

# Tropical Topics

An interpretive newsletter for the tourism industry



Feral and introduced animals

No. 25 January 1995

## Notes from the Editor

There are two main types of animal pest in Australia, feral animals — domestic livestock or pets which have gone wild — and introduced wild animals — which were deliberately or accidentally set free in the Australian environment. Sometimes this was for sport (foxes, rabbits), as an attempt at biological control (cane toads, mynahs), accident or thoughtlessness (fish, rats, birds) or simply because people thought they would make a pleasant addition to the Australian countryside (birds, deer).

Not all creatures introduced by people have been successful. A number of birds were released and never seen again. Certain characteristics, however, made some of the introductions into pests — rapid breeding, few or no natural predators and diseases, adaptability and a talent for thriving when others are in difficulty (foxes do well during times of drought).

Most pests have been greatly assisted in their invasion of the continent by the activities of people. Foxes and feral cats have a ready food source in the introduced rabbits, rats and mice. Rainforest, which is avoided by most pest animals, becomes vulnerable when openings are cleared for them to make their way in.

## Foxes at the door

European red foxes (*Vulpes vulpes*) were released in Victoria in the 1840s-70s for sport hunting. They spread rapidly over most of the continent, following introduced rabbits, reaching Queensland by the 1900s. They were first recorded at Longreach in 1920, and by 1933 had moved north by 400km.

Until recently it was thought that north Queensland would remain free of foxes — that they did not thrive in a tropical climate and environment. However, as rabbits have been increasing in numbers in the Ravenshoe/Herberton/Atherton area in the last few years, so too have foxes been appearing. In 1993 two road-killed foxes were discovered between Mareeba and Kuranda and they have now been sighted at Laura and Mt Carbine.

Foxes prefer open country and are not found in rainforest. It seems, therefore, that they have been circling around the wet tropics, hunting along rainforest margins, including wet sclerophyll forests, and taking advantage of areas cleared of forest by people.

For this reason, foxes may pose a major threat to northern bettongs (*Bettongia tropica*) which exist only in a few small pockets uncomfortably close to recent fox sightings. Other wet tropic animals at risk from foxes include rufous bettongs, bandicoots, wallabies, phascogales, quolls, planigales, tree-rats and various other marsupial mice and rodents in drier tropical woodland, as well as ground birds. Apart from direct predation, foxes also tend to outcompete native carnivores for food.

Elsewhere in Australia, foxes have been implicated in the decline of at least 19 native mammals and the extinction of at least two, possibly nine. A further 30 are considered at risk. Although habitat clearing remains the main reason for the decline of native species, foxes may be the factor which tips a reduced population towards extinction. Certainly, where they have been excluded, endangered animals, such as rock wallabies in Western Australia, have made a good recovery.

With their additional potential as rabies carriers, should this disease ever reach Australia, foxes are a priority for control measures.

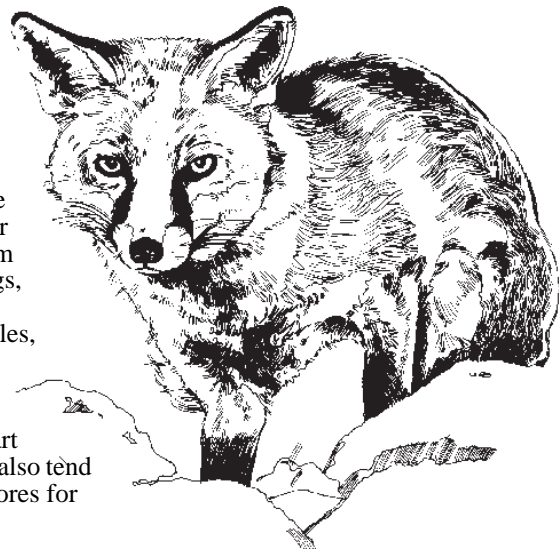


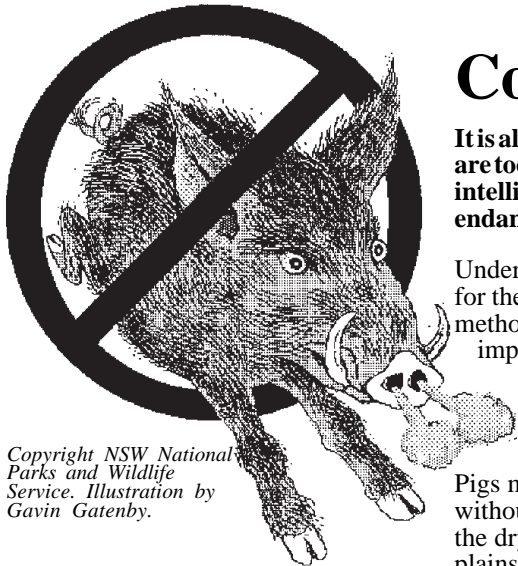
Illustration courtesy Rural Lands Protection Board



WET TROPICS  
MANAGEMENT AUTHORITY



Queensland  
Department of  
Environment and  
Heritage



Copyright NSW National Parks and Wildlife Service. Illustration by Gavin Gatenby.

