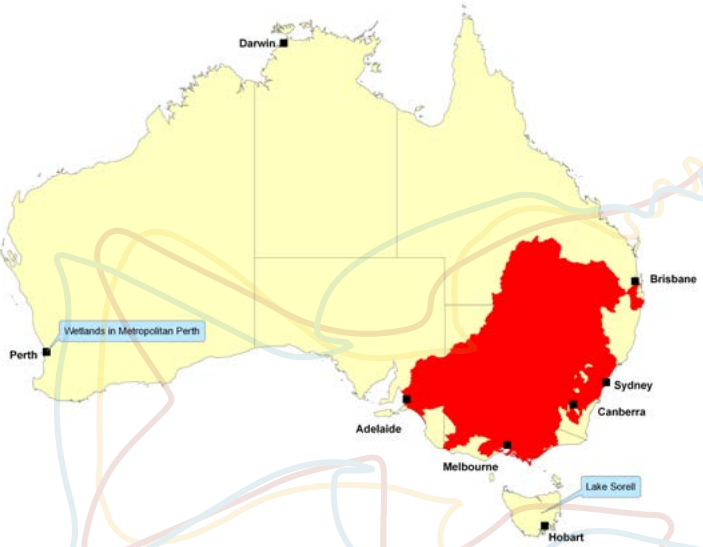
PESTSMART

Carp (*Cyprinus carpio*)

Carp (*Cyprinus carpio*) were first introduced to Australia more than 100 years ago. They are now widely established throughout the Murray-Darling Basin and can also be found in all states and territories except the Northern Territory (see PestSmart Factsheet Carp introduction and distribution for more detailed information). Carp are very common in parts of this range in Australia and are considered to be one of our major pest fish species.

Map of distribution of carp in Australia (more detailed information on their distribution may be found in another fact sheet in this series). Image: Dean Gilligan, NSW Fisheries.



Common names:

Carp, common carp, European carp, koi, mirror carp, leather carp. These names are the main ones used in Australia, all referring to *Cyprinus carpio*, but many other common names are used for this species in other parts of the world.

Head of carp showing barbels around the mouth. Image: Chris Wisniewski, Inland Fisheries Service, Tasmania

Synonyms:

Because of the wide distribution of carp, around 30 scientific names have been used for the species, mostly in the genus Cyprinus. The original name given by Linnaeus in 1758, *Cyprinus carpio*, is still used in Australia. Two subspecies are often recognised: *Cyprinus carpio carpio* for the European/eastern Asian populations and *Cyprinus carpio haematopterus* for the western Asian populations.

> “The main features that distinguish carp from other fish species found in Australia are the two pairs of fleshy whiskers, known as barbels, either side of the mouth”

Biology and ecology:

Carp belong to the Cyprinid group of fishes, which contains other species introduced to Australia (such as goldfish, tench and roach) as well as common aquarium species, such as the danios (including zebra fish), barbs and rasboras. These fish all have an extendable upper jaw, no teeth on the jaws or

Mirror carp variety with other normal carp.
Image: Chris Wisniewski, Inland Fisheries Service, Tasmania

the palate and no scales on their head. They do have what are known as 'pharyngeal teeth' on the last gill arch and the arrangement of these teeth is the main feature used to distinguish between carp and their close relatives.

Carp have an elongated body with a slightly raised back and a deeply forked tail. They have a single dorsal fin with a strong serrated spine at the front. They also have spines at the front of the anal and pelvic fins. They usually have large scales, although variations with only a few very large scales (mirror carp) or virtually no scales (leather carp) are found occasionally. There is no obvious difference in general form between males and females, unless they are in advanced breeding condition.

Colour:

The colour of carp varies. Some forms are bronze to olive on the back grading to paler yellow underneath. Other forms are a quite uniform gold/bronze to orange all over. The koi varieties have a broad range of colours with white, black and yellow patches in variable patterns. Brightly coloured koi varieties are sometimes seen in the wild, especially in New Zealand. These may revert to the bronze colour pattern after some generations of breeding with non-koi strains. There is no difference in colour between the sexes.

Similar species:

There are no native cyprinids in Australia, so carp are only usually confused with other introduced species, especially goldfish. Goldfish usually also resume their natural colour (olive green) after several generations in the wild, but they do not have barbels. Carp sometimes breed with goldfish in the wild, producing hybrid offspring sharing some characteristics of both species

> "Carp are a generalist species able to tolerate a wide variety of habitats"

Habitat:

Carp are known as a generalist species because they tolerate a wide range of conditions and habitats. However, they usually prefer slow-moving rivers or lakes with soft vegetated sediments. Their tolerance of a wide range of habitats means that they are less affected by habitat disturbance than many native species. They normally live in a preferred temperature range of around 15–32°C, but are able to survive in a wide range of temperatures, including ice-covered lakes (at about 2°C) and much warmer ponds (up to about 40°C).

Carp are also able to tolerate poor quality water with low oxygen levels, and water that is slightly salty. Their salt tolerance has been recorded at levels up to around 14 parts per thousand (ppt; seawater has a salinity of 35 ppt). In Australia, carp are generally rare at high altitude and uncommon in clear, fast-flowing streams. Juvenile carp are usually found strongly associated with aquatic plants in marsh areas or river backwaters for the first year of their life.

