Bat-eared Fox *Otocyon megalotis*

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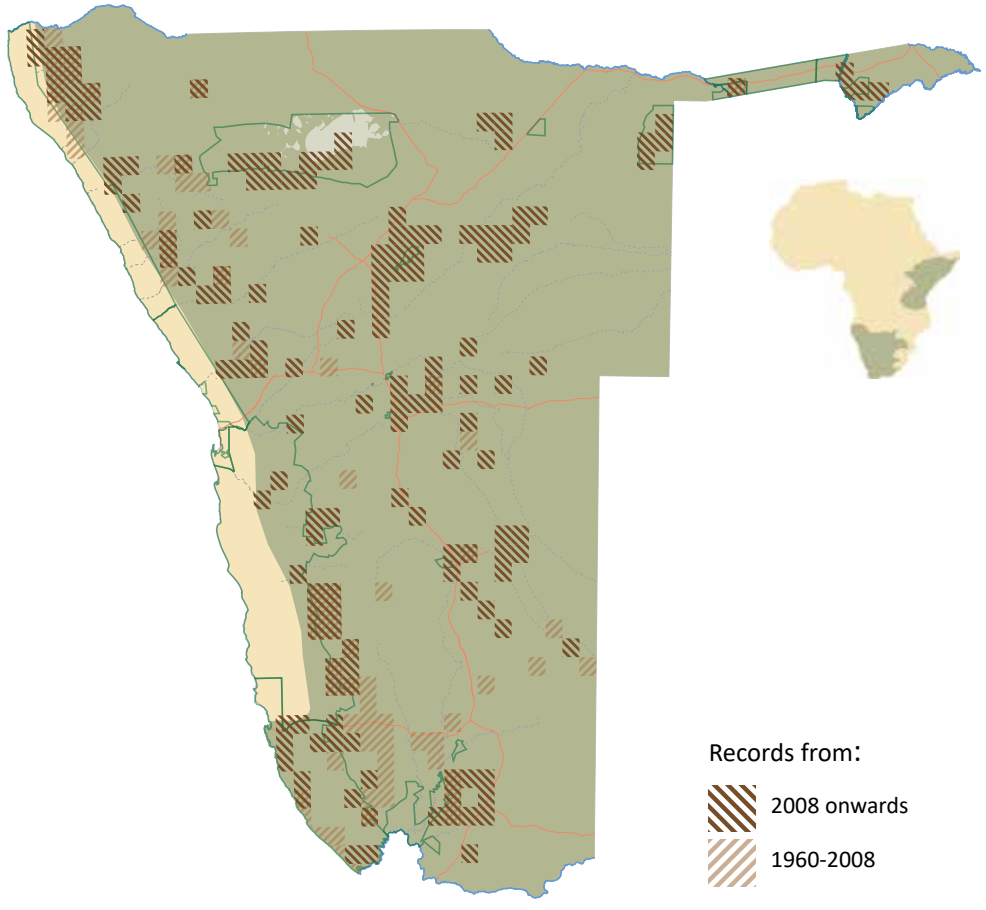
Namibian conservation status	Least Concern
Global IUCN status	Least Concern since 1996
Namibian range	Approximately 769,400 km^2, which is ~31% of the southern African range
Global range	~5,011,300 km^2 in two distinct populations: ~2,626,300 km^2 in southern Africa ~2,385,000 km^2 in eastern Africa
Population estimate	Namibia: unknown Global: approximately 1.3- 5.2 million individuals in southern Africa based on density estimates for a few populations
Population trend	Currently unknown, but likely stable based on general observations Common in protected areas, but becoming less common on small-stock farms where they are persecuted
Habitat	Short grassy habitat, open shrubby vegetation and semi-arid to arid savanna with bare ground, sandy areas of the Kalahari and Namib
Threats	▸ Under some pressure in small-stock farming areas because of persecution. This is mostly from hunting and poisoning where falsely perceived as a predator or where it is indirectly killed from anti-jackal measures ▸ Population fluctuations caused by diseases (rabies and canine distemper) ▸ Drought conditions, causing depressed insect populations. Extensive areas under jackal-proof fencing pose a threat, as the animals are prevented from moving in response to changing climate conditions ▸ Road mortalities

LEAST CONCERN

Distribution records of bat-eared fox, and present estimated area of distribution in Namibia.

Inset: African distribution of bat-eared fox according to IUCN (Hoffmann 2014b).

The Namibian distribution in the main map is more up to date and does not necessarily agree with the distribution shown in the inset.



IDENTIFYING FEATURES

Bat-eared foxes are small canids (~2–4kg, Estes 1991) with conspicuous large ears. The tail is bushy with a broad black stripe extending down to the black tip. They appear quite dark and "hunch-backed" when seen foraging at a distance, and are often in pairs or small family groups. They crouch low and hold their enormous ears horizontally when trying to avoid detection. These features separate them from similarly sized Cape fox which are lighter coloured, more slender and not at all hunched, and are usually solitary. When scared or threatened, bat-eared foxes curve their tail in a characteristic inverted U-shape and erect their fur to try to appear bigger than they are.

