seasonal variation in prey use occurs (Bester 1982). They will also scavenge and occasionally include young lambs and goats in their diet (Stuart 1981; Bester 1982).

Foraging behaviour Although the Cape fox lives in monogamous pairs, foraging is a solitary activity (Bester 1982). However, occasionally they may gather in loose groupings to forage at an abundant food source (Stuart 1981). Foraging is an almost exclusively nocturnal activity, with peaks shortly after sundown and just before dawn. Much prey is obtained by rapid digging with the front paws, often preceded by intensive listening bouts. Caching of prey is common (Le Clus 1971; Bester 1982; C. Stuart and T. Stuart pers. obs.).

Damage to livestock or game Predation on domestic livestock, especially lambs up to the age of three weeks, has been well documented (Stuart 1981; Bester 1982). However, it is not always clear to what extent scavenging is involved, and at least in some areas damage levels are exaggerated. In our experience, lambs killed by the Cape fox are seldom older than four days. Although some authors (Roberts 1951; Bothma 1966) found no evidence of stock killing by Cape foxes, this may have been influenced by their particular study areas. The seasons when samples were taken could also have influenced their conclusions, as the majority of sheep farmers follow fixed lambing times. The highest incidence of lamb losses to the Cape fox has been documented from the Free State, where Bester (1982) recorded that they may take 4.5% of the lamb crop.

Adaptations

Large pinnae and enlarged bullae and auditory meatus suggest enhanced detection of prey as well as predators. Nocturnal activity could serve to reduce predation, especially by the larger diurnal raptors (as has been hypothesised for Blanford's fox, *Vulpes cana*; Geffen and Macdonald 1993).

Social behaviour

The ecology of the Cape fox is poorly known and much of what is known comes from the study undertaken by Bester (1982) in the Free State. Cape foxes live in monogamous pairs. They appear to have overlapping home ranges, especially in areas where food is abundant, although the defended territory is believed to be a limited area around the den in which the female has her litter (Skinner and Smithers 1990). Home ranges ranged in size from 1.0–4.6km² (Bester 1982) and are likely to vary according to rainfall and food abundance.

The main vocal communication consists of a high-pitched howl, ending with a sharp bark. The vixen may bark when a potential predator approaches a den occupied by pups (Smithers 1983). Facial expressions and tail positions play an important role in visual communication (Le Clus 1971; Bester 1982).

Reproduction and denning behaviour

Breeding appears to be non-seasonal in some areas, and strongly seasonal in others (Stuart and Stuart 2001). The majority of births take place in spring and summer, with births recorded in August and September in South Africa's west (Stuart 1981), and August to October, with a peak in September, in the Free State (Bester 1982). In captivity, at the National Zoological Gardens in Pretoria, births were recorded from mid-September to mid-October (Brand 1963). In the Kalahari, breeding apparently extends throughout the spring and summer months. In the Western and Northern Cape provinces, juveniles and subadults have been collected during November and December (Stuart 1981).

Gestation lasts about 52 days (Brand 1963) and litter size in the Free State (2.9; range=1–6; n=16) and Kalahari (2.8; range=2–4; n=5) is similar. Young are born in burrows which are dug in sandy soil, or otherwise the adults enlarge those dug by species such as the springhare or aardvark (*Orycteropus afer*). They have also been known to use crevices, cavities amongst boulder tumbles and, occasionally, dense vegetation (Stuart 1981; Bester 1982). Although both parents feed the pups, the vixen is the main provider; no helpers are found at dens. Both parents will defend the pups against potential predators (Bester 1982). Their habit of abandoning one den for another could avoid accumulation of parasites and confuse potential predators (Bester 1982). Bester (1982) established that pups first begin to hunt at about 16 weeks and are independent of the mother and disperse at the age of about five months.

Communal denning has been recorded in the southern Kalahari (M.G.L. Mills pers. comm.), and Bester (1982) found one litter consisting of eight pups in the Free State, perhaps evidence of a similar situation.

Competition

Although poorly known, it is likely that the black-backed jackal (*Canis mesomelas*) is a competitor, and an occasional predator. It is likely that other predators, such as the caracal (*Caracal caracal*), are also competitors. Where Cape foxes coexist with possible competitors, such as black-backed jackal, some separation in prey use is evident (Bothma *et al*. 1984; Kok 1996). Over much of its range, large predators have been eradicated or greatly reduced in numbers.

Mortality and pathogens

Natural sources of mortality C. Stuart and T. Stuart (pers. obs.) recorded two instances of predation by black-backed jackal, and Mills (1984) observed a single case of predation by a leopard (*Panthera pardus*) in the Kalahari.