## Controlling the pigs

**It is almost certainly impossible to eliminate feral pigs from Australia. There are too many, they are widespread and they are too clever (they are more intelligent than dogs.) Local eradication in sensitive areas, such as rare and endangered species habitat, is the best we can hope for.**

Under the Lands Protection Act every landholder and land manager is responsible for the pigs on their land. Hunting, poisoning and trapping are all effective control methods, but when the pigs are scattered throughout inaccessible forests it is impossible to target enough of them at one time. Poisoning and hunting, especially with dogs, endanger native species, so trapping is seen as the best option, from the point of view of efficiency and environmental sensitivity.

Pigs move in and out of the rainforest. A pig cannot go longer than four hours without water and a sow with young must stay almost permanently by water. In the dry season large numbers concentrate around water holes on the coastal plains. Pigs also need cover, disliking the open. By day they may hide in the forest, especially when the cane is too short to cover them, coming out at night. The most efficient way of trapping them seems to be to catch them as they move between the coastal areas and the forested ranges. Reducing populations on the fringes should both reduce damage to agriculture in these areas and control numbers within the World Heritage Area.

### Pig traps

Over the last two years the Wet Tropics Management Authority has purchased \$50 000 of materials to build 200 large traps. These have been issued to various organisations who have contracted 14 professional trappers to operate them. These trappers have killed over 1 000 pigs this year. Additional numbers have been trapped by several Aboriginal Corporations, DEH and Forestry staff and Cassowary Protection groups.

The most successful method involves providing free food for the pigs for some time before the trap is set. Numbers of pigs increase as news gets around the local population and then one night, when they are all at the party, the gate shuts!

The traps are set at night to avoid catching cassowaries but the accidental trapping of native wildlife is a concern. Recently farmers from Mission Beach, in conjunction with the Wet Tropics Management Authority and the local Community for Coastal and Cassowary Conservation (C4), designed a wildlife-proof trap based on observations of pig foraging. A metal trigger bar is placed in front of the food. The pig reaches under this bar and then, in the process of eating, throws its head up, hitting the bar. This causes the door of the trap to shut. If cassowaries and other animals enter the trap, they simply reach over the bar and are not caught. In its first year the trap has caught 55 pigs on three farms — and no other animals. More are being manufactured. Called the trailer trap, it can be transported to where the pigs are. Despite this success not all pigs will be outwitted. A number of these very intelligent animals will

### The plus side of pigs

Since it is impossible to eradicate these animals, it has been suggested that they be seen as a resource instead. In fact, it has been pointed out that when sheep prices are low it would make more economic sense to kill the sheep and feed them to the feral pigs! Australia is now the world's biggest exporter of wild pig meat for human consumption as game meat. The 120 000 pigs exported annually to European markets earn foreign revenue of up to \$20 million, more than from the commercial pork industry. Thus a valuable industry has the added bonus of cutting down numbers of feral animals.

Aboriginal people complain that feral pigs have damaged many of their traditional food sources, such as yams. However, the pig itself has become an important food source for many remote communities. Provision of mobile abattoirs could enable those communities to earn a good income from the game meat industry, while also participating in feral pig control. In addition, if trained in identifying disease symptoms, they could give early warning of an outbreak of problems such as foot and mouth disease.

### Control complications

Control of feral animals is not a simple matter of concentrating on one at a time. A certain balance is maintained between all these unwanted introductions. If foxes and cats are eliminated, rabbit populations will explode, competing with native animals. On the other hand, if only rabbit numbers are reduced, foxes and cats will prey even more heavily on native wildlife.

## Controlling the cats

It is impossible to eradicate feral cats except on islands where trapping baiting and shooting can be effective. These methods are also worth using in specific habitats of endangered species. A biological control is the only long-term possibility. At the moment CSIRO scientists are attempting to use a modified virus to immunise foxes against their own sperm or eggs, effectively sterilising them. This method could possibly be used eventually for feral cats.