DISTRIBUTION

Bat-eared foxes occur in two different subpopulations corresponding to distinct sub-species: *Otocyon megalotis megalotis* in southern Africa and *O. m. virgatus* from East Africa (Nel & Maas 2013) and their distributions mirror that of their main prey, *Hodotermes mossambicus* (Mackie & Nel 1989).

In Namibia, bat-eared foxes occur throughout the country all the way into the Zambezi and Kavango Regions and to the south and Namib region. The current distribution also includes the southern coastal area as part of the range of this species, which is an extension from the IUCN distribution map (Hoffmann 2014b). It is not clear if this extension results from better observational data or reflects a real range expansion.

Bat-eared foxes are common within protected areas, but are becoming less common particularly on small-stock farmland where they are persecuted as part of efforts to kill jackals (Hoffmann 2014b). In the Waterberg area, bat-eared foxes were detected by camera trap only on freehold farms and never in communal land over the course of a 9-day survey period (Kauffman *et al*. 2007).

POPULATION ESTIMATE AND TREND

The current lack of data on bat-eared fox abundance precludes any estimation of population size and trend in Namibia. Through their range, local densities fluctuate depending on rainfall, food availability (Nel 1984), breeding season and disease (Maas 1993, Maas & Macdonald 2004). Diseases, particularly rabies and canine distemper, can cause short term but drastic declines in populations (Maas 1993, Hoffmann 2014b) from which they usually recover within 1–2 years (Dalerum *et al*. 2016).

Quantified densities in southern Africa range from 0.57 to 2.3 individuals/km^2 (Maas & MacDonald 2004, Kamler *et al.* 2012b, 2013). A small sample from the Kalahari went from 0.25 individuals/km^2 in 2016 to 1.75 a year later, possibly reflecting a rapid increase in the population when conditions were favourable (Brown pers. obs. 2017).

The above-mentioned density studies arrive at a total population of approximately 1.3–5.2 million individuals in southern Africa. The population trend is currently unknown, but is likely to be stable based on general observations. Bat-eared foxes are common in protected areas, but are becoming less common on small-stock farms where they are often persecuted (see below).

ECOLOGY

There is a lack of information about bat-eared fox ecology in Namibia but they are likely to have similar ecology as the neighbouring populations which is described below.

Bat-eared foxes are found in open grasslands, overgrazed rangelands and sparse *Acacia* woodland. They prefer short grass or extensive bare ground. Their habitat requirements and geographic range are nearly the same as the harvester termite (*Hodotermes mossambicus*) which is their primary food source in southern Africa (Mackie & Nel 1989, Nel 1990, Kurberg 2005, Sillero-Zuberi 2009a). In the Namib Desert, bat-eared foxes consume mainly *Hodotermes* and *Triniterves* species and seem to increase their use of *Triniterves* species in years with low rainfall and lower *Hodotermes* availability (Bothma *et al*. 1984). Their diet also contains other termites, other insects and invertebrates, mice and small reptiles, and wild fruits (Estes 1991, Jumbam *et al*. 2019).

Bat eared foxes are primarily nocturnal but are also active during daytime in winter months, mirroring the activity patterns of *Hodotermes* (Lourens & Nel 1990, Nel 1990).

Group size varies with the time of the year between monogamous pairs (occasional trios with one male and two females), and parents accompanied by their offspring prior to dispersal. They breed annually, whelping near the beginning of the rainy season during the period of peak insect abundance (Nel 1984). Pairs inhabit relatively small (0.43–5 km^2) and temporary home ranges (Mackie & Nel 1989, Kamler *et al.* 2012b). Contrary to the situation in East Africa (Maas 1993), these ranges overlap to a large extent in southern Africa and foraging family groups intermingle with little antagonism (Mackie & Nel 1989, Lourens & Nel 1990, de Bruin *et al.* 2018).

This species is characterised by a high involvement in pup rearing by the fathers who often spend more time with the pups than the mothers, guarding the den and playing, grooming and foraging with them (Wright 2006, Nel & Maas 2013).

The presence of other meso-carnivores such as black-backed jackals can negatively affect bat-eared foxes. While the presence of jackals doesn't suppress bat-eared fox density (Kamler *et al.* 2013), coexistence with them and other meso-carnivores can have negative effects on bat-eared foxes. Indeed, they tend to occur less than expected in habitat preferred by jackals and avoid denning in the core of jackals' home ranges (Kamler *et al.* 2012b). Evidence from areas where large predators and jackals have been extirpated for more than 50 years show that bat-eared foxes still display anti-predatory behaviour (Welch *et al.* 2017).

