



Foxes and their Impact

Department of Primary Industries

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Common name

Fox, red fox

Scientific name

Vulpes vulpes

Status

“Foxes” are declared as established pest animals throughout the State under the *Catchment and Land Protection Act 1994*.

The keeping of foxes as household pets is not permitted under the *Catchment and Land Protection Act 1994*.

Origin and distribution

Foxes are found throughout Victoria in nearly all environments.

The red fox, *Vulpes vulpes*, is the most widespread member of the genus *Vulpes* and the most well known. The actual origin of the fox is not known, it evolved 30-50 million years ago possibly in North America. The red fox is well established across all continents.

Impact of foxes

Effective fox control is effective management of fox impact. Most fox control effort does not have a significant effect on the fox population to alleviate impact or fails to adequately affect those individuals that might be, in some situations, causing the major impact on specific species. Any control program must have a component of monitoring to define the reason for, and the effect, of fox control work.

History of introduction

Though many more were attempted, there were two successful introductions of the fox and these probably formed the basis of the current population. A “well know sportsman and acclimatiser, probably Dr. King, released a dog and a vixen 12 miles from Ballarat about 1871; and Thomas Chirnside released several at Point Cook, also in the early 1870’s” (Rolls, 1969).

Reports of fox sightings occur at:

- Ballarat district 1874
- Laverton 1878
- Braybrook, Little River approx. 1878
- Corio Bay 1880
- Merrang (near Warrnambool) 1880
- Bendigo 1886
- In South Australia, Arthur Bean (1869) had two fox cubs, what happened to them is unknown, however four foxes were seen along the Coorong in October 1888
- Euroa, Benalla, Shepparton, Yarrawonga 1893

In less than a decade the descendants of a handful of English red foxes had colonised some 13,000 sq km of Victoria (McDonald, 1989).

By 1917, foxes were to be found as far as Kalgoorlie in Western Australia. Foxes now range over some two-thirds of the continent, their northern limit being within 160 km of the Gulf of Carpentaria.

Characteristics of the red fox

The fox is adapted to live in a wide range of habitats from the arctic to sub-tropical, including savanna plain, grasslands, open woodlands, some forest types and urban areas such as Melbourne (eg. Boxhill, Camberwell, Spotswood, Balwyn, Port Melbourne). The fox’s “..*grace and elegance..*” “..*have piloted its evolution. Aesthetics and adaptation are one in the red fox - its most exquisite features are also some its most important tools for survival. For instance, the long tapering limbs, gazellelike body and yellow serpentine eyes of the fox are stunning characteristics, but they are also physical attributes that help make the animal a lethal hunter*” (Henry, 1996).

Physical

Adult weight:

4.5 - 8.3 kg.

Size:

male	110 cm average (47 cm tail av.)
female	103 cm average (40 cm tail av.)



Sexual dimorphism:

male approx. 15% heavier

Scent glands:

anal sacs, chin, foot pads

Vocalisations:

wide range

Max. Speed:

50 kph

Reproduction

- sexual maturity: 9-10 months
- social suppression of reproduction by dominant animals
- monoestrus
- breeding season: 2-3 days in July to October (peak = August)
- gestation: 51 - 53 days
- birth weight: 50-150 g
- litter size:- 4-10 (average = 4)
- cubs dark greyish brown

Behaviour

- male brings food to den for breeding vixen for about 2-3 weeks
- sub-adult non-breeding females may act as helpers to the vixen
- cubs suckled until four weeks, then weaned to solids
- cubs trained to fur and feathers (vixen and helper fox(es) bring food back to the den)
- four months after birth vixen and dog fox may exclude sub-adults from the territory
- sub-adults may disperse, males are most likely, and some females may remain.
- territorial (defending food sources, shelter and breeding opportunities, natal dens and breeding partners especially in the home range)
- mark territory boundaries with excrement, urine (anal glandular secretions) and scent
- territories may overlap slightly
- home range: urban > 30 ha, rural = 250-750 ha, alpine = 550 ha
- dominance hierarchy with dog foxes and vixens
- dominance behaviour by vixens may stop young vixens breeding
- usually hunt alone, group hunting may occur
- caching or the burying of food for eating later is very common
- dig dens or excavate existing rabbit / wombat burrow for breeding dens
- dens are located in areas of highest food availability, especially quality food sources

