



Young feral piglets.

# The pig problem

If you are out bush-walking and suddenly hear something crashing through the undergrowth, the chances are it will be a wild pig.

The Australian bush is now home to vast numbers of them — estimates range from 4 to 20 million. They easily outnumber our 2-6 million domestic pigs. But the possible hazard to bushwalkers is not the main reason for concern about this situation; feral pigs damage the natural environment, are a nuisance to many farmers, and, possibly worst of all, have the potential to help spread exotic livestock diseases (see the box on page 22).

Since first settlement, pigs have repeatedly escaped confinement. They have established wild populations almost anywhere that food, cover, and permanent water exist in sufficient abundance to support them. They are particularly numerous in northern and eastern Australia.

Feral pigs can damage crops and pastures, and may eat young lambs. Their cost to our agricultural production has been put at about \$80 million a year. But they also live in many national parks, where anecdotal evidence and observations by rangers suggest that they can do considerable damage. Unfortunately, we don't know just how serious a problem they pose, and what long-term effect they may have. However,

two recent studies have given us a better picture of the situation in two very different localities.

Dr Mike Hopkins and Mr Andrew Graham, of the CSIRO Division of Wildlife and Ecology's Tropical Forest Research Station in Atherton, northern Queensland, assessed the problems posed by feral pigs in rainforest areas near Tully, which the Army uses for training.

## Hogs in bogs

The survey revealed a range of physical disturbances. These included mud wallows, due to pigs rooting for underground tubers, compacted soil on trails the animals had made through the forest, 'ploughing' up of the soil surface, and diggings along creek banks presumably made in the search for food.

The turning of the surface soil — often in areas up to half a hectare in extent — is the most obvious physical problem. Disturbance like this, if it occurs two or three times a year, can physically disrupt the process of establishment and growth of seedlings — adding to the direct destruction of small seedlings by the pigs' trampling. This

has important implications for the future species composition of the forest. The 'ploughing' also damages shallow surface-feeding roots and changes the surface properties of the soils, which could result in the death of some large canopy trees.

The scientists believe that, in several sites that had previously been disturbed by logging and were re-growing with seedlings of secondary species (those species that recolonise breaks in the rainforest canopy), permanent open clearings dominated by grasses could be produced within a few decades if feral pig damage remains at its current level. These areas could not then be easily re-colonised by forest.

## Eat like pigs

The pig may well deserve its reputation for being rather unselective in matters of food, if we can go by the stomach contents of the feral variety in the rainforest. When Dr Hopkins and Mr Graham, together with Mr Pavlov of the Queensland Department of Primary Industries, analysed stomach contents of the pigs sampled during their research, they turned up a bird, various large insects and other arthropods, rainforest fruits and understorey plants, grass and grass roots, and possibly snails. Evidence from other studies suggests that earthworms are also important in the diet. This list of foodstuffs means that pigs compete directly for food with native ground-feeding animals in rainforests — as well as destroying understorey habitats necessary for nesting and shelter. This is an important consideration when it comes to assessing their wider ecological impact.

From their survey of the Army training-ground, the scientists suggest that all ground-dwelling and nesting animals, including the small yellow-footed antechinus (*Antechinus flavipes*), the long-nosed bandicoot (*Perameles nasuta*), and the rainforest musky rat-kangaroo (*Hypsiprymnodon moschatus*) may have something to fear from the presence of the feral pigs. So too may some birds, such as the noisy pitta (*Pitta versicolor*) and the chowchilla (*Orthonyx spaldingii*), which feed on the ground and nest low in the forest. The ground-nesting scrub fowl (*Megapodius reinwardi*) and brush turkey (*Alectura lathamii*) would be more directly affected, because pigs dig up their nests and eat the eggs.

The cassowary (*Casuaris casuaris*) — rainforest cousin of the emu (*Dromaius novaehollandiae*) and already rare — may also be compromised by the presence of the pigs, which will eat its eggs and chicks as well as feeding on some of its favoured

seeds. However, attempts to control the pigs — for example, by shooters and their dogs entering the forest — may well disturb the cassowaries and their nests even further.

