Invasive species in Northern Australia

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Australia is home to many endemic species, for example over 60% of all mammal species, 45% of all bird species and 93% of all reptile species inhabiting mainland Australia are endemic. Since European colonisation in the 1700s, many invasive species (i.e. species that do not historically exist in Australia but were brought to the country through other pass-ways, such as human movements and international trade) were introduced. This currently totals over 27000 plant species and 650 vertebrate species.

Invasive species have become one of the biggest ecological issues in Australia, causing the loss of numerous native animals, plants, and fungi including many small mammal species. Australia currently has the highest rate of vertebrate mammal extinctions in the world, largely driven by invasive species.

What is an invasive species:

An invasive species is defined as a plant, animal, or organism that is not native to a specific ecosystem and causes harm to the environment, economy, or human health. These species tend to spread aggressively and outcompete or disrupt the native species in that area. Invasive species can cause problems by consuming resources that native species rely on, spreading diseases, or altering the habitat in ways that make it more difficult for native species to survive.

Which native species have been impacted by invasive species:

Currently, invasive species are the leading cause of native Australian mammal extinctions since the 1960s. Many native marsupials and rodents, which have evolved without any natural predators, are unable to co-exist with non-native foxes and cats. Some small-to-medium-sized wallabies and bettongs, such as Burrowing bettong (*Bettongia lesueur)*, yellow-footed rock wallaby *(Petrogale xanthopus)*, Brush-tailed Rock Wallaby (*Petrogale penicillata*) and Swamp Wallaby (*Wallabia bicolor*), are predated by invasive species. Invasive species are also closely related to the extinction of some species such as Western Bettong *(Bettongia penicillate)*. Besides wallabies and bettongs, some unique native marsupials, such as Greater Bilby (*Macrotis lagotis*), Northern Hairy-Nosed Wombat (*Lasiorhinus krefftii)*, and Leadbeater's possum (*Gymnobelideus Leadbeater*), are currently listed as endangered because of invasive species.

Common invasive species in Northern Australia:

1. Mammals

The most common invasive species in Australia are feral cats, red foxes, rabbits and hares. They sometimes predate animals not for food but for fun. Feral cats were introduced to Australia by European settlers in the early 19th century, around the time of British colonization. The first recorded introduction was in 1804, when cats were brought aboard ships as a means of controlling rats on board. On arrival in Australia, cats quickly adapted to the Australian environment. They spread across the continent, from coastal areas to remote inland regions, and established wild populations on mainland Australia. Currently feral cats threaten over 120 endangered species in Australia, including the numbat (Myrmecobius fasciatus), bettong (Bettongia spp.) and bandicoot (Peramelidae spp.)

A feral cat catching a galah. By Mark Marathon

European red foxes (*Vulpes vulpes*) were introduced to Australia for recreational hunting. The first known release of foxes occurred in 1855, near Geelong, Victoria. A group of European settlers brought foxes with them to establish a hunting tradition similar to what they had back home. Like cats, foxes spread rapidly across the continent after their introduction. By the 1890s, foxes were already found in New South Wales and Queensland, and their distribution expanded across most of mainland Australia. These species are highly adapted to Australian environments and have now become pests. Feral cats and foxes are top predators that prey on small birds, mammals, insects, amphibians, and reptiles. Foxes are also able to spread diseases such as rabies and other diseases which native mammals have not previously been exposed to, further threatening native species.

Rabbits and hares are another two pest species. Although rabbits (*Oryctolagus cuniculus*) are more well-known pests, hares (*Lepus capensis*) that look similar to rabbits are also invasive species. The differences are that hares have longer legs and ears and do not live in burrows. Rabbits were introduced in the 1850s for hunting and spread rapidly across Australia, causing severe ecological damage due to their grazing, competition with native species, and land degradation. Hares were introduced in the early 1830s for similar reasons and have since established themselves across parts of Australia, also contributing to grazing pressure on native vegetation and crops. Rabbits and hares are strong competitors with native herbivores as these two species graze plants, leaving no food for other species. Due to the lack of natural predators, rabbits and hares reproduce quickly and establish large wild populations. One interesting fact is that rabbits are an endangered species in their natural distribution in Europe, part of their decline has been due to Rabbit Haemorrhagic Disease and Myxomatosis.

Besides the pest species previously mentioned, feral pigs, dogs, cattle and sheep are also invasive species according to the government of the Northern Territory. They act like pests, predating native animals or competing with them. There are cases of juvenile animals escaping captivity and becoming pests, although the majority of invasive species such as cats, dogs and pigs have already established populations in the wild.