In the meantime, responsible cat ownership is one way to reduce the cat problem. Straying and dumped cats quickly become feral, restocking areas where eradication programs have been carried out.

Responsible cat ownership involves:

- keeping cats indoors, in the house, a shed or special outdoor run, particularly at night. Cats kept at home live much longer.
- identifying cats by microchips, collar and tags or tattoos.
- limiting the number of cats kept.
- desexing all cats not used for commercial breeding.
- providing adequate food so cats will not hunt due to hunger.
- attaching two or more bells to their collars. Though not very effective this may give potential victims some warning.
- *never* dumping cats in the bush.



Illustration by John Allison

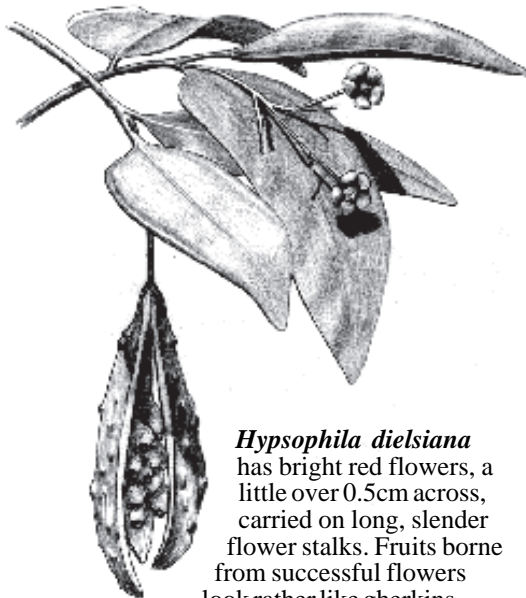
## Nature notes

A diary of natural events creates a pleasing journal which grows richer with the passage of time. Watching for the recurrence of an event after noting it in a previous year, and trying to understand what could have caused changes in timing, is intriguing.

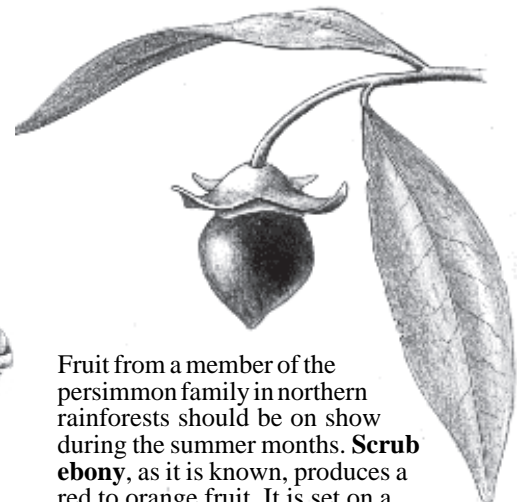
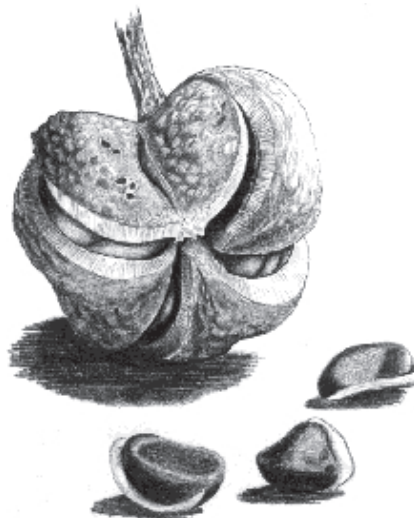
These notes are from the author's own notebook, or were offered by researchers and fellow naturalists. Readers will, inevitably, note variations between their observations and those appearing here. If you do not keep a nature diary perhaps this will inspire you to begin one.

While some plants put on flowers quite dependably over a short period each year and others may flower sporadically at intervals of many years, there are some species which carry a few flowers in many months of each year.

Two plants which often reward a search for flowers are both members of the family Celastraceae. Neither is rare in suitable habitat, but they are still without common names.



*Hypsophila dielsiana* has bright red flowers, a little over 0.5cm across, carried on long, slender flower stalks. Fruits borne from successful flowers look rather like gherkins, hanging from surprisingly thin stalks. After quite a long maturation period these 'gherkins' split open revealing seeds encased in bright orange arils which are soon devoured by birds. The name *Hypsophila* is derived from the Greek *hypsos*, meaning high, and *philos*, loving, an allusion to the montane habitats preferred by some species of this genus.



