

# What is a Carp

## Carp (*Cyprinus carpio* Lineaus)

(Roughly translated means bony yellow fish) Also known as Common Carp, European Carp or King Carp.

## Historic Overview of Carp.

It is a widely held belief that Carp originated in China around the 2<sup>nd</sup> century BC and spread throughout Asia. However, 225 million years ago the world's landmasses were one super continent called Pangea (all lands). (Alfred Wegener, 'The Origins of Continents and Oceans' 1912). As the continental plates shifted and continents such as Antarctica, South America, Africa and Australia formed, both terrestrial and aquatic flora and fauna became isolated. This isolation caused life to hybridise, mutate, adapt and evolve in a variety of different ways from their ancestors, according to the 3.5-billion-year-old genetic code, that is the blueprint of life. Even today, flora and fauna species are constantly changing.

However, the Carp story really begins in the murky primordial waters of lower Pangaea. Fossils of carp like fish were recently discovered in America, which date back some 200 million years. (Utah February 2000). By the Oligocene period (25 million years ago) (Oligocene "means little life" a geological period about 40 to 25 million years ago. This is the period when primates first appeared) fossils indicate that carp had evolved into a more recognisable Carp form. During this period they migrated north and, eventually over land bridge into Laurasia. [Laurasia was the northern half of an ancient continental mass that split away, and included North America, Europe, and Asia. Alexander Du Toit, a South African geologist, in "Our Wandering Continents" (1937) proposed its existence].

Hence, modern Carp (*Cyprinus Carpio*), having migrating into what is now Northern Russia, evolved on the Asian continent between 20,000 and 9000 years ago. Carp fossils discovered in South Western Guangxi province in China support this view. These fossils are around 20,000 old. Evidence also suggests that Carp have long inhabited the Manchurian region of China; rivers feeding into the Black, Mediterranean, Caspian and Aral Seas; and, rivers entering the Pacific Ocean, from the Amur River near Siberia to Burma, for around 9000 years. Carp are gregarious species, flourishing best in shallow, sun-warmed waters of low altitude rivers.

Nevertheless, it was not until the Chinese and the Japanese cultivated and crossbred Carp as ornamentals and as food fish, did they become an important human resource.

Today, Carp are an integral part of human life. Carp play an important role in Asian mythology and in Indo – European culture. It is a riding animal and messenger of the gods. In both Japan and China, it is a symbol of intelligence, strength, nobility, honour, courage and endurance. Carp in a dream is a sign of good luck. Chinese also believe that Carp speaking in a dream, is your soul trying to speak to your conscious self. Carp also symbolises both material and spiritual productiveness. In India, the star Rohini (the red star) is associated with the carp (Rohita, 'the red fish') as symbolised by the red tilaka mark worn by Indian women on the forehead. Even European and Celtic Dragons had Carp scales.

As humanity continued to migrate to various other areas of the known world and trade routes flourished so did Carp. Around the turn of the 17<sup>th</sup> century, evidence suggests that European monks introduced Carp into the UK. . In addition, Jewish traders on the silk route were involved in introducing carp from China to Central and Eastern Europe in the seventeenth century. The Jews were the first to farm carp in Poland. They managed fishponds and bred fish taken from the Black, Azov, and Caspian Seas and from the river Don. Carp were selected because of their hardiness and tolerance to low oxygenated water, which made them readily transportable. For the Jewish people, Carp became the table fish of the Sabbath. The cheaper salt herring, which Jewish merchants also traded in, was eaten on weekdays.

There are several varieties of Carp - leather, mirror, common - and a wild type (golden). (Eddy & Underhill 1974) Wild Carp are descendants of the original stocks of Carp kept as food in the 'middle ages'.

However, interbreeding with cultivated strains of Carp has caused a decline in the genetically pure and prolific wild Carp, which is now found only in a few isolated waters. Other species of Carp including the Crucian Carp, and the Grass Carp, a native of eastern China and Russia, were introduced into European waters in the 1970's to control weed growth. Today Carp serve as a sport-fish, ornamental fish, good luck icons and a symbol of fertility and long life. Some people still have Carp as their main item for celebration feasts, e.g. Christmas, Weddings etc.

