



# • Alien invaders

Western Australia is under attack from aliens—invasive species that are driving many of our native animals to extinction and placing many more under threat. This process is even going on in our own gardens and our oceans. The aliens are not just introduced animals, but also introduced diseases and weeds.

by Andrew Burbidge

Australia has been greatly affected by invasive species, including predators, herbivores, disease organisms and weeds.

### Predators

Three recently-introduced predators—the European red fox (*Vulpes vulpes*), the feral cat (*Felis sylvestrus catus*) and the black rat (*Rattus rattus*)—have had a huge impact on terrestrial native species. *Western Shield*, a major long-term project being carried out by the Department of Conservation and Land Management (CALM), is aimed at reducing the impact of these predators and, where possible, reintroducing threatened species that they have eliminated from conservation lands.

Foxes were released in Victoria during the 1860s and 1870s for 'sporting' purposes. Once established, they spread very rapidly both northwards and westwards. They were first reported in the South West of WA in the 1920s, and were common by the 1930s. They are best adapted to temperate and subtropical areas and, fortunately, don't fare well in the hot, wet tropics, nor in very rocky areas. Thus, they are either absent or present only in low numbers in far northern deserts, and are not established in the Pilbara uplands or in the Kimberley—although individual animals are found in these habitats in some years. Research by CALM scientists has demonstrated that foxes are a major predator of many native animals and can cause species to become extinct.

Feral cats became established in WA well before foxes. It has been suggested that they established before European settlement from early shipwrecks, but available evidence does not support this. They certainly became wild soon after 1788 in eastern Australia, then spread rapidly throughout the continent. Because of the lack of an effective broadscale means of feral cat control, it has not yet been possible to conduct scientific experiments to document the effect of cats on native mammals. However, evidence from islands indicates that they have been responsible for eliminating native mammals from arid areas, and historical evidence suggests that, in the South West of WA, they were responsible for



the extinction of several species that disappeared before the arrival of the fox. These include the woorop or rufous hare-wallaby (*Lagorchestes hirsutus hirsutus*). They have also been responsible for the failure of a number of attempted mammal reintroductions in the arid zone.

Black rats and brown rats arrived in Australia with early sailing ships. In WA, brown rats have been reported only near Perth. Black rats, on the other hand, have adapted very well to our conditions. They are common in bushland areas in the South West and along the west and north-west coasts, including North West Cape peninsula, as well as near Broome, Fitzroy Crossing and Kununurra. During the second half of the nineteenth century, black rats were introduced to many northern WA islands by pearling boats. Most of these populations have now been eradicated by CALM. Black rat control on the mainland has not been widespread, but has been necessary in one of the nature reserves set aside to conserve the critically endangered western swamp tortoise.

A third species of invasive rat, the Pacific rat or Polynesian rat (*Rattus*

*Facing page*

Patterson's curse (*Echium plantagineum*) invading native pom-pom everlastings. Photo – Sallyanne Cousans

**Above** Rainbow lorikeet (*Trichoglossus haematodus*). Photo – Hans and Judy Beste/Lochman Transparencies

*exulans*), has been found on Adele and Sunday islands, off the Kimberley coast, and may be more widespread than we think. The house mouse (*Mus domesticus*) now occurs in most of Australia. Its effects on native wildlife are poorly understood, but its ability to outbreed small native mammals—and its extremely varied and adaptable diet—suggests that it may have a detrimental effect through competition for food.

Another mammal predator that was introduced to Australia some time ago has had, and may still be having, a major effect on native animals. The dingo (*Canis lupus dingo*), a subspecies of wolf, was introduced to Australia from Asia about 3500 to 4000 years ago. It is generally accepted that dingoes



exterminated the thylacine (*Thylacinus cynocephalus*) and Tasmanian devil (*Sarcophilus harrisi*) from mainland Australia—these species survived in Tasmania, where dingoes do not occur. Aboriginal people introduced dingoes to some northern Australian islands (including large Kimberley islands such as Augustus, Bigge and Middle Osborne), but were not able to take them to most of WA's very valuable (from a biodiversity conservation viewpoint) islands, such as Barrow, Bernier and Dorre. Today, many mainland populations of dingoes include hybrids with domestic dogs, which were bred by people from wolves.

**Above** Feral honey bees are taking over nesting hollows of threatened Carnaby's black-cockatoos in WA's woodlands and forests.

