



The fox

Vulpes vulpes

DECLARED CLASS 2



The most common and widespread of the world's many fox species is the European red fox (*Vulpes vulpes*). Foxes are a major pest species in Australia that threaten agricultural and native species alike. Foxes have pointed muzzles, flattened slender skulls, large ears and long bushy tails. Adult male foxes weigh around 6 kg, with females closer to 5 kg.

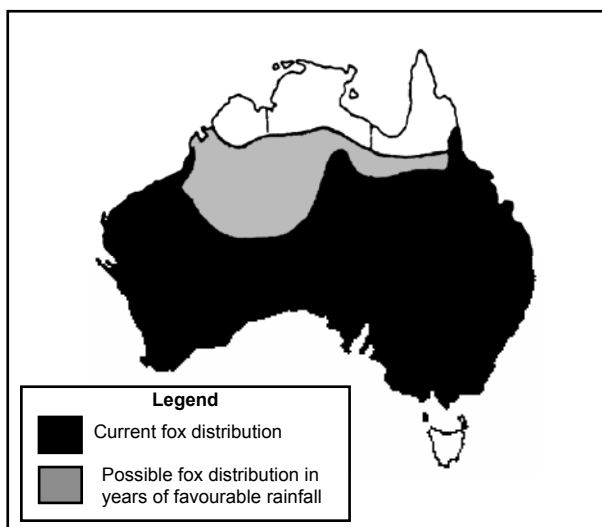
Under the *Land Protection (Pest and Stock Route Management) Act 2002*, the fox is a declared animal and it is the responsibility of landholders to control foxes on their own land. It cannot be kept in captivity or introduced to Queensland without a permit.

Distribution

The European red fox was deliberately introduced into Australia in 1845. First released near Melbourne for sporting purposes, it spread rapidly. By 1893, it had become a nuisance in north-eastern Victoria and by 1930 it occupied most of southern Australia.

Next to wild dogs, the fox is the largest land-dwelling carnivorous mammal in Australia. Foxes are adapted to a variety of different habitats, ranging from deserts to urban environments. However, foxes are not found in tropical Australia. Competition with dingoes, climatic preferences and food supply likely determine their distribution.

FIGURE 1 – CURRENT DISTRIBUTION OF THE FOX



Diet

Foxes in Queensland are primarily carnivorous (meat-eating) scavengers and opportunistic predators. Although they consume a varied diet of rabbits, rodents, frogs, birds, insects and even fruit, the largest proportion of their diet in Queensland consists of kangaroo and sheep carrion.

Fox predation is considered the greatest threat to the long-term survival of many small marsupial species in Australia. Long-term studies have shown that rock wallaby and malleefowl populations are probably regulated by fox predation. Predation on birds and reptiles appears seasonal.

Growth and reproduction

Foxes breed once a year. Over a period of 2–3 weeks in early winter females come into oestrus for 2–3 days. Males appear to be fertile throughout winter and early spring.

The fox's gestation period is 51–53 days. Cubs are generally born in burrows but litters have been found in hollow trees, rock crevices, under houses or in stick-rake piles. The average litter size ranges from four to a maximum of ten.

Although red foxes have generally been considered monogamous, communal denning has now been recorded, as well as the presence of "helpers" at the den.

Among red foxes the proportion of vixens that breed varies greatly between areas ranging from 30% to nearly 100%.

Fox populations can withstand up to 75% yearly mortality rates and recover to pre-control population levels. Recovery rates are dependent on immigration rates and breeding.

Behaviour

Foxes generally disperse from where they were born in Autumn at 6–9 months of age. Dispersal behaviour varies between males and females and between individuals of the same litter. Females generally disperse 3–15 km on average and males 11–43 km, although distances of 170 km have been recorded.

Foxes were previously thought to be solitary, but recent evidence suggests that fox family groups occupy well-defined home ranges. Rural home ranges in Australian are in the order of 500 ha, however this is dependant on resource availability.