2. Amphibians

The cane toad is the main amphibian pest across Australia. Cane toads were introduced to Australia as a biological control agent to combat the cane beetle (*Dermolepida albohirtum*) and the French cane grub (*Scirtidae*), which were major pests damaging sugarcane crops, particularly in Queensland. The first batch of cane toads (around 102 toads) was brought to Australia in 1935 from Hawaii, where they had already been introduced for pest control. They were initially released in the Queensland sugarcane fields, where they were expected to eat the cane beetles and grubs. Cane toads kill native predators, such as goannas, dragons, monitor lizards, Northern quolls, and saltwater crocodiles with their poison. These reptile predators help control insects to reduce crop damage. Cane toads also eat large amounts of small vertebrates and insects, which are food for native small animals. Although cane toads do not eat crops, they are poisonous to many native species and their numbers have been increasing rapidly in recent years.

3. Fish

Invasive fish species are a significant problem in Northern Australia. European Carp (*Cyprinus carpio*) were introduced to Australia in the 1800s for recreational fishing. They were meant to be sport fish, but they quickly spread in Australia's river systems. Carp disturb the sediment in aquatic ecosystems, leading to increased turbidity (cloudy water), which affects water quality and reduces the amount of sunlight available for submerged plants. This disrupts aquatic plant growth and harms native fish species that depend on plants for shelter and food. Tilapia (*Oreochromis spp.*) were introduced to Australia in the 1960s for aquaculture purposes. Tilapia compete directly with native fish for food and space and have established wild populations in many of the river systems in North Queensland. They consume a wide variety of plant material, algae, and invertebrates, which native species also rely on.

4. Plants

Currently, over 27000 plant species have been introduced to Australia. Invasive plant species, often called weeds, are competitors to native plants and can increase the risk of fires due to their dense, dry foliage. Some common weeds in Northern Australia are: Gamba Grass (*Andropogon gayanus*), Mission Grass (*Cenchrus polystachyos*), Prickly Pear (*Opuntia spp.*), and Rubber Vine (*Cryptostegia grandiflora*). Almost all weeds compete with native plants for water, sunlight and nutrition. The loss of native plants also leads to a loss of food

for native animals. Non-native grasses are highly flammable and can increase the frequency and intensity of bushfires, which are a major concern in tropical and savannah landscapes. The thick, dry grass can create intense fires that spread quickly and destroy native vegetation. For example, prickly pear has caused significant damage to agricultural lands, particularly in the Gulf of Carpentaria region, where it can infest pastures and crops, making land difficult to farm. Gamba Grass also spreads rapidly, displaces native plants and increases fire risk.

Gamba Grass in Northern Territory. By Btcpg

5. Invasive species control

Multiple methods to control invasive species have been implemented across Australia, including baiting, trapping, culling, poisoning, biological control and pesticide programmes, which have varied in their effectiveness. To control rabbit populations, biological control has been trialled, for example myxoma virus (MV), rabbit haemorrhagic disease virus (RHDV), and RHDV2 have all been used to control rabbit numbers. RHDV K5, released in 2017, is the latest form of rabbit biocontrol, which is not harmful to other species but specifically targets the European rabbit. Biocontrol has proven to be the most cost-effective, large-scale control method for rabbits in Australia.

To control fox numbers, poisons and carbon monoxide treatments have been trialled. Currently, sodium monofluoroacetate (1080) and Para-aminopropiophenone (PAPP) are the main toxins used as fox control. Immunosterilisation is currently being investigated as a potential long-term fox control method. Additionally, under the Catchment and Land Protection Act (CaLP) 1994, landowners are responsible for eradicating or taking all reasonable steps to prevent the spread of pest species on their land, including foxes. Due to their mobility, resilience and ability to re-populate areas where control measures have been used, foxes are one of the most challenging invasive species to eradicate, therefore an integrated, multi-control approach is needed.

Invasive plant species are often more difficult to control due to their entanglement with native species and issues coordinating control efforts across multiple landowners. Currently, herbicides, biological control agents such as insects or pathogens, and manual removal are the main control methods. An example of an herbicide currently used is glyphosate which is applied in the early wet season to control Gamba Grass by preventing seeding. It is also essential that control methods for plant species are undertaken quickly, before the plant species have become established.

In addition to control methods, legislation has been created to protect native species and reduce the impact of invasive species, for example, today the majority of Australia's native fauna is protected by legislation and land owners have a legal responsibility to control invasive species under section 20 of the CaLP Act (Agriculture Victoria, 2024). However, the number of invasive species in Northern Australia is still rising, therefore more long-term control methods, as well as public engagement, additional funding and prioritisation of this issue is needed to achieve a long-term reduction in invasive species.