Fruit from a member of the persimmon family in northern rainforests should be on show during the summer months. **Scrub ebony**, as it is known, produces a red to orange fruit. It is set on a robust green calyx comprised of four prominent star-like sepals joined at the base. At a diameter of up to 40mm, this *Diospyros hebecarpa* fruit is larger than any other wet tropics persimmon, although a long way short of the luscious cultivated fruit.

A related plant is *Hedraianthera porphyropetala*, a small shrub or tree which produces delicate, five-petalled flowers varying in hue from white to pink to purple. The flowers are carried on fine stalks about 2-3cm long, which grow into thick woody stems bearing a stubby fruit if pollination has been successful. The hard-surfaced fruit splits into five component lobes which scatter shiny brown seeds ornamented with only a small, pale aril. These seeds seem to fall unnoticed to the earth, quite unlike those of *Hypsophila* which are plucked and dispersed soon after they go on show. *Hedraianthera* is an allusion to the almost stalkless anthers described as growing like ivy clinging to a wall!



Those who give attention to the summer skies above open fields, particularly in February, may be rewarded by the song of an inspiring bird known as the **singing bushlark**. Widespread in Australia and common in many parts of the wet tropics, this little bird is seldom noticed except when it lifts into the air on display flights during the breeding season. The singing bushlark flies a long way up, circling and hovering while putting out a stream of melody and mimicry, sometimes for as long as 40 minutes. One of the delights of a bright summer's night is to hear the clear song of this little bird long after dark.

Summer beside rainforest streams or rivers will often yield sightings of two lovely butterflies attracted to damp leaves or still pools. The orange and black male **cruiser** will often allow quite a close approach, making it possible to take photographs at distances of about a metre. Male cruisers sometimes alight on bright orange flagging tape such as that used by bushwalkers. Cruiser females are markedly different in appearance, showing more colours and yet not looking as brilliant. The **blue triangle** (above) is an even more prominent streamside butterfly on hot summer mornings, the males being not only approachable but often flying to people wearing a colour comparable to the sky blue of their wings.

# Ferals and pests in the Wet Tropics

## Pigs

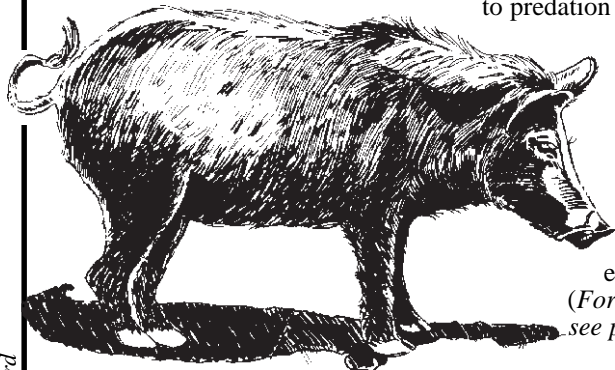
While most feral pigs originated from European domestic stock, some may have been introduced from Melanesia and China. Now an estimated 12 million of them roam Australia, 3 million of them in Queensland.

Pigs are considered a major agricultural and environmental pest. It is calculated that they do over \$70 million agricultural damage annually, eating and trampling crops and damaging fences and roads. Omnivores, they kill and eat up to 40% of newborn lambs in some areas. There is also great concern about their potential to carry foot and mouth disease, estimated to cost at least \$9 billion in the first year if it gets into Australia.

Pig damage is evident in the environment. They dig up large areas, eat roots and trample saplings, rub and ringbark trees, erode stream banks, muddy and contaminate water. Weeds thrive in areas disturbed by pigs, possibly having been carried there on the coats or in the stomachs of the animals. They can carry many diseases, including forest dieback (phytophthora).

Pigs prey on native wildlife, consuming large numbers of soil fauna, such as earthworms and beetles. Feathers, fur and mammal bones have been found in their stomachs but it is uncertain whether these animals are killed or eaten as carrion. (Other pigs' toenails have also turned up — evidence of cannibalism.) They eat the eggs of ground nesting birds, such as the brush turkey, as well as eggs of sea turtles.

