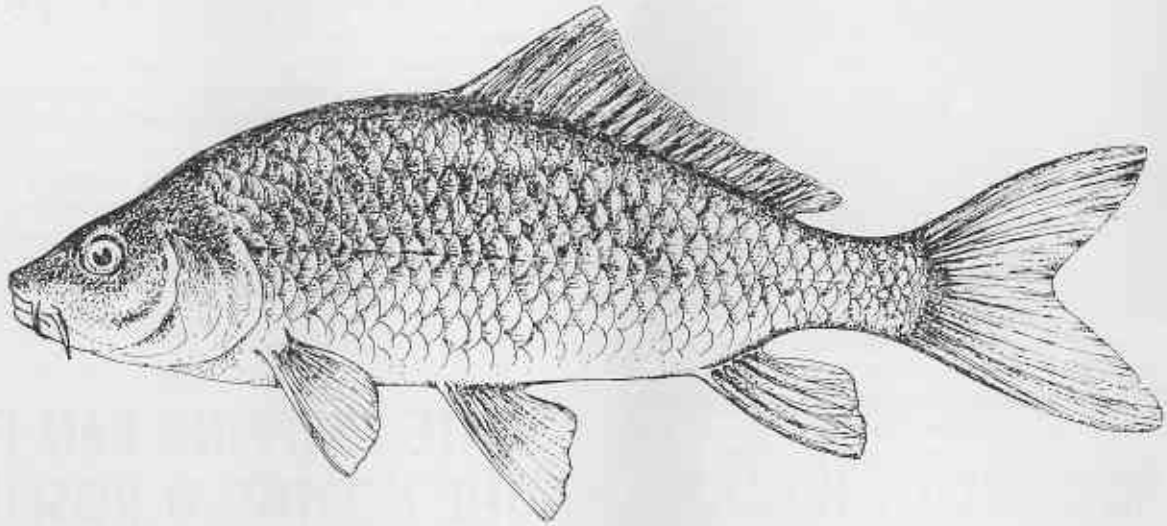


CARP SPREADS THROUGHOUT AUSTRALIA



Common or European Carp, *Cyprinus carpio*, are gradually finding their way into all of the Australian inland waterways. So far, because of the geographical barrier separating the east and west of Australia, the Western State is free from the scourge.

The following is an article taken in part from "Australian Fisheries" journal March 1975 and gives the situation that has evolved in Australia, since the thoughtless introduction of this noxious fish.

The bold print is Western Australia's emphasis in the saga.

"CARP was little known in Australia 15 years ago. Today it is established in river systems in Victoria, South Australia and New South Wales, and recently was discovered in farm dams in Tasmania.

The possible threat posed by the fish has been widely debated by fisheries authorities, parliamentarians and anglers and a number of control methods considered. However it is extending its range and eradication is now generally considered impossible.

In 1962 Victoria declared it a noxious fish, ordered its removal from waters in the State and authorised fines up to \$1 000 for conveying live carp; last year South Australia appointed its first senior freshwater fisheries biologist—with a special brief to study carp; and the Tasmanian Government recently made an emergency grant of \$10 000 to eradicate the fish from farm dams in the north-west, while a bill passed by the Legislative Council imposes fines of up to \$1 000 on landowners with carp on their property.

Basis for concern is the well-documented deterioration of native flora and fauna stocks in some bodies of water following the introduction of carp. This concern has been heightened by the fish's rapid rate of spread—the length of the Murray River in South Australia in less than a year for instance—though this has perhaps been the result, to some degree, of man-made changes to the environment.

Mr. A. Dunbavin Butcher, former Director of Victorian Fisheries and Wildlife, described the introduction and establishment of carp in the State as a story of great tragedy and frustration.

'The appearance of European carp in Victorian waters is perhaps the greatest tragedy ever to befall our fresh water environment,' he said.

The carp is native to eastern Asia and reached Europe through Cyprus centuries ago. In 1872 it was introduced to the United States and has since spread to every State except Alaska, indicating its adaptability to widely varying conditions.