Persecution This fox suffers direct and indirect mortality from problem animal control activities, particularly in South Africa and southern Namibia. In the past fairly accurate figures were kept by hunting clubs and associations of most problem animals killed during control operations. However, in recent years, most of these hunting clubs have been disbanded and control measures, by and large, have been left to individual farmers. This has resulted in a paucity of records and data that can only be quoted from the 1960s and 1970s. In the former Cape Province of South Africa, from 1966 to 1970 and 1974 to 1976, more than 6,000 Cape foxes were killed by registered hunters/hunting clubs in the districts to the south of the Orange River. During this same period, in six hunting districts in the Eastern Cape province, records show that more than 20% of all animals killed were Cape foxes (Stuart 1981). In the Free State in 1974, 4,000 Cape foxes were killed during organised control operations and an average of 2,000–3,000 animals were taken in each subsequent year (Bester 1978). The Cape fox is often indirectly killed as a 'by-catch' of efforts aimed at the black-backed jackal and the caracal. The main control methods employed are leg-hold traps, dog packs and poison.

Hunting and trapping for fur Although the occasional pelt may be seen for sale in South African and Namibian curio shops, numbers entering the trade are very small. In Botswana, the pelts of this fox and other species are used in the making of traditional blankets (kaross) but no figures are available. The availability of mass-manufactured blankets has probably greatly reduced demand for animal pelts. Fur trapping poses no threat to this fox anywhere within its range.

Road kills Although occasionally seen as a road kill, the incidence of road traffic death is very low, particularly when compared with that for the bat-eared fox. Bat-eared foxes tend to stand more easily for oncoming lights, whereas Cape foxes usually turn and move.

Pathogens and parasites They are susceptible to rabies but not to the same extent as some other mammalian carnivores. The following parasites have been collected from this fox in the former Cape province: Order Siphonaptera, *Ctenocephalides connatus* and *Echidnophaga gallinacea*; Order Acarina, *Haemaphysalis leachi* and *Rhipicephalus capensis*; Order Eucestoda, *Taenia endothoracicus*, *Joyeuxiella* sp. and *Mesocestoides* sp. (Stuart 1981). In general, the role of disease and parasites as mortality factors in the Cape fox is largely unknown.

Longevity Unknown, but unlikely to be more than about seven years in the wild.

Historical perspective

Pelts were used for the production of traditional blankets, especially by the Tswana people, along with those of species such as the bat-eared fox. However, their usage has greatly diminished.

Conservation status

Threats Habitat loss/changes are not a major factor influencing the conservation status of the Cape fox. In fact, in Western Cape province and elsewhere, changing agricultural practices have resulted in range extensions for this species, as well as for the bat-eared fox (Stuart 1981). Expansion of semi-arid karroid vegetation during the process of desertification, especially eastwards, has also resulted in range extensions of this canid. Heavy direct and indirect problem animal control measures do not seem to have had a major impact on populations of the Cape fox, even though they have resulted in declines in some areas. The illegal but widespread and indiscriminate use of agricultural poisons on commercial farms poses the greatest threat (C. Stuart and T. Stuart pers. obs.).

Commercial use The trade in Cape fox pelts is negligible and this situation is unlikely to change.

Occurrence in protected areas

- *Botswana*: Central Kalahari Game Reserve, Kgaligadi Transfrontier Park (shared with South Africa);
- *Namibia*: Etosha National Park, Damaraland Wilderness Reserve, Namib-Naukluft Park, Fish River Canyon Park, Skeleton Coast National Park;
- *South Africa*: Addo National Park, Augrabies Falls National Park, Bontebok National Park, Cape Peninsula National Park, Golden Gate Highlands National Park, Karoo National Park, Kgaligadi Transfrontier Park, Mountain Zebra National Park, Richtersveld National Park, West Coast National Park.

The Cape fox occurs in many provincial and private nature reserves, as well as on game ranches in all South African provinces, although the species has a much more restricted range in Limpopo Province and KwaZulu-Natal (Stuart 1981; Rautenbach 1982; Lynch 1975; Rowe-Rowe 1992). In Swaziland, the species may occur in Nhlangano Nature Reserve in the south-west, and pups have been successfully reared in Milwane Game Reserve (Monadjem 1998).

Protection status CITES – not listed.

Current legal protection Although treated as a problem animal across most of its range, it is partially protected in several South African provinces, as it does not appear on the official lists of problem species. However, no permit is required from any authority to kill this fox in problem animal control operations. No protection measures are currently enforced and at the present time, this is not necessary.

Conservation measures taken None.

Occurrence in captivity

None known.

Current or planned research projects

There are no formal research projects being undertaken or planned on the Cape fox anywhere within its range.

Gaps in knowledge

Although the Cape fox has been extensively studied in South Africa's Free State province (Lynch 1975; Bester 1982; Kok 1996), there is little information for elsewhere within its range. Aspects such as diet and reproduction are quite well known but little information is available on aspects of social ecology and behaviour in the wild. Some investigation into the role, if any, this species plays in disease transmission is necessary.

Core literature

Bester 1982; Lynch 1975; Stuart 1981.

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