- consistently re-use dens
- natal den may be moved during breeding season (vixens may use 1-3 dens)
- foxes have safe day lay up spots, & are not usually in an earth den
- omnivorous (eating vegetable matter, fruit, insects, meats)
- opportunistic predators (preferring up to 5kg)
- rabbits bulk of diet 36.1%, 35% / 20% (data from USA/Victoria/NSW), Mice:-13.5%, 14% / 10% (USA/Victoria/NSW) see table below
- three peaks of activity early morning, evening and the middle of the night
- daily travel >10 km
- entire hunting territory not covered in a single night's hunting foray

Table 1. Food items found in fox stomachs

Food Item	% Volume
Sheep	20
Rabbit	35
House mouse	14
Macropod	2
Possum	5
Pig	1
Fox	1
Cattle	1
Poultry	1
Bird	1
Insects	5
Other invertebrates	2
Plant material	3

(Source: Coman, 1973)

Diseases and parasites

Distemper, hepatitis and mange are known to be widespread among foxes. They also carry several species of tapeworms and roundworms that parasitize domestic animals.

The main disease problem is the threat that foxes pose as carriers of rabies. In Europe, foxes are the main vector and reservoir host of rabies. At present there is no rabies in Australia, although in recent decades it has spread through much of South-east Asia. Researchers are in clear agreement that if the rabies virus gains a foothold in Australia, control would be extremely difficult, unless fox populations are kept down to levels that would restrict the disease from spreading rapidly.

Studies have suggested that the disease spread may be more controllable in areas where population density of foxes is below 0.2 - 1.0 foxes per square kilometre. Researchers from the Department of Sustainability and Environment (DSE) and Department of Primary Industries (DPI) have found that throughout much of rural Victoria the average density is between 2-4 foxes per square kilometre. Considering that summer densities are about

twice as high, this is well within the range required for a disease outbreak (epizootic). More recent research by DSE and DPI reveals the urban Melbourne area to have fox densities as high as 16 per square kilometre in breeding season. Given the close contact between foxes and domestic animals this would make the control of rabies epizootic very difficult (Marks & Bloomfield, 1991).

Fox populations

Fox populations effectively replace themselves each year, with high mortality of young foxes and little overall increase in population. Foxes are highly adaptable, very mobile and successful in most habitats. Most fox control techniques, such as shooting, poison baiting and trapping, can have an immediate effect on individuals, but, usually, will not result in a significant reduction of the species on any broad scale.

Fox populations both here and overseas tend to show a response to increasing control efforts by altering structure, whereby young foxes tend to become more predominate in the population. This appears to be due to an increase in productivity and to increasing dispersal of young (approximately 1 year old) into vacant territories.

Assessing fox populations

Spotlighting

While it is difficult to obtain precise numbers, spotlighting in the early hours is probably one of the best guides to fox abundance. From the counts, it can be gauged if sufficient numbers are present to pose a threat to lambs or assess if the numbers are changing. Five foxes seen in an hour (or one fox every two kilometres) would indicate that fox numbers are high enough to be affecting lamb marking percentages. Caution must be used when estimating fox numbers. The number of visible foxes often does not reflect the true number of foxes present. Research carried out in Bendigo suggests that for every fox seen there will be another four undetected. The ratio of foxes seen to those undetected will vary according to topography, hunting pressure and terrain.

Fox sign

Look for fox tracks on roads or sheep pads and droppings (scats) near carcasses or scent marking posts. These will all be easily noticed if foxes are plentiful. The following examples of fox tracks and scats have been reproduced from Triggs (1996).

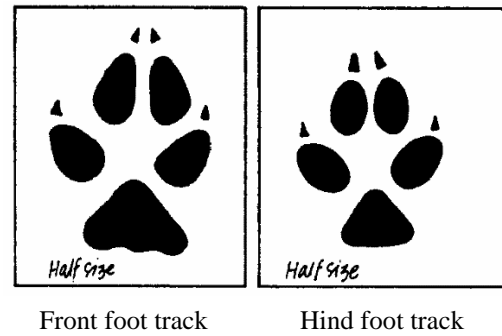


Figure 1. The heel pad of the front foot is separated from the toe by hair. This distinguishes the tracks from those of dogs.

Carrion feeding

Foxes readily eat sheep and lamb carcasses. Lamb carcasses may be difficult to find if foxes are a problem.