On at least one occasion strong evidence points to predation of cassowary chicks and they certainly compete with these birds for forest fruits, the pigs' digestive systems probably destroying the seeds which the cassowaries distribute so effectively. Pigs are also responsible for attracting hunters, who often bring badly-controlled dogs, into environmentally sensitive areas. (For information on pig control, see page 2)

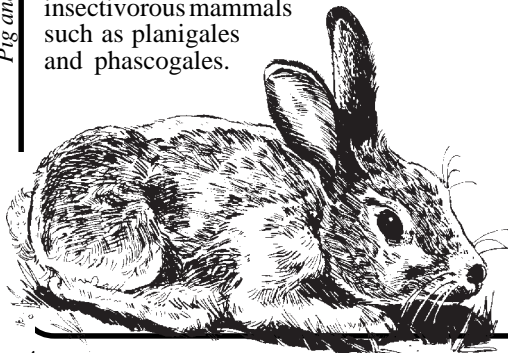


Pig and rabbit illustrations courtesy Rural Lands Protection Board

## Rabbits

Like foxes, rabbits were introduced for sport in 1859. Their numbers have been increasing in the Ravenshoe/Herberton/Atherton region in the past few years and have even been spotted well within the rainforest, although it is not anticipated that they would move into this environment in any numbers.

Apart from attracting foxes, rabbits are very damaging to the environment. They compete for food with pademelons, wallabies, rufous bettongs and anything else that eats grass (including cattle). They also change the habitat for animals such as the northern bettong. Many animals suffer from reduced cover which also means reduced food supplies for insectivorous mammals such as planigales and phascogales.



## Introduced birds

As many as 20 species of birds have been introduced to Australia. Many were imported by early settlers who wanted familiar animals around them in their new home and Acclimatization Societies which deliberately set free all sorts of exotic fauna and flora.

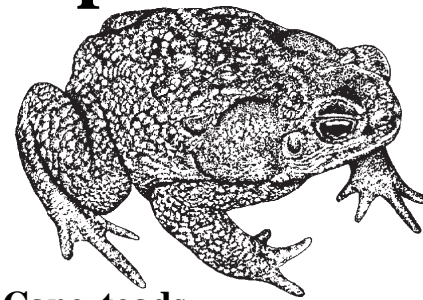
Many introduced birds originally escaped from captivity. The nutmeg mannikin (spice finch) spread rapidly once it became established in Brisbane in the 1930s to become one of the most abundant birds on east coast Australia. Breeding all year round and eating seeds of almost any grass and herb, it is a major threat to native finches in tropical grasslands.

The common myna (right), a native of India, was introduced to north Queensland cane fields in 1883 in the hope that it would control insect pests. Sometimes referred to as flying rats, mynas now compete successfully with native birds for food and, even worse, for nesting sites in holes.



## Rats and mice

The black and brown rats and the house mouse probably arrived with the First Fleet — or even earlier on the ships of previous seafarers. They benefit from human habitation and crops. The black rat can carry serious diseases such as plague, leptospirosis (Weil's disease) — a problem in cane fields — and salmonella poisoning. Rats can also cause fires by chewing electrical insulation and they have been blamed for damage to seabird colonies. Plagues of mice can create huge amounts of damage to grain crops.

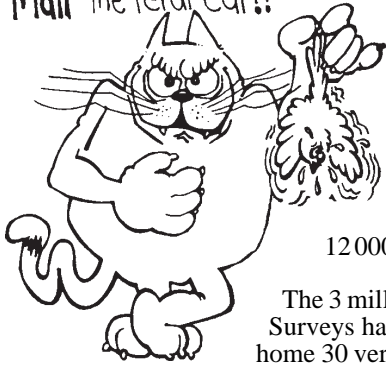


## Cane toads

The introduction of the South American cane toad (*Bufo marinus*) represents a spectacular failure of a biological control method. In 1935, 102 toads were imported to Gordonvale and bred in a research station. By 1937, 62 000 toadlets had been released in the hope that they would eat their way through the swarms of beetles consuming the sugar cane.

Unfortunately beetles can fly but toads can't — plus the toads didn't like the cane fields. The insects were finally brought under control by applications of chemicals — while the cane toads continued to spread, well out of control. They have now colonised most of Queensland and are advancing into the Northern Territory at the rate of 27km a year. They are a menace to the environment, gobbling up insects, other frogs, small mammals and reptiles, and poisoning anything which tries to eat them. Their eggs and tadpoles are toxic, a threat to other aquatic creatures. CSIRO researchers are now studying their native environment in South America, in the hope that they will discover a control which can be applied to Australian populations.

Meet the feral cat!!