Moreover the scientists noted strong circumstantial evidence that feral pigs may help spread fungal spores, including those of the root-rot fungus *Phytophthora cinnamomi*. Records of plant death associated with the fungus elsewhere in the northern Queensland rainforest include descriptions of local site disturbance by feral pigs. The fungus has also been isolated from a pig wallow in Palmerston National Park.

As well as all of the above, pigs, by their feeding, could have a long-term effect on the structure of the rainforest because of the different fates of the plants and seeds that they eat. Some rainforest plants, such as small feather palms, are a favourite food of pigs. These plants die once the growing tip is removed, so eating the shoots of the young ones may, over time, constitute a real threat to their survival in pig-infested areas.

The scientists found that small seeds, less than 5 mm in diameter, pass through the animals unaffected. Large seeds, by contrast, are chewed and therefore destroyed. In general, the forest's secondary species have small seeds. The pigs could therefore serve to spread and thus promote the establishment of these plants at the expense of large-seeded trees, which in the main are those that predominate in the later stages of forest development.

Thus, in theory at least, a large enough pig population for a long enough time could change the forest's species composition.

### **Pigs aplenty caught in the A.C.T.**

At the other climatic extreme, feral pigs live in the cool temperate forests that clothe the mountains near Canberra. A study by Mr Paris Alexiou, then of the Australian National University, quantified the extent of vegetation changes and damage to the ecosystem caused by feral pigs in a study area of about 5 sq. km in the Brindabella Ranges, south-west of Canberra.

Mr Alexiou rarely found evidence of pig disturbance in eucalypt forest with a dry sclerophyll understorey. He found the sites most susceptible to damage along natural drainage lines and in low-lying areas with wet soils and dense herb or grass cover, especially where the vanilla lily, upon whose roots the animals feed, was common. His survey showed that 32% of the sites defined as susceptible had been disturbed by pigs, and the damaged portion was increasing. Furthermore, these disturbed sites revegetated only slowly, although



**Hogs in bogs: a crowd of feral pigs degrades the land near a waterhole.**

some native plants did well in attempts to recolonise them, as they faced less competition than before. However, these areas contained considerably fewer plant species a year after disturbance. Whether this would right itself with time, we don't yet know.

In addition to their ecological effects on the vegetation, Mr Alexiou noted that pig activity affected the water quality and reduced the appeal of the grassy 'flats' — where soil was regularly ripped up — in an area renowned for its beauty.

### **What's to be done?**

Trying to control feral pigs is not easy — eradicating them entirely appears virtually impossible. Shooting them from helicopters can be quite effective — exercises in regions with known pig populations suggest that it can remove about 80% of the animals. Naturally, however, it's not feasible in heavily wooded or mountainous areas. In

such places, poisoning may help. Dr John McIlroy of the CSIRO Division of Wildlife and Ecology has been trying to improve existing methods of controlling pigs, and to develop and evaluate new techniques.

The basic idea is that baits of preferred foodstuffs are impregnated with a poison — which, until recently, was mainly 1080 (sodium monofluoroacetate), a substance highly toxic to pigs. This method suffers from quite extensive problems: first, it's hard to place the baits in remote and inaccessible terrain; second, other animals — non-target species — may eat the baits or, more likely, the vomited but still poisonous remains; third, during spring and summer food is abundant and pigs may ignore the baits; fourth, some pigs still survive after eating a bait; and fifth, sly pigs may develop bait shyness after a time.

Dr McIlroy and his collaborators have found that warfarin — a rat poison — is also

**The map shows the distribution of the feral pig in Australia. (After M.G. Garner and P.H. O'Brien, Bureau of Rural Resources.)**



## Feral pigs and exotic diseases

Foot and mouth disease (FMD) heads the list of 12 devastating livestock diseases that have so far spared Australia. Freedom from FMD allows us access to important markets that are closed to many other livestock-producing countries where the disease is endemic.

An outbreak of FMD could cost the nation up to \$6 billion in lost export trade even if the disease were immediately eradicated. Many buying countries would turn away our exports until we could demonstrate a clean bill of health. And all this could start if some feral pigs found virus-harboring scraps — from food brought into the country illegally — at a rural garbage tip or in the bush.