**Top left** Bat lyssavirus disease is affecting bats in the tropics, such as the little red flying-fox, and can be fatal if it is spread to people.  
*Photos – Jiri Lochman*

**Centre left** The introduction of the dingo to Australia less than 4000 years ago led to the disappearance of native animal species, such as the thylacine, from the mainland.  
*Photo – Babs and Bert Wells/CALM*

**Left** Cane toad.  
*Photo – Jiri Lochman*

Yet another mammal predator of concern is the ferret, the domesticated form of the polecat (*Mustela putorius*), which has become feral in Tasmania and New Zealand and which turns up in the wild in the South West of WA from time to time.

Introduced fish are a significant problem in places. The so-called mosquito fish (*Gambusia holbrooki*), introduced from the Americas, eats a wide variety of native species. In eastern Australia it has detrimentally affected the threatened green and gold bell-frog (*Litoria aurea*), by eating the eggs of this species, but in WA its effects have not been researched. The introduction of redfin perch (*Perca fluviatilis*) to many WA waterways is affecting native fish. In Tasmania, the introduced brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) have eliminated native fish from many rivers. In WA, this introduced predator does not seem to have had such a dramatic effect, probably because the highly temporary nature of our rivers makes them less-than-ideal habitat for trout. However, there is still cause for concern.

Another invasive species that is on its way to WA is the cane toad (*Bufo marinus*), introduced into Queensland in 1935. It will establish throughout the wetter parts of the Kimberley, where it can be expected to greatly affect some native animals via its highly toxic skin glands (see 'Poison in paradise: cane toads hop west', *LANDSCOPE*, Autumn 2003).

Invasive invertebrate predators include a species of snail from Europe, *Oxychilus* sp., which has become established in the South West and is eliminating native snail species. Predation by *Oxychilus* is thought to be at least partly responsible for the extinction of the Albany snail (*Helicarion castanea*) and the Pemberton snail (*Occirhenea georgiana*). Several species of slugs have also been introduced, some of which may be predators. Introduced ants, such as the Argentine ant (*Linepithema humilis*), Singapore ant (*Monomorium destructor*) and coastal brown ant (*Pheidole megacephala*), have eliminated native ants from much of metropolitan Perth and are now turning up in bushland



areas. Introduced earthworms are probably eliminating native earthworms. European wasps (*Vespula germanica*), already found occasionally in Perth, and American fire ants (*Solenopsis invicta*), which have established in suburban Brisbane, have the potential to do great damage to WA's native animals (and to our way of life) should they become widespread.

### Herbivores

Many grazing animals have established in Australia. Some were brought in as stock, others were released for food or sport, and still others arrived on ships or in food and equipment. The list seems endless: sheep, goats, cattle, horses, donkeys, camels, rabbits, pigs and water buffalo. Even black buck (*Antilope cervicapra*) and red deer (*Cervus elephus*) were released in WA, but fortunately failed to establish. Introduced herbivores

**Top** Feral donkeys occur in the Pilbara and Kimberley, where they graze on native plants and degrade habitat with their hard hooves.

**Above** Feral goats create similar problems in areas where they occur, grazing all the trees and shrubs to goat-height.

Photos – Jiri Lochman

compete with native species for food and, by damaging plants, degrade habitat as well. The effect is not restricted to farming and pastoral areas, as species such as rabbits, goats, pigs, donkeys, cattle and camels are widespread in unoccupied lands, including conservation reserves.

The honey bee (*Apis mellifera*), another introduced species, competes with native insects and vertebrates for pollen and nectar, and may also reduce the pollination rate of some specialised native plants. By establishing hives in



hollows within trees and elsewhere, they reduce the availability of nesting hollows to native birds, such as cockatoos and parrots, and mammals, such as possums. Rainbow lorikeets (*Trichoglossus haematodus*)—now well established in Perth with the potential to spread further—also compete with native birds for nesting hollows.

### Diseases

Diseases introduced to Australia can affect native species. Diseases of wild animals in Australia are not well understood, but there is significant concern. Several accounts of large numbers of marsupials dying, apparently from disease—in places like the Nullarbor Plain and the South West—during the first half of the twentieth century, suggest that introduced diseases may have played a role in the decline of native mammals, but there are no scientific studies to support this.

*Toxoplasma gondii*, a parasite that causes toxoplasmosis, is transmitted by cats and can cause blindness, birth defects, miscarriage and possibly mental disease in people, and lead to blindness and damage to the central nervous system and respiratory organs of native wildlife. Some native animals, such as bandicoots and kangaroos, never recover from the disease once infected.