When Australians talk about Carp, they usually mean the European Carp (dubbed Common Carp) introduced by a German migrant in the 60's. However, evidence suggests that colonial governments deliberately introduced Carp into Australia, with little success and no regard to their impact.

According to historic data, a New South Wales Governor in the late 1800's bred Carp and encouraged people heading inland to stock inland rivers and lakes. Part of the reasoning behind this policy was that Europeans (and Asians) considered Carp as a good source of protein and a good game fish. The Governor believed that it would encourage migrants and make them feel more at home.

## What do they look like?

The common Carp can be distinguished from other cyprinids by the heavy and strongly serrated spines in the anterior portion of its dorsal and anal fins. Cyprinids do not have **an adipose fin** - the small fin located between the dorsal fin (the fin on top) and the caudal fin (tail fin). They generally have small eyes and thick lips, round mouths and a solid body. (Douglas N.H. 1974)

Several other distinctive features identify Carp, such as, forked tail and large strongly marked scales. Coloration can vary from being pallid and quite bland looking in muddy waters, to a stunning gold dorsal surface and rich golden sides in clear waters, with a silvery white stomach and prominent bright orange fins.

However, they are usually an olive-green and or brown colour on the back, becoming yellowish to off white on the belly and lower halves of the caudal fin, single dorsal fin, with the anal fin often being a distinct reddish colour. Their flank colours can range from the deep brown and yellow to the golden sheen of wild Carp. Their upper jaw slightly protrudes. Another distinguishing feature is the two sets of barbules (like catfish) on the sides of the mouth, with the more prominent rear pair located at the corners of the mouth.

Most common Carp have broad deep bodies and, compared to the more frequently fished cultivated varieties of Carp, true wild Carp are more barbel-like in shape, long and lean-body of a hard fighting, fast moving fish. They lack the distinctive hump behind the head of the cultivated Carp and rarely reach 35 kilos in weight.

## Telling male Carp from female Carp

Carp usually reach sexual maturity when the testes (in males) and ovaries (in females) develop. Sexual maturity can occur at a very early age for Carp, where waters are constantly warm, but more often, it is reached; when a male is around 2 years old; a female is around 3 years old; they exceed 30 cm in length and; weigh around 400 grams.

Because ovaries are much larger organs than the testes, females are generally easier to spot, as the stomach of mature females are mostly plump, while males remain a sleek 'torpedo' shape. When males are ready for spawning, they develop breeding nodules on the head and pectoral fins, principally along the bones of the fin rays. These breeding nodules appear as fine whitish raised spots. The nodules appear in abundance on the pectoral fins in regular rows and are rough to the touch. During breeding, the male nudges the female with his head and fins to encourage spawning.

# How good are a carp's senses

Carp have a good sense of smell, taste and hearing

## Hearing

Carp have three types of hearing: an inner ear; an extremely sensitive lateral line sensor; and a Weberian apparatus. This sensory arrangement allows them to detect sound vibrations in a lower and wider range than other fish.

## The Weberian apparatus

In 1820, WEBER described the Weberian apparatus that characterises the Characins group of fish (Carp, minnows, tetras etc.). The Weberian apparatus is a linkage of bones called ossicles (small bones), derived from the vertebrae immediately following the skull, connecting the inner ear and the swim bladder which enables the fish to hear high frequency sounds, sense danger and form shoals for protection.

Carp have a series of four or five modified vertebrae and structures which connect the swim bladder to the inner ear. The swim bladder serves as a resonating chamber and the bony connection amplifies the sounds and transmits them to the skull, where they are detected by the inner ear. This effectively magnifies sound and enables the fish to hear at much higher frequency than most other fish.

## Taste and smell

Carp can taste and smell items in the water in a number of ways. Nostrils, small openings near the eyes of the carp allow water to enter into a highly sensitive olfactory bulb system that allows them to sense any substance that has dissolved into that water and determine whether or not it is a good food source. In addition, when a carp takes bait, the lining of the mouth contains chemically sensitive cells that allow the Carp to determine whether that food item is a good or bad. If good, the carp may continue to feed; if bad, Carp will reject the item and may bolt from the area. Anglers call this "Spooking the carp."

