

Introduction and distribution of carp in Australia

Natural range of carp: The original range of carp (*Cyprinus carpio*) is from the Amur River in eastern China to eastern Europe, probably as far west as the Danube River. It is thought that the species originally evolved in the east Asian region and spread naturally from there. A European/Asian subspecies (*C. carpio carpio*) and an east Asian subspecies (*C. carpio haematopterus*) are now generally recognised.

There are about 20 other species of *Cyprinus*, mainly around the Yunnan region of southwestern China, with some species restricted to single lakes.

C. carpio was apparently domesticated and cultured by the Chinese about 3000 years ago. The extension of its range across Europe began in the first century AD, helped by the Romans and later by monks who cultured the species in Europe. Carp were established across Europe by the 1200s and in the United Kingdom by the 1600s. Carp were transferred from China to Japan around 700 years ago where the koi ornamental varieties originated.

“ Carp are now one of the most widespread fish species in the world ”

Introduction to Australia: The first attempts to introduce carp to Australia were made in the late 1850s. The first of these into Tasmania in 1858 was not successful. An introduction to Victoria in 1859 succeeded in establishing a population in the Botanic Gardens in Melbourne, which persisted until 1962. Carp do not appear to have spread from there. These introductions reflect the community attitudes at the time, with attempts being made by acclimatisation groups to introduce many European species. For example, brown trout were first successfully introduced to Tasmania from the United Kingdom in 1864 and a variety of other new plants and animals were also imported to provide both food and recreation for colonial residents.

Around this same period, and again in the early 1900s, carp were introduced to a number of locations around Sydney, including Prospect Reservoir where they



Wild carp from the Danube River; part of its original range

established a breeding population. Carp had become established but not widespread in the Murray-Darling Basin by the 1920s.

There were also attempts to introduce carp into Western Australia between 1896 and 1907 but these introductions did not become established. Successful introductions have, however, since been made. There are no records of carp in either South Australia or Queensland before 1960.

Carp populations were found in several farm dams in northwest Tasmania in 1974 and again in 1980. These were successfully eradicated. Carp were again found in Tasmania in lakes Sorell and Crescent in 1995 and attempts are in progress to remove them.

Strains of carp in Australia: Recent studies on the genetic relationships of Australian carp indicate that there have been several separate successful introductions of carp^{1,2}.

The carp introduced to the Sydney area and now known as the ‘Prospect strain’ are the ancestors of the oldest existing strain in Australia. Another population of carp was established in the Yanco area of New South Wales (‘Yanco strain’) before the 1940s. A third strain, now known as the ‘Boolara strain’, was originally bred in a licensed fish farm at Boolara in Victoria in the late 1950s. Genetic analyses have shown that all three of these strains originated from Europe and all were likely to be from separate introductions.

There have also been multiple releases of the Japanese ‘koi strain’ of carp, all relatively recently (1976–2008). It is likely that many of these releases originated from locally cultured fish rather than direct introductions from Japan.

The influences of all four of these strains can be seen in the genetic make-up of carp populations around Australia. Analysis of the genetic patterns not only gives some indications of the invasion history of the fish but is also useful in defining where barriers to carp dispersal are and so suggesting possible management units.

Further spread around Australia: Carp from these introductions have been spread around Australian inland waters in various ways, including:

- deliberate release by acclimatisation societies
- escape from aquaculture or culture ponds
- accidental transfer with other fish releases
- release of unwanted aquarium pets
- release of unused live bait
- deliberate transfer for various reasons.

Although the Prospect and Yanco strains of carp were well established in the Murray-Darling Basin by the 1960s, the introduction of the Boolara strain to this system is thought to be the catalyst for the massive expansion of carp in Australia. Some of the Boolara strain carp were released in Gippsland, Victoria in the early 1960s. In 1964, carp were reported near Mildura and over the next five years they had spread from this source into the Murray-Darling system. These fish were later shown to be the Boolara strain. The heavy flooding of the Murray-Darling Basin in 1974/5 (and again in 1993) also helped the rapid spread of carp throughout the basin but it is probably a combination of events that contributed to the expansion, involving several or many of the dispersal methods listed.

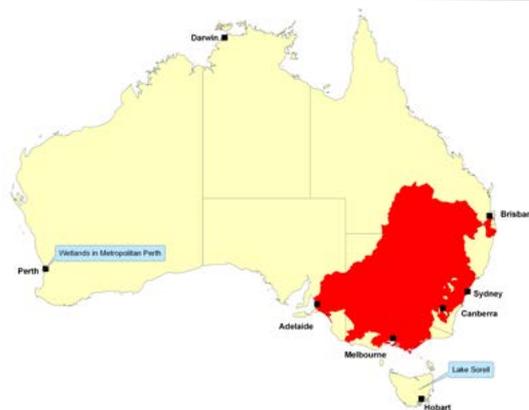
There is little doubt that the rapid expansion was also assisted by the more invasive nature of the Boolara strain. Interbreeding of the Boolara carp with the already present Prospect and Yanco strains of carp resulted in increased fitness of the cross-bred offspring and a mosaic of carp ancestry across its range.



New Zealand wild caught carp showing koi markings.
Image: Wayne Fulton

The koi introductions were more disjointed. Carp populations in the upper Murrumbidgee catchment (Lake Burrinjuck in New South Wales and Lake Burley Griffin in the Australian Capital Territory), the Upper Lachlan catchment, several coastal catchments in New South Wales, lakes Crescent and Sorell in Tasmania and wetlands near Perth in Western Australia have some koi ancestry. Some established wild populations in coastal New South Wales are made up entirely of highly coloured koi strain fish.

Present distribution in Australia: Carp occupy most of the southeast Australian mainland, with isolated populations in Tasmania and Western Australia. Only Northern Territory is free of carp. They occupy almost the entire Murray-Darling Basin, apart from a few relatively small upland regions upstream of waterfalls or large dams, which act as barriers to colonisation.



Map of carp distribution in Australia. Image: Dean Gilligan NSW Fisheries

Within the southeast drainage division, carp occur in the Albert-Logan River system in southeast Queensland, the Richmond, Hunter, Central Coast, Hawkesbury, Sydney and Shoalhaven catchments in New South Wales and most of the coastal catchments in Victoria. Most populations are restricted to waterways below 700m elevation, with relatively few catchments supporting populations in upland streams and waters.

“ The only substantial carp-free regions within the Murray-Darling Basin are in the New England tablelands region of New South Wales and some smaller upland areas in the southern catchments ”

In South Australia, carp are present in most of the rivers draining west from the Mt Lofty Ranges; from the Light River north of Adelaide south to the Inman River. They are also present in the Murray River and its lower lakes and tributaries. In Western Australia, carp are present only in some wetlands around Perth. In Tasmania, carp are known only from lakes Sorell and Crescent in the Derwent River system, although it is likely they have been eliminated from Lake Crescent.

Further information:

1. Haynes GD, Gilligan DM, Grewe P and Nicholas FW (2009). Population genetics and management units of invasive common carp *Cyprinus carpio* in the Murray-Darling Basin, Australia. *Journal of Fish Biology* 75:295-320.
2. Haynes GD, Gilligan DM, Grewe P, Moran C and Nicholas FW (2010). Population genetics of invasive common carp (*Cyprinus carpio* L.) in coastal drainages in eastern Australia. *Journal of Fish Biology* 77:1150-1157.
3. Koehn J, Brumley A and Gehrke P (2000). *Managing the Impacts of Carp*. Bureau of Rural Sciences (Department of Agriculture, Fisheries and Forestry – Australia), Canberra.