THREATS

In Namibia, the practice of putting extensive areas under mesh "jackal-proof" fencing in the south and west of the country poses a threat, as the animals are not able to move in response to changing climatic conditions. This threat is likely to become more severe as the impacts of climate change become more evident. In addition, intense droughts

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can depress insect populations, which may have an impact on bat-eared fox populations (Hoffmann 2014b).

Across southern Africa, bat-eared foxes are often falsely perceived as predators of small livestock, and they may be mistaken for black-backed jackals when dogs are used for hunting (Kurberg 2005, Hoffmann 2014b). In either case, they are often intentionally or accidentally persecuted by farmers. The combination of poisoning, gin traps and direct persecution have eradicated them on many farms. It takes typically at least a decade for populations to show signs of recovery, depending on recolonisation from adjacent areas. Where former small-stock properties border on national parks and well established privately protected areas, recolonisation is more rapid than in areas surrounded by small-stock farms.

Bat-eared foxes seem to be particularly susceptible to diseases such as rabies and distemper virus, and their numbers are known to fluctuate strongly in response to disease outbreaks that can almost wipe out local populations. In southern Africa, bat-eared foxes can act as a reservoir for rabies (Sabeta *et al.* 2007, Swanepoel *et al.* 2015a). Like many other diseases, rabies outbreaks usually follow periods of high stress, such as drought causing a significant decline in insect populations. Food deprivation could lead to impaired immune systems, creating opportunities for rabies infection. Vaccination of domestic dogs is therefore highly recommended in areas where they come into contact with bat-eared foxes, to prevent rabies transmission between species. Rabid bat-eared foxes do not usually show typical symptoms of frothing at the mouth and aggressiveness; most individuals develop the paralytic form of rabies. Behavioural signs range from violent convulsions and cramp-like seizures during which foxes frequently cry out, to lethargy and complete ataxia (Maas 1993, S Périquet pers. obs.). Rabies diagnosis requires examination of the brain from a freshly dead individual, which is rarely possible to obtain. An 11-year study in central Namibia revealed 16 cases of rabies in bat-eared foxes, and no long term trend in the disease prevalence (Courtin & Carpenter 2000). In Etosha, bat-eared foxes were also reported as being killed by rabies between 1975 and 1990 (Berry 1993). A more recent study (Hikufe *et al.* 2019) found that between 2011 and 2017, six cases of rabies were reported in bat-eared foxes.

While intense grazing can negatively affect bat-eared foxes, intermediate grazing pressure can be beneficial through increase of trampled vegetation and bare ground favouring *Hodotermes* (Kurberg 2005). In the current framework of climate change, drought periods are predicted to increase in length and severity, thus impacting insect species more severely. This will have a strong negative effect on bat-eared foxes, with increased food shortages making them more susceptible to disease. Erratic rains will also impact their breeding success and the pups might be born out of sync with the insect eruption after the first rains. The increased need for land for livestock production will likely have a negative impact on bat-eared fox populations as well. This effect will most probably manifest itself in the increase of direct and indirect killing as farmers increase their predator removal practises.

Bat-eared foxes are particularly vulnerable to road kills, and they are one of the carnivore species most reported killed on roads in South Africa (Périquet *et al.* 2018). With the increase of human population and thus traffic, it is also likely that road mortality of bat-eared foxes will increase in the future.

Commercial use (for pelts) is very limited, but they are sold as hunting trophies in South Africa (Hoffmann 2014b).

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CONSERVATION STATUS

The bat-eared fox is listed as Least Concern on the IUCN Red List (Hoffmann 2014b) and has been so since its first assessment in 1996. The species is not included in the CITES Appendices.

We have very little information on the bat-eared fox population in Namibia, but no reason to believe that it is declining as they are still seen very often across their range.

ACTIONS

There is still very little known about bat-eared fox populations and ecology in Namibia, and more research is needed in order to provide reliable recommendations. Promoting citizen science participation in online reporting platforms (e.g. EIS), and especially private camera trap owners and farmers (e.g. via NAU) would help in gathering data at a large scale.

Conservation actions for bat-eared foxes should focus on reducing their mistaken persecution on farmland and reducing their susceptibility to roadkill.

It is important for farmers to identify this species correctly in order to stop targeting them during predator control operations. Bat-eared foxes do not prey on livestock, even small goats and lambs, and scavenge on carcasses extremely rarely. Livestock dung attracts many insects, which in turn help to sustain this species. Therefore, by maintaining a healthy population of bat-eared foxes, farmland can benefit from the control of *Hodotermes*, which is implicated in rangeland degradation in Namibia (Mitchell 2002). Banning the use of gin traps and poisons for predator control, and stopping/minimising the use of pesticide to control termite populations, will greatly benefit bat-eared fox populations. Such information could be disseminated through AgriForum for instance.

People driving at night should be particularly vigilant when bat-eared foxes are spotted on or near the road. They are blinded by the lights and dart away, often changing direction very abruptly (S Périquet pers. obs.), ending up back on the road. When seeing bat-eared foxes, drivers should simply slow down and dim their lights to allow them to escape safely to the bush.

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