### Cats

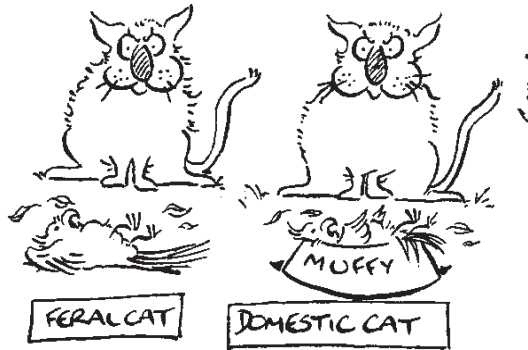
Cats are the most widespread pest in Australia, occupying almost every environment — although they tend to avoid undisturbed rainforest. Some are domestic while many more are ferals, not relying on human contact. Both types are hunters.

An average feral cat weighs 4kg (they are larger than domestic ones). It needs to eat 5-8% of its body weight, the equivalent of ten small animals each day or 3 600 each year. If only 1 000 of these are native animals, it is possible that the estimated 12 million feral cats kill an appalling 12 000 million native animals a year.

The 3 million or so domestic cats take their toll as well. Surveys have shown that the average well-fed cat brings home 30 vertebrate animals a year. This adds up to almost 90 million vertebrates, probably 75 million of them native, killed annually by domestic cats. This is almost certainly an underestimate, since not all prey is brought home and not all domestic cats are as well-fed as those in the surveys.

While rabbits, mice and other introduced species are among the species taken by cats they have been known to kill and eat more than 186 species of native birds as well as 64 mammal, 87 reptile, ten frog and numerous invertebrate species. They also compete directly with native carnivores for food and dens and transmit diseases, such as toxoplasmosis which is generally fatal to marsupials. Like foxes, cats have the potential to spread rabies.

(For information on cat control, see page 2.)



### Earthworms

Originally a resident of Brazil, *Pontoscolox corethrurus*, an earthworm, has successfully established itself throughout the tropics. These worms may have arrived attached to equipment used during the gold rushes or in potted plants. Certainly they were well established by 1913. Occurring in very large numbers they have been moving into disturbed rainforest along walking tracks, roads and streams. At this point it is not known if the invaders compete with and/or displace native worms but natives are rarely found where the newcomers have become established. Native worms are important for breaking down and recycling nutrients from dead wood, a task which *Pontoscolox* does not perform. It doesn't aerate the soil either and it may carry diseases. Many wet tropics worm species are found nowhere else. It would be a great pity to lose them before they have even been adequately studied.

### Ants

Along with many more foreign insects, a number of species of ants have somehow been introduced to Australia. The brown Argentine ant is a common household pest.



Another introduced ant is ousting the native species from ant plants (left) — those peculiar epiphytes which accommodate ants in special passages in the structure of the plant, trading shelter for food supplies. The ant plants, however, are not thriving with their new tenants. The seeds do not set as well and the caterpillars of the Apollo jewel butterfly, which are normally tended by the traditional residents of the ant plant, are being neglected. (See *Tropical Topics* 13.)

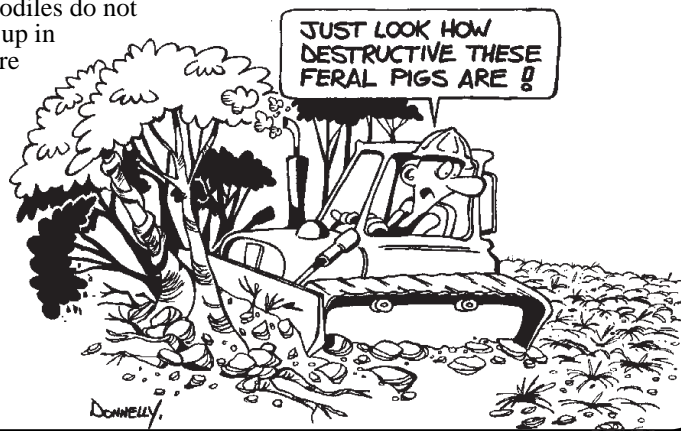
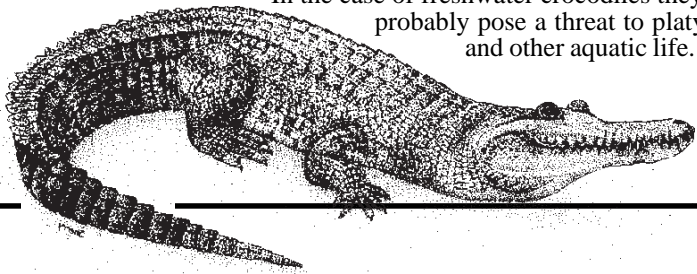
### People

While most of these animals have arrived in Australia naturally, some were released or escaped from captivity in the Sydney area in the late eighteenth century. They are, without doubt, the most destructive of the introduced species, having extensively damaged the environment when building their shelters and in their quest for food. They are also responsible for introducing all pest species to the continent.