Pigs are highly susceptible to FMD and, when infected, they secrete larger quantities of the virus in their urine and saliva — so the disease could spread rapidly through feral populations. FMD could build up undetected in a pig population in the bush, only coming to notice through the activities of hunters, or even when it had spread to domestic livestock. By then it may be so widespread in the feral population that eradication would prove impossible. Also, feral pigs could increase the rate of spread of a disease outbreak that started among domestic animals.

Dr John McIlroy and Dr Roger Pech, of the CSIRO Division of Wildlife and Ecology in Canberra, have been researching the impact of feral pigs on possible exotic disease outbreaks in Australia. Dr Pech and Dr Jim Hone of the University of Canberra have constructed mathematical models to describe the progress of foot and mouth disease in feral pigs. Using these, they simulated an outbreak in western New South

Wales, and found that the threshold pig density needed to sustain the disease is 7 pigs per sq. km — any fewer pigs and the disease would die out naturally.

To eradicate the disease quickly, we'd need to reduce the pig density below the threshold (which differs in various localities). This would require killing a high proportion of the feral pig population in the area, an aim that, in some parts of Australia, is probably not achievable.

Another model shows that early detection of an infected feral pig population is unlikely. Knowing the numbers that pig-hunters kill, and assuming they can recognise and report the disease, the scientists conclude that it could take up to 7 months in a 100-sq.-km area (with a pig density of 15 per sq. km) to detect the disease, by which time many animals would have been exposed to, or still be carrying, the virus. Time to detection could be even longer in more sparse populations or in the absence of hunting.

Clearly, FMD and our feral pigs should never be allowed to mix. We must, therefore, continue our rigorous quarantine procedures and vigilance to prevent it, and any other exotic diseases, entering the country. The good news is that the virus would need considerable luck to get established here: it must first clear the quarantine barrier, find transport to an area occupied by cloven-hoofed animals, be ingested or inhaled by one of them, and finally be fortunate enough to infect a population of animals that exceeds the threshold density necessary for the disease to persist. However, all this is no cause for complacency — because once here the disease could well have the upper hand.

effective against pigs and is less likely to cause bait shyness. (A useful feature for those working with it is that it has an antidote, which 1080 does not.) A campaign in which the scientists used a helicopter to drop baits near pig haunts over a wooded area of 260 sq. km achieved an 84% reduction in pig numbers. These figures show that, once again, although some measure of control is possible, complete eradication is not — the remaining pigs will repopulate the area and new animals could move in from elsewhere.

When it comes to poisoning in rainforest areas, Dr Hopkins and Mr Graham feel that all potential effects need to be examined very thoroughly and further research carried out before any program is considered. It's no good if attempts to destroy the pigs end up having unforeseen damaging consequences elsewhere in the rainforest.

Usually biological control is the most effective means of reducing pest numbers. Why not use a deadly virus as a biological control for pigs? Several pig-specific viral diseases do exist, although not in Australia. (African swine fever is one.) The problem is that such diseases, if brought here, could also infect domestic pigs, threatening an important export industry.

Not everybody wants to see feral pigs eliminated. For an estimated 100 000 pig-hunters they represent a valued recreational resource! And each year, Australia exports \$10 million worth of the wild-pig meat so acquired. The hunters and those involved in the wild-pig industry clearly don't hold the same views about eradication as do farmers, the Army, and national park agencies.

Our best hope for the future lies in refining our control measures and applying them where we know that feral pigs cause ecological problems. At least this localised control would yield results for the native flora and fauna of an affected area — but plenty of pigs would still remain at large elsewhere for those who want them!

Roger Beckmann and Steve Davidson

### More about the topic

Effect of feral pigs (*Sus scrofa*) on subalpine vegetation at Smokers Gap, A.C.T. P.N. Alexiou. *Proceedings of the Ecological Society of Australia*, 1983, **12**, 135-42.

A preliminary assessment of problems and control measures of feral pigs in rainforests of the Field Force Battle School, Jarra Creek, Tully, north Queensland. A.W. Graham and M.S. Hopkins. *Division of Water and Land Resources internal report* (P5 file), 1985.

This young Alexandra palm, trampled by pigs and with its apex eaten, will not survive.