The common or European carp (*Cyprinus carpio*) was introduced to Australia in the same year, with the crucian carp *Carassius carassius* and the goldfish *Carassius auratus*, by the Geelong and Western District Acclimatisation Society. The latter two fish have spread into numerous Victorian waters but are not considered a major problem. (Throughout this article, 'carp' refers to *Cyprinus carpio*.)

Carp introduced into Australia were little seen for almost a century. They survived in ornamental ponds in several areas, including the Melbourne Botanic Gardens, and also became established in Prospect Reservoir, a comparatively large body of water supplying domestic water to Sydney (and which shows no ill effects for the presence of the fish).

In Victoria the Fisheries Act of 1958 prohibited stocking of non-indigenous fish (including carp) in public waters but did not prohibit them in private waters.

In 1960 an application was made to the Victorian Fisheries and Wildlife Department for approval to import carp from Germany. The Department discouraged the venture but an advertisement appeared in the country Press in July 1960 inviting inquiries from farmers wanting 'a fast growing and hardy fish suitable for stocking in a majority of dams and ponds'.

The original inquirer had built a series of special ponds in Gippsland and had adult European carp. Another advertisement in May 1961 announced *Cyprinus carpio* were available—and that orders of 1 000 or more would be delivered anywhere in Victoria or the Riverina.

By the end of the month European carp had been liberated in farm dams in many parts of Victoria. In August Mr. Dunbavin Butcher flew to the United States to study the impact of carp there. In December the sale of carp in Victoria was prohibited. But by then the problem was ensuring that the fish did not escape from farm dams into Victoria's river systems.

Widespread debate on the carp led to a State Development Committee inquiry which in turn led to passage of the Noxious Fish Act in May 1962. Anyone having carp in their control was to notify the Department; its officers were allowed to enter private property to destroy the fish; and anyone possessing carp and failing to notify the Department was liable to a fine of \$1 000.

A 'carp-kill' program began in May to eradicate the fish before they bred in September-October. It cost 200 man-days and \$50 000 to poison more than 1 300 dams throughout the State. Later tests on 200 treated dams did not produce a single live carp.

However about 10 months later carp were found in the Yallourn Storage Dam in the Latrobe Valley. Chemical poisoning failed to get a total kill (as expected) and by early 1964 the fish had bred. By February 1965 they were reported as 'infesting' the dam and appeared downstream.

In the meantime carp were reported from other areas of the Latrobe Valley and according to the Department fish had been stocked secretly and illegally in a number of private waters, without owners' permission.

They also appeared mysteriously in Hazelwood Dam, Lake Guthridge and Moondarra Reservoir, as well as forestry dams and smaller water storages. It also became obvious that fish had been released in the Latrobe River.

In September 1967 representatives of the Victorian Piscatorial Council, State Electricity Commission, Latrobe Valley Water and Sewerage Board and the Fisheries and Wildlife Department met to discuss carp control. The Department tested mid-water trawl nets unsuccessfully and shelved schemes for seine netting and permanent traps as impractical.

Attention suddenly swung from the far south-east of Victoria to the far north-west when carp were found near Mildura in Lake Hawthorn, a salty irrigation drainage lake connected by a short channel to the Murray River. Fish up to 5 kg were caught and obviously had been put in the lake some years earlier. Carp then were found in the Murray, downstream from the Lake Hawthorn channel.

Carp have since been found in the Yallourn Storage Dam, the Morwell, Tyers, Latrobe, Thomson, McAlister, Avon, Perry, Nicholson, Tambo and Snowy Rivers, Stony and Boggy Creeks, and Gippsland Lakes in south-east Victoria; the Yarra and Maribyrnong Rivers north of Melbourne; and the Murray River from Yarrawonga Weir west, including the tributaries of the Broken, Campaspe, Loddon, and Avoca Rivers and the Laanecoorie Reservoir and Kerang Lakes.

In South Australia carp are found along the length of the Murray River and in Lake Alexandrina. First recorded capture was at the Chowilla Dam site in January 1970. Numerous fish were being caught in the upper Murray River by November of that year and also were reported in the lower reaches—only 10 months after they were first seen in the north.

