CHAPTER FOURTEEN

LIVESTOCK AND FERAL ANIMALS

Many of the native mammals which once inhabited and grazed Australia's inland floodplains are now locally, or even nationally, extinct. They have been replaced by large numbers of feral animals and by livestock. Similarly, some native fish are now locally extinct, or nearly so, in large stretches of river where they were once abundant. Introduced fish often out-number native fish by hundreds to one. But are such feral creatures the cause of the river system's problems, or just one more symptom of it? The answer is far from simple.

From the earliest days of European settlement floodplains have been grazed, usually much more intensively than they now are (Chapter 11). Vast numbers of sheep and cattle were moved overland, using the floodplains as stock routes through the arid interior — in 1865 alone, an estimated 350,000 sheep walked the Murray corridor. And in the early days of pastoralism stock had to be kept near the river and its floodplain to provide them with watering points. Livestock grazing on the floodplains now, with some local exceptions, is probably the lowest it has been in more than 100 years.

INTRODUCED ANIMALS

Similarly, in the past, feral rabbits were much more abundant in river valleys, which served as highways for the rabbit plague as it swept through Australia last century. Before the introduction of myxomatosis in the 1950s, rabbits flourished in enormous concentrations along the waterways of the Murray-Darling Basin. Myxomatosis was spread — much to the surprise of the scientists involved who believed the experiment had failed — by floodplain mosquitoes, whose populations boomed in the spring of 1950 following an unusually wet year. Enormous numbers of rabbits were killed in the first wave of disease; locals spoke of the river valleys reeking with the stench of rotting carcasses. (52)

Excessive grazing by livestock, feral and native animals removes vegetation and lessens the ability of floodplains to slow floodwaters, trap silt, filter out excess nutrients, replenish river life and perform many other functions. Also grazing and trampling, especially by large animals, damages floodplain waterbodies (Chapter 18). Different grazing animals have different impacts. Rabbits are among the most damaging, because they prefer the seedlings of native perennial plants. Goats are browsers rather than grazers and also prefer shrubs, but they can survive on any vegetation, and cause great damage in poor seasons. Grass-eaters like sheep, cattle and horses also have preferences, and in addition their hard hooves can cause serious soil disturbance, compaction and plant damage. Some scientists believe hard-hoofed animals also crush underfoot large numbers of the resting stages of freshwater invertebrates. In general cattle do less damage than sheep, which graze more intensively and chew plants closer to the ground. However, cattle, unlike sheep, will graze into the water, disturbing riverbanks and wetland margins.

As grazing pressures increase, palatable species disappear and are replaced by unpalatable ones. Introduced annual weeds typically replace perennial native plants. Livestock tend to favour some important floodplain plants so these plants are especially vulnerable to grazing. For example, uncontrolled grazing by cattle selectively removes beds of the common reed, *Phragmites australis*, so that often reeds now grow only in areas that are inaccessible to stock. Phragmites grows in up to two metres of water, and is especially important for bank protection in regulated rivers, with their erosive flow patterns (Chapter 11). Densely growing reed stems slow destructive currents, while reed root masses help bind riverbanks and accumulate silt. The plants also provide habitat for aquatic invertebrates and birds, and floodplain reedbeds can considerably extend the duration and lessen the destructiveness of floods (Chapter 12).

Cattle can severely damage the ecology of billabongs by grazing and trampling aquatic plants and compacting the soil with their hard hooves. In addition they may also impact water quality by urinating and defecating in the water. Photo: *Karen Markwort, CRCFE*

Before the introduction of myxomatosis rabbits flourished in huge numbers along the waterways of the Murray-Darling Basin.

Photo: *CSIRO Wildlife and Ecology.*

Inset: A recent survey of NSW freshwater fish resources found an average of one carp per square metre in the lower reaches of the Bogan River.

Similarly, rabbits appear especially fond of river red gum seedlings, and in high numbers can prevent the trees from regenerating. Cattle also browse young river red gums, but prefer more palatable plants. Trials in red gum forests have shown that cattle will often damage river red gum seedlings, but will not necessarily kill them — so long as there is sufficient grass to be found. Dehorned cattle cause less damage to red gum seedlings than do horned cattle. (53) However, trampling by such hard-hoofed animals restricts native plant regeneration in other ways, for example by crushing plant shoots (or rhizomes) growing beneath the soil surface. Hard hoofs also 'pug' moist soil, breaking down its structure and making it more susceptible to erosion. Sheep and cattle hooves exert many times more pressure on the soil than do the paws of the heaviest native mammal, the kangaroo.

Grazing also removes much of the plant matter which, under natural conditions, decays rapidly when floodplains are inundated, and forms the bottom of the food chain for fish and birds (Chapters 4 and 6). Midge larvae, for example, feed on the same kind of vegetation favoured by livestock. Grazing cattle can remove up to 90 percent of this from a floodplain, and do not always return it as manure. Stock feed during daylight hours, often grazing in lower-lying, swampy areas where vegetation is most luxuriant and palatable. But at night they move to higher ground — often off the floodplain — to 'camp'. They transport nutrients from the floodplain with them, depositing them on higher ground as manure and urine. So nutrients which might otherwise have fuelled an explosion of breeding by midges and other floodplain invertebrates during the next inundation are instead carried to areas where they can be washed into the river as pollution. Because midges are a major food source for breeding ducks, grazing by cattle may have serious impacts on waterbird populations (Chapter 9).