Ideal carp habitat — Barmah Millewa Forest, NSW.
Image: Wayne Fulton

Reproduction and growth:

In Australia, male carp generally mature at 2–4 years of age and females at 3–5 years, with the later ages being in cooler areas. Large numbers of eggs are produced by females and a 4–5 kg carp can produce 1 million eggs or more. The number of eggs produced varies with factors such as fish size and condition, water temperatures and habitat quality. Not all eggs mature at once so carp are able to spawn more than once a year, depending on water temperatures and available spawning habitat.

Spawning generally occurs within a temperature range of about 17–25°C. Some local variations in these temperatures are known. This means that the main spawning period usually starts in spring to early summer, although spawning may occur throughout the year if conditions are suitable. Conversely, carp may not spawn at all in a year if conditions are not suitable. Spawning occurs over several weeks, with females shedding eggs at regular intervals, although up to 80% of eggs may be released in the first event.

Spawning takes place in shallow water usually less than 0.5 m deep (but depth can be up to about 2 m) and usually in association with aquatic plants. In lakes or ponds this will generally be in marsh areas, while in rivers carp will move into offstream habitat such as floodplains or large marsh areas. Eggs are 1.0 to 1.5 mm in diameter and are sticky when first spawned, so they attach to aquatic plants, logs or other submerged debris. Egg development is temperature dependent and typically takes 2–8 days.

Growth is rapid in the first year, with carp reaching an average size of around 150 mm in this time. Mortality rates are high (over 90%) in the first year, but this is compensated for by high egg numbers. Carp are known to grow to more than 1.0 m long and weigh more than 40 kg. Carp in Australia have been aged at more than 30 years, although most fish captured are usually within the range of 3–11 years.

There is some predation of juvenile carp by native fish species and birds, but carp rapidly grow to a size that makes them unavailable as prey to most native fish.

Nutrition and feeding habits:

Carp will eat a variety of small food items depending on availability. Bottom and swimming insects,

Juvenile carp below Menindee Weir, NSW September 2011. Image: Nigel Harriss, NSW Office of Water

microcrustaceans, snails, terrestrial insects and some plant material including seeds and general detritus have all been found to be common in their diet. The lack of teeth in the carp's mouth means that they cannot generally take and hold active prey items like fish, but they do consume fish eggs. Carp use their pharyngeal teeth for crushing and grinding harder items such as snails. Diet varies between adult and juvenile fish, with juveniles consuming more plankton and larger carp consuming more bottom-dwelling food.

Carp feed by sucking soft sediment from the pond/river bottom into their mouths, where food items are separated and retained and the sediments are ejected. This habit often leads to a suspension of sediment in the water where carp are feeding. The use of this feeding method also means that carp prefer areas with soft sediment, such as slow river pools and backwaters or lakes and ponds.

Movement and migration:

The relatively recent use of radio-tracking methods to study fish movements, combined with tagging study information, has shown that carp can be a highly mobile species. They move considerable distances as individuals and also undergo mass migrations at certain times. They are also known to form aggregations in winter in lakes in Australia and overseas and probably also in large rivers such as the Murray. The location of these aggregations can have quite specific depth and/or temperature characteristics. Carp also move considerable distances in lakes just before the breeding season and have been found to congregate around access points to wetland and marsh habitats in spring.

They will move into this habitat as soon as water flows allow and they often get trapped there when water levels recede. Large mass movements of juvenile carp have also been observed at stream barriers.

The mass movements of carp as well as their aggregations are a significant weakness in their behaviour that can be exploited for control.

Uses:

Very large quantities of carp are grown throughout the world for human consumption. However, this is mainly done in Europe and Asia with very few carp actually grown or consumed in Australia. There are commercial fisheries for wild carp in Australia; the catches from these are exported for human consumption, or used domestically for rock lobster bait, pet food or fertilizer. Minor markets exist for some by-products such as carp roe and carp leather.

Carp are also a highly valued recreational species, particularly in Europe. There is some recreational fishing for carp in Australia, but this sometimes conflicts with state noxious fish legislation.

It is also legal to keep carp (koi) as ornamental fish in New South Wales and Western Australia. Growing koi is a highly specialised task, with certain colour patterns being favoured by fanciers.

Further Information:

More information on impacts of carp and on their behavioural weaknesses can be found in other factsheets within this series. Summaries of research by the Invasive Animals Cooperative Research Centre are available at www.pestsmart.org.au. For more extensive information on carp in Australia, the following references are recommended:

1. National Land and Water Resources Audit (NLWRA) and Invasive Animals Cooperative Research Centre (2008). *Assessing Invasive Animals in Australia 2008*. NLWRA, Canberra.
2. Brown P, Sivakumaran KP, Stoessel D, Giles A, Green C and Walker T (2003). *Carp Population Biology in Victoria*. Report 56, Marine and Freshwater Resources Institute, Department of Primary Industries, Snobs Creek, Victoria.
3. Koehn J, Brumley A, and Gehrke P (2000). *Managing the Impacts of Carp*. Bureau of Rural Sciences, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra.
4. Smith BB (2005). *The State of the Art: A Synopsis of Information on Common Carp (Cyprinus carpio) in Australia*. SARDI Research Report Series No 77. Prepared by the South Australian Research and Development Institute for the Pest Animal Control Cooperative Research Centre.

Carp. Image: Chris Wisniewski, Inland Fisheries Service, Tasmania

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