The origin of the recently-discovered chytrid fungus (*Batrachochytrium dendrobatidis*) is not known, but it was probably introduced from Africa or South America (see 'In pursuit of the frog fungus', *LANDSCOPE*, Autumn 2001). It causes a disease known as chytridiomycosis in frogs, and is thought to have caused the



**Above left** The western swamp tortoise is threatened by clearing, foxes, feral cats, black rats and changing hydrology. Photo – Babs and Bert Wells/CALM

**Left** The Darling Range, near Harvey. The stream banks are overgrown by the exotic weeds sour-sob (*Oxalis* sp.) and ivy (*Hedera helix*). Photo – Jiri Lochman



extinction of some frog species in eastern Australia. The fungus is present in many species of frogs in the South West of WA, but so far does not seem to be causing significant decline in these species.

The recent discovery of bat lyssavirus in Australia shows how little we know about diseases in wildlife. This virus, closely related to rabies, is present in many bat species, particularly in the tropics, and has caused the death of at least one person in Australia. People should avoid handling bats (both flying-foxes and small insectivorous bats), especially in the tropics, as the disease can be transmitted by biting.

Elsewhere in the world, it has been shown that indigenous animal diseases become more common when ecosystems and species are put under stress, such as occurs in fragmented landscapes. There are, as yet, no studies on this issue in Australia.

One major disease of native plants, dieback disease caused by the root-rot pathogen *Phytophthora cinnamomi*, affects native animals by altering habitats. In the Stirling Range National Park and along the south coast, species-rich kwongan (heath) dominated by proteaceous genera like *Banksia*, *Dryandra* and *Grevillea* is being converted to a species-poor sedgeland. The many mammals, birds and insects that depend on the susceptible native plant species are thus eliminated. Recent research into Gilbert's potoroo at Two Peoples Bay Nature Reserve shows that it survives only in areas where *Phytophthora* is absent. This may be because the fungi on which it feeds are eliminated by the pathogen and/or because its shrubland habitat changes to a sedgeland.

## Weeds

In 1999, there were 1350 species of weeds that had been recorded in the wild in the WA Herbarium's database. Environmental weeds have the potential to greatly alter ecosystems, thus degrading and altering animal habitat. Weed invasion can also lead to changes in fire regimes, prevent native plants from germinating, and smother native plants to the extent that few natives remain.

With such a variety of climates and ecosystems, weeds in WA tend to have localised effects, but some species have invaded large areas. Buffel grass (*Cenchrus ciliaris*) is one such weed. Introduced from Africa as a food plant for stock, it has invaded many, especially coastal, ecosystems and islands in the north-west of WA, eliminating native plants and changing fire regimes. Bridal creeper (*Asparagus asparagoides*) is a widespread, suffocating weed of the South West, and Victorian tea-tree (*Leptospermum laevigatum*) is another major bushland weed that forms dense monocultures under which most native species cannot exist. On the Swan Coastal Plain near Perth, introduced grasses such as perennial veldt grass (*Ehrharta calycina*), wild oat (*Avena barbata* and *A. fatua*) and other introduced grasses are changing the understorey of many remnant bushland areas, and must be affecting the area's original wildlife.

## Interaction of threatening processes

Often, threatening processes combine to produce a much greater effect than would otherwise be expected. Weeds can lead to altered fire regimes, more frequent fire opens up habitat and allows invasion by feral



**Above left** Changed fire regimes can lead to weed invasion and alter animal habitat. Photo – Len Stuart/Lochman Transparencies

**Above** The eastern long-billed corella has established in Perth from aviary escapes and presents a threat to the endangered Muir's corella. Photo – Babs and Bert Wells/CALM

animals, extensive fire can restrict animal populations to small areas, making them more susceptible to predation by foxes and cats, and so on. Thus, threatening processes cannot be managed in isolation—a holistic approach is needed. A new book, *Threatened Animals of Western Australia*, describes WA's threatened animals, species by species, and outlines what has been done and future plans to bring them back from the brink of extinction. The book is essential reading for all who care about Western Australia's environment.



- 49 Not all thistles are weeds  
Although most people think of thistles as weeds, Western Australia has some rare and interesting thistle species.
- 56 Alien invaders  
WA's native plants and animals under attack.

## Regulars

- 3 Contributors and Editor's letter
- 9 Bookmarks  
Threatened animals of Western Australia.  
The golden pipeline heritage trail guide.  
The Australian 4WDDrivers handbook.
- 18 Feature park  
Karijini National Park.
- 55 Endangered  
Majestic spider orchid.
- 62 Urban antics  
Peregrine falcon.

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