## Sight

Carp have the ability to see sideways and upwards at an angle of around 49° through each eye, although they are tunnel vision feeders, therefore nothing outside of this angle will be visible to the carp. In humans, cone cells allow us to see the "visible" light spectrum. Carp, have four types of cone cells. This allows them to see every colour we see, plus colours in the ultraviolet spectrum that we do not see. However, in water the carp's vision is dependant on the turbidity of the water just as in other fish. In water clouded by silt particles etc, the carp's have poor vision, especially in minimal light, but in clear water in bright sunny conditions, the carp's ability to see is excellent, depending on its depth in the water. However, like most fish they cannot focus their eyes forward.

## Touch

Nerve fibres in their skin allows the carp to identify the item touched. The carp has an ability to sense touch through its lateral line. The lateral line on a carp which runs from its head to its tail is made up of very fine fluid filled tubes which open to the outside by tiny pores. These pores operate similar to hairs and can detect very slight movements. This assists the carp when locating potential good food sources or detecting items to avoid, such as predators. Carp can also sense food items through their barbules, (like whiskers) located at the side of their mouth. Once a carp has located a food item it can use the barbules to touch the food source and assess it, particularly if poor water clarity limits vision.

## Carp Spawning

Carp spawn in the spring and early summer in weedy, grassy, shallow areas of lakes and watercourses. Spawning occurs when the water temperature is around 16-26° Celsius. A female Carp has up to seven males fertilising her eggs at any one time, although three to four males is average and spawning may occur over several days. Spawning generally occurs very early in spring in warm waters and may also occur twice in the year.

When Carp are ready to spawn, they move into shallow vegetated areas preferably when the level of water is rising. Flood conditions usually trigger furious activity as Carp wallow and splash, making a noise heard for some distance. During their spawning, this splashing and physical activity can uproot and flatten aquatic plants. Damage from feeding and spawning is likely to be more extensive where there are larger Carp populations. Another problem is that Carp tend to spawn earlier than native fish and can reach a size too large for young native predators. Hence, the needs to ensure plenty of predators are present during Carp spawning periods be they other fish or birds.

Carp have one of the most effective reproductive systems in our waterways a 4kg fish could produce up to 1 million eggs, 90% of these eggs are fertilised and more than 80% hatch. Nevertheless, the amount of eggs produced depends on the age, size, health and the number of times a Carp has produced eggs). Carp deposit their small, sticky, yellowish eggs randomly and they become widely dispersed in the shallows, attaching to submerged weeds, grasses or other substrate. The eggs hatch in three to eight days, again depending on temperature. Growth is rapid where the water is warm and rich in food and Carp can reach 0.9kg (2lb) and approx 15cm in length in a year. They continue to grow at that rate, but not in waters that are too cold to encourage maximum size. The new hatchlings (fry) live off their yolk sacs for a few days. If hatching comes too close to winter the young Carp fry do not have enough time to build up reserves of fat before winter sets in, and so die. Although this prevents them from taking over many waters, Carp are so long-lived, that the few that do reach adulthood ensure the survival of the species.

Some research suggests that the survival of the fry is also high under good conditions and that the life span of Carp can be up to 20 years. In aquariums, Carp have been known to live up to 100 years. An 1805 Article from Cambridge England, mentioned a Carp living in a garden pond for more than 70 years. A sixteenth-century Swiss naturalist cited a fish that was 150 years old. However, 20 years may be an average age for carp in the wild.

Given the longevity of Carp (based on 20 years) one female Carp could produce over 16 million immediate offspring and have over 12 billion descendants in her lifetime. If this is true then today we should have nothing but Carp left in any waters!!

Anglers have observed that in pools where Carp and natives exist and the larger Carp removed, the number of native species caught goes up significantly even though there may be greater numbers of Carp fry present. This is because native species are predators and have learned to eat Carp fry and Carp still small enough to swallow, thereby reducing breeding stock.