Foxes are usually active at night and rest during the day in an earth den (often an enlarged rabbit burrow), thicket, hollow log or stick-rake pile. In winter, when there is less food available, foxes may hunt and scavenge during the day.

Although paths may cross many times each night, foxes within a group tend to forage in different parts of the group territory. Dominant animals monopolise the best habitat.

Faeces and urine are used to define territories by scent marking conspicuous landmarks like tussocks of grass and rabbit warrens. These scent marks are distributed throughout the fox's range, especially in places that are visited often. Dominant animals scent mark with urine more than subordinates.

Foxes communicate by sound as well as by scent marking and body language. Young foxes use aggressive yapping and a resonant howl during the winter mating season. Vixens and pups will bark and whimper softly, adult foxes also scream.

Causes of mortality

Mortality of young foxes is generally high with up to 80% dying in the first year. Poisoning, hunting, roadkills, disease, food shortage and social factors contribute to mortality.

Most foxes live less than 4 years although eight year-old foxes in the wild have been reported. Mange and distemper are thought to be important causes of mortality in wild populations of foxes, however little is known about their role in regulating Australian fox populations.

Predation on livestock

In some circumstances red foxes may kill lambs and goat kids. Fox predation on healthy, viable lambs is generally less than 5%, however this varies between properties. Individual rogue foxes can cause high stock losses. Furthermore, red foxes, as well as dingoes/wild dogs, are noted for 'surplus killing' and will kill multiple easy prey despite an abundance of carrion.

Foxes usually attack the throat of lambs and kids, although some are killed by multiple bites to the neck and back. This may result from young animals being caught while lying down. Foxes do not have the size and strength to hold and immobilise adult sheep or goats, or to crush large bones; therefore, repeated bites may be required to subdue prey.

Foxes generally prefer large internal organs and begin feeding through an entry behind the ribs. However, some target the nose and tongue and may consume the head of small prey. Red foxes are noted for carrying small carcasses back to their dens to feed their young, which may account for some poultry, lambs and kids that disappear and are never found.

One way to distinguish fox kills from wild dog attacks is that foxes rarely cause severe bone damage to stock. Poultry can however be badly damaged through fox attacks.

Urban foxes

Both in Australia and overseas foxes readily survive and prosper in urban environments. Fox densities in Melbourne are reported to be as high as 16 per km² compared to densities generally less than 2 per km² in most semi-arid grazing areas.

The distribution of urban foxes is dependent on the availability of suitable daytime hiding places. While foxes in urban areas are generally found in remnant bushland or parks, foxes can find refuge under railway platforms, houses or sheds, or in quiet gardens. The availability or distribution of food supply in any given habitat will also affect the distribution of urban foxes. Bushland areas in and around cities provide ideal shelter.

In urban areas, foxes eat a diversity of food types including small birds, worms, insects, fruit and food put out by residents.

Urban foxes will rarely attack people. However, any urban fox is a wild animal and should be treated as such.

Urban foxes can be a nuisance by:

- attacking poultry and livestock in peoples yards
- raiding garbage bins scavenging for food
- digging holes in lawns scavenging for food and
- causing domestic dogs to bark.

Rabies threat

Foxes, along with other feral animals, have the potential to spread diseases such as rabies, should



such diseases ever be introduced into Australia. They would also provide a reservoir of infection, making rabies almost impossible to eliminate. Rabies (Latin for madness) is a contagious disease of virtually all mammals, including humans. Once symptoms of rabies appear, the virus is always fatal to both humans and animals.

This deadly virus is not established in Australia but is present in Asia.

However, we should not be complacent about the rabies issue. All foxes are capable of contracting and spreading rabies. In the Northern Hemisphere red foxes are the principle vectors and victims of the disease. Millions of foxes have been culled overseas in unsuccessful attempts to control the disease.