Figure 2. Scat no wider than 2 cm with a characteristic strong smell and 'tail' of hairs. Sometimes bone fragments or seeds like blackberry or briar rose is obvious

Agricultural impact

Foxes are known to kill young lambs. Some studies indicate foxes may account for approximately 30% of all new born lamb deaths. Other research evidence suggests that the economic losses due to fox predation may be of secondary significance when compared with other causes. Lamb losses due to starvation, mismothering and exposure may be the direct cause of most lamb deaths. Individual foxes can cause heavy losses at a local level.

Environmental impact

The Australian National Strategy for the conservation of species and habitats threatened with extinction viewed the fox as a major threatening process to many species of native wildlife. This position is supported by the Victorian Scientific Advisory Committee (established under the *Flora and Fauna Guarantee Act, 1991*), whose final recommendations determined that predation of native wildlife by the fox was a potentially threatening process, as in the absence of appropriate management, it:

- poses a significant threat to the survival of a range of fauna;
- poses a significant threat to the survival and evolutionary development of two or more taxa.

Australian fauna did not co-evolve with the fox and thus our wildlife are susceptible prey - species with few adoptive strategies to avoid predation. Victorian studies on fox diet indicate that substantial predation on indigenous fauna occurs in all environments, including areas of heavy forest.

Some studies indicate that when food supplies become low foxes will simply move on to another area. The actual effect of foxes may be greater as many of our vulnerable native species have low population densities, meaning even small losses due to fox predation may be significant.

Certainly the abundance of rabbits can help maintain fox numbers and, consequently, fox predation pressure on native species. Disturbed environments with high proportions of non-native weed species such as boxthorn, furze/gorse and blackberry help the survival of rabbits and also provide harbour for foxes.

Native species at risk from foxes

The following list, although far from comprehensive, provides an indication of species believed to be at risk from fox predation across Australia.

Marsupials

Parantechinus apicalis, dibbler
Dasycercus cristicauda, mulgara
Dasyuroides byrnei, kowari
Phascogale calura, red-tailed phascogale
Sminthopsis psammophila, sandhill dunnart
Myrmecobius fasciatus, numbat
Isoodon obesulus, southern brown bandicoot
Perameles gunnii, eastern barred bandicoot
Macrotis lagotis, bilby
Burramys parvus, mountain pygmy possum
Pseudocheirus occidentalis, western ring-tail possum
Dasyurus geoffroii, western quoll
Potorous longipes, long-footed potoroo
Bettongia penicillata, brush-tailed bettong
Lagorchestes conspicillatus, spectacled hare-wallaby
Lagorchestes hirsutus, rufous hare-tailed wallaby
Petrogale lateralis, black-footed rock-wallaby
Petrogale penicillata, brush-tailed rock-wallaby
Petrogale xanthopus, yellow-footed rock-wallaby

Rodents

Pseudomys australis, plains rat
Pseudomys shortridgei, heath eat
Notomys fuscus, dusky hopping mouse
Zyzomys pedunculatus, central rock-rat

Birds

Pezoporus wallicus, ground parrot
Geopsittacus occidentalis, night parrot
Leipoa ocellata, malleefowl
Burhinus magnirostris, bush thick-knee
Cinclosoma alisteri, nullarbor quail-thrush
Sterna albifrons, little tern
Eudyptula minor, little penguin

Saunders, G., Coman, B., Kinneer, J. & Brayser, M. (1995). *Managing Vertebrate Pests: Foxes*, Bureau of Resource Sciences, AGPS.

Control or damage reduction?

Fox populations are very resilient to conventional methods of control. Rapid re-invasion of areas occurs after control measures are applied. This suggests that control is either rarely achieved or not achieved, especially when tackling the problem by yourself or using a once-off management technique. DSE promotes an integrated use of techniques with a group approach to fox control.

Integrated fox control

A control program must ensure that all of the species is at risk from the control measures chosen. Effective control integrates:

- a knockdown' effect from large scale poisoning programs combined with den fumigation
- exclusion fencing
- strategic shooting, and
- appropriate animal husbandry.

Integrated fox control programs over large areas should account for the varying densities and rates of re-invasion that will be encountered in different habitats. Integrated group control measures are more efficient and more effective in achieving long-term fox control.

Further information

- Contact your local landcare or friends group for further assistance and advice.
- Call the DPI/DSE Customer Service Centre on 136 186.
- Contact your local DPI Pest Management Officer for advice on local programs.
- Visit the DPI website at:
<http://www.dpi.vic.gov.au>
 and the Invasive Animals Cooperative Research Centre at: <http://www.invasiveanimals.com>

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Acknowledgements

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