### Freshie crocs

Although native to some parts of tropical Australia, freshwater crocodiles do not occur naturally in the wet tropics. However, they have been turning up in freshwater lakes and streams, both on the coast and tablelands. There are at least two in Lake Eacham and one in Lake Tinaroo. Probably people have picked them up (illegally) from the wild and have subsequently dumped them when they became too large to keep as pets. Animals (and plants) artificially transferred from one part of Australia to another can be just as destructive as imported pests.

In the case of freshwater crocodiles they probably pose a threat to platypus and other aquatic life.



Cartoon by Patrick Cook © Australian Nature Conservation Agency

## Questions & Answers

**Q Why do some trees fruit on the trunks?**

**A** Cauliflory, as the habit of flowering and fruiting on the trunk is termed, is a characteristic feature of tropical rainforests. Rather than risk flowers and fruit being hidden from potential pollinators and dispersers in the dense canopy, producing them in the relatively open understorey may be a better advertising strategy for some species. As many rainforest species flower and fruit only occasionally, visibility is especially important at that time. A study of bumpy satinash, *Syzygium cormiflorum*, has shown that the major pollinator of this trunk flowering species is the blossom bat. Honeyeaters, long-tailed pygmy possums, moths, flies and cockroaches also helped.

Mass flowering after a long non-flowering period is another common strategy of rainforest species. All the bumpy satinashes in a region may suddenly flower profusely after several years without flowers. It has been suggested that this type of mass flowering is a protection against animals which destroy flowers and fruits by eating rather than pollinating or dispersing them. Botanists suggest that the sheer abundance of food produced by mass flowering and fruiting swamps

these hungry animals thus allowing some to survive and produce the next generation of plants.

**Q How did the Great Barrier Reef survive the Ice Ages?**

**A** In the course of continental movements the northern tip of Australia reached the warm waters of the tropics about 17 million years ago. Coral larvae from the Pacific coral reefs began to colonise the shores where water was shallow.

During the Ice Ages sea levels fell as the climate cooled and more water was trapped in the ice caps. Some corals were left high and dry and died — but others flourished where waters became more shallow. During the last glaciation, about 20 000 years ago, the area which is the Great Barrier Reef lagoon today was probably a grassy plain where Aborigines hunted. The reef itself would have been on the edge of the continental shelf.

When conditions warmed sea levels rose again. Some reefs were drowned but others kept pace with the gradual rise so that the growing coral stayed just below the surface in clear sunlight. Coastlines changed enormously with these fluctuations in sea levels, the ocean sometimes reaching 250km or more inland from the present coastline.

## Facts and Stats

### on pests

Foxes are the largest mainland predators next to dingoes and feral dogs. Apart from their main prey, rabbits, they feed on other small mammals, carrion and even insects and wild fruits.

**A researcher tracking radio-collared ringtail possums north of Sydney discovered that 45% fell prey to foxes while native predators took only 5%.**

A female cat can have three litters, averaging five kittens each, in a year. If one female produces four female kittens a year she could, in ten years, have nearly 2 million female descendants.

**In a 'good year' a female pig can have 2.2 litters, averaging five to seven (up to 14) piglets in each. Rabbits produce 11-25 young annually and foxes four or more. A female toad can lay almost 100 000 eggs a year. One in 200 survive to maturity — and then live up to 16 years.**

Feral pigs from Cape Tribulation National Park show similarities with pigs of Melanesian origin rather than domestic breeds. They also carry a Melanesian tick. They may have originated as the result of trade between Aborigines and people from New Guinea or Melanesia or may have accompanied Kanaka workers from Melanesia brought to work on the sugar cane. Some spotted pigs on Cape York are thought to have been introduced by Chinese miners. The earliest record of feral pigs in the area is from 1896.

**Pigs need a diet containing 14% protein before they can breed. In the rainforest earthworms and insects provide this in the wet season, but since these burrow deeply in the dry season it may be one reason for the apparent migration of pigs to the coast at this time.**

Acclimatization Societies, formed in the 1860s, devoted themselves to introducing exotic creatures to Australia. "The objects of the Society shall be the introduction, acclimatization and domestication of all innocuous animals, birds, fishes, insects and vegetables whether useful or ornamental..." Among their most stunning follies was the introduction of the Australian possum to New Zealand where it is now a major pest. Happily, they failed to introduce monkeys to Australia.