In Tasmania farmers introduced carp about 10 years ago to control weed growth in dams. They flourished in dams on about 20 farms in the Natone-Stowport area in the north-west. Inland Fisheries Commissioner Mr. D. D. Lynch hopes the fish can be eradicated before escaping to open rivers.

In New South Wales carp have been in the Murrumbidgee irrigation area and the Riverina district for some time and are widespread in the Murray-Darling system.

Carp have not been reported from Queensland but given its known pattern of movement it is expected the fish will eventually reach that State also.

The most serious impact carp have on the habitat is caused by their method of feeding. They feed by sucking up mud and plants from the bottom, ejecting them and selecting food suspended in the water. This keeps the water turbid, in turn inhibiting growth of bottom aquatic plants by reducing light intensity.

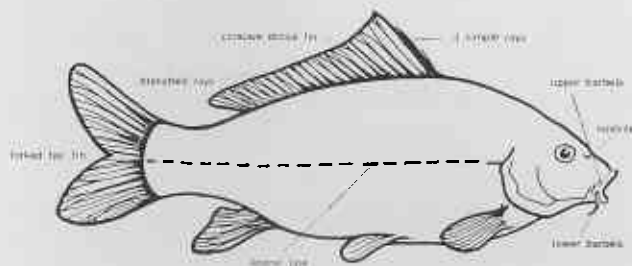
Water conditions produced by carp, particularly in shallow lakes are also believed to encourage blue-green algal blooms, possibly because carp excretions raise the nitrogen level.

Director of the Victorian Ministry for Conservation's Fisheries and Wildlife Division, Mr. J. C. Wharton, considers carp cause most damage in still, shallow water with a muddy bottom. In these conditions it could make the water so turbid no other fish could live there. Vegetation also is destroyed and the water becomes unattractive to water fowl and to man.

Problems have also been reported by officers of the State Rivers and Water Supply Commission with carp fouling drains.

Carp breed mainly during the summer months from September to November in Australia although spawning is said to occur continuously in tropical regions. Main stimulus to breeding seems to be an increase in water temperature to at least 18°C and often local flooding. They breed in tropical countries in water at 32°C. average temperature in fish ponds.

Carp segregate into small groups to spawn, typically one female and two to three males. They prefer shallow recently-flooded sites less than 0.5 m deep but will spawn in up to two metres of water. There is loud splashing during spawning and the water is muddied.



Characteristics of Common Carp.

Males mature in their third or fourth year and females in the fourth or fifth in Canada, although most females in Europe mature within three. Nearly all fish are mature at 40 cm. Fecundity of carp ranges from 13 500 eggs at 20 cm up to three million at over 65 cm. Large females may breed more than once in a season, after an interval of 25 days. The creamy yellow eggs, one or two millimetres in diameter, are laid near the surface on aquatic vegetation. Fertility rate is about 90 per cent. though often less for larger fish.

Hatching at the ideal temperature of 20°C takes 46-144 hours. Prehatching mortality can be 80 per cent. New fry, 4.6-6.2 mm long, sink to the bottom and then attach to plants while the yolk sac is absorbed. They are free swimming and feeding on zooplankton within two to six days and begin phytoplankton feeding at about three weeks. Survival to three weeks generally varies from 20-86 per cent. of egg production.

Growth rate varies with food supply, water temperature and length of growing season. Carp seem to grow faster in Australia than in Europe because of the longer growing period and higher water temperatures. They weigh 1.5-2 kg after two years. Normal life span is about 20 years, when the fish is about 85 cm long and weighs more than 15 kg. Fish of 50 kg have been reported but are rare. The record British carp taken by an angler in 1952 weighed 20 kg. The United States record was also set in 1952 with a 106 cm fish weighing more than 25 kg.