Control

Current options available for control of foxes in Queensland include poisoning, trapping, shooting, guard animals and exclusion fencing. The choice of control method should suit the individual circumstances. The potential of M-44 mechanical toxin ejectors and fertility control, such as immunocontraception, is also being researched.

Poisoning

Presently there are two poisons legally available for fox control in Queensland; sodium monofluoroacetate (1080) and strychnine. 1080 poison baits are the most economic and effective method of controlling foxes. Processed (FOXOFF®) or fresh meat baits can be laid quickly by hand, vehicle or from the air, with population reductions of greater than 90% recorded from some baiting campaigns. Baits should be placed along track and fence lines 200–500 m apart, 8–10 cm underground and covered with loose soil. Burying baits has the advantages of reducing non-target bait take (more baits for foxes) and protecting baits from the elements. All property neighbours should be notified at least 72 hours

prior to baiting, and baiting signage should be erected at every property entrance and left for at least one month after baiting. Based on fox biology, the optimum time to bait is in November followed by June/July when food demand is highest; the latter timing coinciding with lambing on many properties. Foxes are also often killed by 1080 baiting programs that are designed primarily to control wild dogs or feral pigs. FOXOFF® or meat baits can only be obtained through licensed Department of Natural Resources, Mines and Water Officers and Local Government operators.

Queensland and Western Australia are the only two states that have not outlawed the use of strychnine for controlling foxes based on target-specificity and humanness issues. A Health Department permit is necessary to purchase strychnine. Cyanide capsules are currently being evaluated as an alternative toxin to strychnine.

Baits can be selectively positioned or tethered to avoid killing native non-target species. This is particularly important in areas containing native carnivores such as quolls. The foxes keen sense of smell enables them to find baits intentionally buried in sand or otherwise hidden.

To effectively reduce the short and long-term impact of foxes, it is highly recommended that baiting activities be coordinated among adjoining properties. Baiting of individual properties will only provide short-term success due to the high mobility of foxes and will result in rapid re-invasion.

Trapping

Trapping is time consuming, labour intensive and generally ineffective in reducing fox populations. The success of trapping (using Soft-Catch® traps and snares, not illegal steel-jawed traps) depends on the skill of the operator. Trapping is predominantly used in urban areas where poisoning and shooting are restricted, where there is high risk to native species, or for live-capture research purposes.

Shooting

Shooting of foxes is a highly selective, popular and widely used control technique in rural Australia. Fox shoots are normally carried out at night from a vehicle using a .222 calibre rifle with the aid of spotlights. Although the success of this method varies depending upon the marksmanship of the shooter and the wariness of the foxes, the technique is still considered ineffective in reducing fox populations over the longer-term. Furthermore, the practice is biased towards young unwary juveniles and may do little to reduce the impact of foxes on lambs or wildlife. Shooting is best performed in addition to other control techniques rather than a primary method.

Guard animals

Guard dogs, primarily maremmas, and alpacas are used to protect sheep and goats from fox predation in numerous countries, including Australia. The effectiveness of guard animals in reducing fox predation on lambs and goat kids is primarily unknown. Consequently, guard animals should not replace other control techniques until such a time that the technique is proven successful.

Although dogs have traditionally been used for guarding, alpacas have the added advantage of being herbivores and therefore do not require additional feeding. They are also less likely to wander and become problem animals themselves. This control technique is most suited to small properties on the urban fringe.

Exclusion

Exclusion fencing for foxes is expensive and must be well maintained due to the agility of foxes and their ability to squeeze through small holes. Fencing is most often used to protect high value stock, poultry or wildlife from fox predation in areas where other methods are not able to be used, such as closely settled areas.

Secure poultry runs and night yards for small livestock should be considered in areas where foxes are a problem. Foxes can dig and climb so runs and yards need to be constructed with this in mind.

Further information

Further information is available from animal control/environmental staff at your local government, or if your council does not have animal control staff, from your local Department of Natural Resources, Mines and Water Land Protection Officer: contact details available through 1800 803 788. ■