The larger Carp usually dominate the feeding areas so smaller Carp do not grow as quickly which means the majority are more likely to become food for other fish. As mentioned earlier, both Murray Cod and Golden Perch prey on Carp. The introduced species of Trout also prey on Carp fry. It has also been noted that in pools where Carp remain undisturbed their numbers increase dramatically and the number of native fish caught declines at a greater rate. This implies that Carp numbers in the wild increase in an environment that allows them greater predator avoidance, thereby increasing their ability to survive to sexual maturity. This also means greater ability to forage on natural food sources and a greater ability to spawn and produce young before other species.

This suggests that a key way to combat Carp and reduce turbidity is to increase predatory native species. Eventually the balance will favour natives. It becomes a question of balance and counter balance. One of the most important features that make waterways vulnerable to invasion by exotic species is the level of human-induced interference.

## How Carp Utilise Food

While there may be some competition from Carp for food and space, there is no evidence to suggest that Carp compete directly with native species, but their diet does include macro-invertebrates and this may lead to competition with many native species, although few species feed in the same way as Carp. Hence, dietary overlaps appear minimal and the effects of habitat interactions not calculated. Nevertheless, because of the large body size of Carp, their longevity and rapid growth rates, Carp can utilise large amounts of the total food resource available in waterways. Carp growth is strongly dependent upon temperature, as they are naturally a warm water species, with little growth occurring below 10°C. The ideal temperature for maximum growth is 20-28°C.

A study in the UK estimated growth as follows: At 1yr 10-15cm, 2yrs 20-25cm, 3yrs 30-40 cm and 5 yrs 40-50 cm, with a weight of 2-3kg. In the UK, wild fish generally have a top weight of 65lb (and growing!). In warmer European countries and Australia Carp grow more quickly and have reached 40 kilos, because of an extended feeding season and plentiful food resources.

Some ecologists hold the view that Carp prey on other fish and fish eggs but this statement is unconfirmed. Even though Carp are omnivorous that is, they eat about any type of plant and animal matter, there is little evidence to prove that Carp consume native fish, and ingestion of native fish eggs is likely to be accidental - through normal feeding habits. Nevertheless, although not strictly predators, large Carp from time to time eat small fish by swallowing them whole, especially older Carp when food sources get scarce or they get slower, but given their physiology it would not be a general rule.

Carp have no teeth in their jaws, but have pharyngeal teeth (teeth in the throat cavity behind the mouth) that are broad and form three rows, with the inner rows acting to crush/grind their food. Because of this, the design of a Carp's mouth is not for chewing plants or other fish, but for crushing and grinding molluscs, seeds and algae. Carp feed by sucking up or swallowing completely their food and then dispelling soils or by blowing out the sediments and selecting their food suspended in the water. Much of the Carp's digestion of food takes part in their intestinal tract. If Carp feed in heavily muddy or stagnated areas they will have a strong smell and flavour but this will disappear in a few days if the Carp is kept in freshwater.

Within the mouth, Carp are also equipped with several sets of receptors. Carp receptors are extremely sensitive taste and smell. They can distinguish one sort of shellfish from another and different substances stimulate different receptors.

This sensitivity, coupled with their ability to experience pain and stress, enables the Carp to avoid baits on which they have been caught previously and released. While Carp may not need fish baits, some baits do stimulate their receptors. Particularly if it contains elements essential to the Carp's diet, such as leucine. At least 3% of a Carp's protein intake must be leucine. When Carp consumes protein, their digestive system breaks it down into simpler compounds such as amino acids and peptides. The amino acids create body proteins for the Carp or become energy. However, for Carp to fully utilise their protein intake, they must also consume fat. A small percentage of fatty acids are essential for cell wall structure, the rest provides energy or becomes stored as fat in the Carp's body. Minerals and trace elements are also essential in a Carp's diet.

Carp generally shoal together in winter, becoming more solitary as the water warms. They are mostly bottom feeders, but will utilise all areas of the water during summer. Temperature affects Carp feeding. If the water is colder than 14°C (57°F), Carp feed less readily. They like shallow weeded lakes and slow-flowing lowland rivers and can tolerate very low oxygen levels.