Carp can tolerate poor environmental conditions such as high turbidity (165 000 ppm of silicon dioxide kills juveniles), low oxygen tensions (0.5 cc-1), wide temperature range (5-32°C) and salinity levels which would make water unsuitable for irrigation (0.002 per cent.). Carp are highly tolerant to pollution and are cultivated in sewerage ponds. Carp often will survive where water quality is too low to support any other species.

It is difficult to assess the degree of competition between carp and native species. Carp compete directly for food with other detritus feeders such as fresh water catfish and bony bream, but also destroy the weed beds which harbour the young carnivorous species such as Murray cod and golden perch.

However John S. Lake, former biologist-in-charge of the Inland Fisheries Research Station at Narrandera in New South Wales, argued that man-made changes to the river systems affected native fish far more severely than did introduced species.

Many of the environmental changes which have helped to cause the decline of native species are favourable for carp.

Carp are essentially still-water fish and are suited to the quiet bodies of water formed by locks, which slow the river flow rate. Constant water levels behind locks favour survival of carp eggs, laid on vegetation close to the surface and in danger of being exposed by falling river heights. (One control method is to systematically lower levels in impounded waters during the breeding season.)

Anglers have been particularly vocal about the spread of carp and the possible effect on native species. They commonly regard the fish as vermin which fights poorly when hooked and is not worth eating.

In Europe, by comparison, it is a prized angling species and a popular food fish. (Monks bred it for centuries as a table fish.) One British angling publication described it as 'the biggest, strongest and most wily of all our fresh water species'.

Professor Marcel Huet, Director of the Research Station of Waters and Forests of Belgium, describes the fish as 'wary, crafty, very resistant and difficult to catch'. The flesh was greatly esteemed in many countries and any muddy taste could be removed by soaking fillets in running water.

It is very popular in Asia. *Cyprinus carpio* is widely cultivated along with two groups of cyprinids labelled 'Chinese carp' and 'Indian carp'. It brings higher prices in south-east Asian restaurants than giant perch (barramundi), popularly regarded as Australia's number-one food fish. It is important to village economies.

It has been said, albeit with a certain degree of cynicism, that Australian anglers may one day be grateful for having any fish at all that can survive in our inland waters. Some anglers who have caught the fish say the flesh makes good eating, though it is an acquired taste.

All known eradication techniques throughout the world have either failed or proved impossibly expensive in any but small areas of enclosed water.

Several chemicals have been used in Victoria. Most effective was rothone but at a cost in chemical alone of about \$15 for every 1.24 million litres of water use of this chemical is only practical on a small lake with extremely high fishing potential.

There has been no widespread poisoning in Victoria in recent years because carp have not infiltrated the 'blue ribbon' fishing lakes in the State.

Other possible control methods include:

- fences or dykes to bar adult carp from certain areas, but costs and maintenance would be prohibitive and carp fry could still enter;

- electric barriers, similar to those used in the American Great Lakes to control lampreys might be effective in small channels and waterways, but they would be non-selective and stop native fish as well; and

- water level controls to expose the eggs. Because of the short incubation period and long spawning season water levels would have to be dropped at least once a day for several months. This is impracticable in most areas.

Also considered as a control method is increased commercial fishing"

"Much of the current work on carp in Australia consists of the collecting of basic data, such as growth, reproduction, food and behaviour. Its effect on native species (competition, predator-prey relationships, population structure and sizes of native fish species) are also being studied and control methods are being evaluated.

There is exchange of information between the three currently affected States—South Australia, Victoria and New South Wales. Because inland waters are the responsibility of the States the Australian Government has not been directly involved"

In the State of Western Australia, legislation has been tightened to control any situation that might arise in regard to noxious fish. The Minister for Fisheries and

Wildlife has the power to assert strong action against the introduction into this State of any species such as European Carp.

Prevention is better than cure.

During 1975 Mr. John Hendry of Mt. Pleasant notified the Department that he had received in error a consignment of koi carp from Singapore. Fisheries and Wildlife Department Officers subsequently destroyed the fish, which had eluded all entry checks into the State.

Appreciation is expressed for Mr. Hendry's responsible and unselfish action in helping to restrict the entry of this unwanted species into Western Australia.