## Tourist talk

ENGLISH	GERMAN	JAPANESE	
pest	Plage	gai chu	害虫
feral	verwildert	yasei no	野生の
release	freilassen	kaihou suru	解放する
pig	Schwein	nobuta	野豚
cat	Katze	neko	猫
fox	Fuchs	kitsune	狐
rabbit	Kaninchen	usagi	兔
toad	Kröte	gamagaeru	蒲蛙
trap	Falle	wana	わな
game meat	Wildbret	shuriyou niku	狩猟肉

## Exotic fish — keep them in the tank



The Lake Eacham rainbowfish could no longer be found in its only known habitat within ten years of having been discovered — because of the arrival of species such as archerfish, mouth-almighty, sooty and banded grunter and bony bream. These were introduced to the lake illegally sometime after 1982 and presumably ate the rainbowfish and their eggs, fouled the water and perhaps passed on diseases. It is just one instance of how vulnerable fish can be.

Some fish are introduced into our waterways to provide sport and food. Others are simply pets which the owners have disposed of thoughtlessly, thinking that they can fend for themselves in the wild. All too often it is the natives which then have to do the fending.

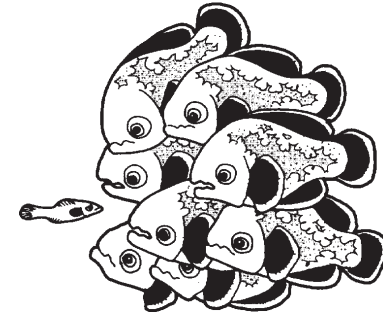
Exotic fish may eat the locals, or simply outbreed and outcompete them for food and places to live. They may change the habitat, making life difficult for native aquatic life — for example, European carp destabilise bank vegetation and muddy streams. Exotic fish may also spread diseases and parasites to native fish and other aquatic animals. Pondweeds dumped with the fish can cause enormous problems, choking waterways and

causing the deaths of aquatic animals.

There are heavy fines for releasing exotic fish into natural waters. The contents of aquariums should **never** be tipped into reservoirs, farm dams, drains or other waterways — or flushed down the toilet. Unwanted fish can be taken to your local aquarium dealer or the local office of the Department of Primary Industries (Fisheries).

Another source of exotic fish (and plants) is escapees from overflowing garden ponds. Beware the wet season!

Certain fish and plant species are considered noxious — officially harmful — and should not be kept. Check with the Department of Primary Industries if in doubt.



*Illustrations courtesy ACT Parks and Conservation Service*

### Illegal immigrants in the ballast

At least 15 varieties of fish, worms, molluscs, seaweed and toxic algae have arrived in Australian waters in the ballast water of cargo ships. This water is taken on in overseas ports to balance large ships sailing to Australia without cargo. On arrival, this water is discharged into Australian ports and the cargo loaded. If conditions are right, whatever is alive in that imported water can grow, breed and spread.

Already predatory fish which may threaten native ones have been found in several harbours, exotic mussels have blocked water pipes, seaweed is outcompeting native species and seastars which feed on shellfish (and breed rapidly) are threatening shellfish fisheries in Tasmania. The Tasmanian shellfish industry has also suffered from a toxic alga which, when eaten by shellfish and fish, causes paralytic poisoning in people who consume them.

With about 66 million tonnes of ballast water, 58 million tonnes from overseas, being discharged into Australian ports each year the problem needs to be addressed. Guidelines now recommend that ships take on ballast water in deep water because oceanic organisms are less likely to survive in ports. Other possibilities are to heat or chemically treat the water or to store it on arrival for treatment.

If you find any unusual species which you suspect are foreign, please contact the Australian Quarantine and Inspection Service or the health department of your local council.

## Bookshelf

### **They All Ran Wild The Animals and Plants that Plague Australia**

Eric Rolls  
Angus and Robertson (1969)  
(Annotated version 1984)

A result of years of intensive research into the history of introduction of exotic animals, particularly rabbits.

### **Pest Animals in Australia**

A Survey of Introduced Wild Mammals  
G. Wilson, N. Dexter, P. O'Brien and M. Bomford  
Bureau of Rural Resources (1992)

*GEO Vol 14 No 3 Aug-Oct 1992 pp 48-65*

### **The Deadly Seven Running Riot over Native Species**

Peter Beeth

Article on foxes, wild pigs, goats, cats, rabbits, buffaloes and cane toads.

### *Brochures*

### **Feral Animals in Australia Introduced Wild Animals in Australia Cats in Australia**

Australian Nature Conservation Agency (1990/1992/1992)  
**Cats and Wildlife**  
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