Native animals also have grazing preferences, which can change the mix of plant species on floodplains. The effects of the vanished medium-sized native mammals can now only be guessed at. Some may have played important roles. In large numbers kangaroos can also cause management problems on floodplains, although their impact is less damaging than that of hard-hoofed animals. Overall, as with the modern flow regime, the modern grazing regime of most floodplains is now probably very much less variable than it once was. Instead of the boom-and-bust populations of native animals, which spread out over the inland in good years and retreated to floodplain refuges in bad years, floodplains are now grazed by fixed numbers of livestock in artificially controlled rotations.

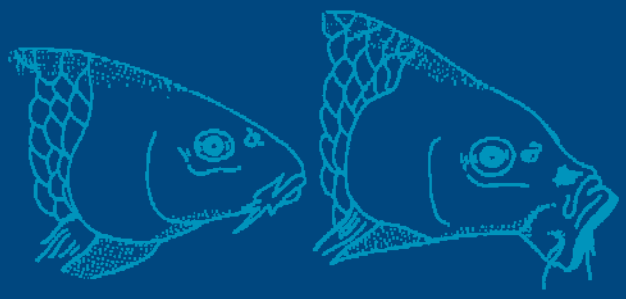
Introduced fish: the great carp debate

Have introduced carp caused the collapse of Australia's inland freshwater ecosystems, or are they just another symptom of it? It is a question that is guaranteed to start a lively debate at any gathering of Australian freshwater researchers. Some scientists, and many river residents, believe carp are directly responsible for many of the ills of Australia's inland rivers. Carp have been blamed for everything from the demise of native fish and aquatic vegetation to the collapse of riverbanks and the muddying of river water. Other scientists, just as vehemently, claim that carp are another symptom of the problem, not its main cause. Carp swarm in the rivers and floodplain waters in such numbers, they say, because the river system has been changed to suit them. Native fish can't compete with carp in such a system.

The answer, as always, probably lies somewhere in between. Carp are certainly very efficient invaders and colonisers, and have established themselves in river systems all over the world. They can survive a wide range of aquatic conditions, including high

Are carp a cause or a symptom or the problems that plague our rivers? The NSW Rivers Survey results found a strong link between high carp numbers and river regulation. Photo: *David Eastburn, MDBC*

Photo: David Williams, CRCFE



Carp are adapted to sucking small invertebrates out of plant roots in a soft bottom stream. The 'bugel' mouth and grinding teeth help sort out the debris with the remainder being pulverised and swallowed.

temperatures and low oxygen levels, and they breed prolifically. So even in an undisturbed river system, carp would be a formidable feral pest. Carp's bottom feeding habits — they mumble their way through bottom sediments, sucking morsels out of the mud — mean that in high numbers they probably do increase the turbidity, or muddiness, of water. There is now evidence that carp destroy some aquatic vegetation by uprooting it. (54) They are also suspected of including catfish eggs, and perhaps those of other nesting native fish, in their diet, swallowing them 'accidentally' along with other edible tidbits as they rummage through the sediment.

However, carp do not eat native fish. Indeed, in their juvenile stages, carp are eaten in large numbers by predatory native fish such as Murray cod. They are the hunted, not the hunters. And native fish can breed just as prolifically as carp, can also survive in poor quality water and some may be more tolerant of high salinity. Anecdotal evidence invariably links the coming of carp with the disappearance of native fish — but which caused which remains an open question. The presence of large numbers of carp is a clear indication that a waterway is in trouble, and it is easy to blame them for its plight. And undoubtedly carp, at high densities, do cause ecological damage. But some scientists believe that carp are scapegoats: that it is often easier for river users to blame them for a river's ills than it is to confront the real causes. There is no question that carp have co-opted the productivity of floodplain and river ecosystems, replacing native fish. But many scientists doubt they could have done it on their own.

Carp, for all their visibility, are just one of many introduced fishes which have taken up residence in inland waters. The carp's close relative, the goldfish, is also common in rivers and other waterways. So too are three species of introduced trout and the predatory redfin perch, all of which are very popular with anglers, but which most decidedly do eat large numbers of native fish. Other feral fish include tench, roach and the so-called 'mosquito fish', gambusia — which despite its popular name does not prefer mosquito wrigglers over other invertebrates, and which also preys on small native fish. A more recent introduction is the weather loach, and possibly now tilapia.

The clearest example of how a changed river system encourages exotic creatures at the expense of indigenous ones probably comes from the world of tiny freshwater microinvertebrates. Reservoirs, farm dams, rice paddies and other human-made water storages contain very different species of microinvertebrates than those that are found in natural floodplain waterbodies. The reservoir microinvertebrates are familiar to scientists: they are cosmopolitan species, the same as are found in reservoirs all over the world. The native floodplain species are often unique to Australia, adapted to life on the changing floodplain but unable to compete in the regulated world of a reservoir.

This graph shows the strong link between river regulation and species diversity, a indication of river health, in four catchments of the Murray-Darling river system. *From Gehrke et al. 1995* (54a)