

The Carp – traditions and ecology

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Preface

The focus of this book is carp fish used in aquaculture and the traditions connected to use of such carp fish. A great number of species of carp fish have been used for aquaculture. In Europe the Carp (*Cyprinus carpio*) and in some northern areas the Crucian Carp (*Carassius carassius*) have been traditionally used for aquaculture and food. In Asia a number of other species have been used and some of them have later been introduced to other continents.

Countries like the Czech Republic, Norway, China and India have far different historical traditions for the use of carp and aquaculture with carp. In the Czech Republic and in Asia there are long and strong traditions for use of carp, **while** there are few such traditions in Norway. However, historically Carp, the close relative Crucian carp and Tench have been introduced and in the country and used in ponds and to some extent in aquaculture. In Norway a number of wild populations of Crucian Carp and Tench exist and a few populations of Carp in the South-eastern part of the country. The latter populations seem to be in continuous need of re-stocking, which is done by interested sport fishermen specializing in angling for carp. In the warmer climate of the Czech Republic Carp have no problem spawning in the wild and aquaculture of carp has long traditions.

Asian traditions for aquaculture are even older and several more species of carp has been used for aquaculture. Recently new immigrant groups from Europe and Asia has brought their traditions to Norway. Thus, old traditions like those from the Czech Republic and Asia are increasingly introduced to the country. In the Czech Republic modern aquaculture has after the Second World War increasingly supplemented traditional aquaculture with new species of carp from Asia. Increasing communication and cultural exchange means that people increasingly use knowledge from other countries and have to relate to the cultural traditions of other areas. Still cultural exchange is as old as humanity – people have always benefitted to the knowledge and traditions of others, and they have always introduced new species of plants, animals and traditions as part of their contact.

Recently it has been focus upon the environmental aspects of introductions of new species of carp and the environmental problems with aquaculture and even the use of fish in garden ponds and for ornamental purposes. Such criticism has been the matter of considerable controversies.

This book is a co-operation between Gabriela Konecna from the Environmental Studies at the Masaryk University in Brno in the Czech Republic and Hans-Jørgen Wallin Weihe from Lillehammer University College and the Maihaugen Museum. A number of other authors have been involved in the project. Carsten Syvertsen from Østfold University College has looked into the economical aspects and the connection to the natural ice production in the Southern part of Norway, Jan Gunnar Vasaasen from Maihaugen Museum at sport fishing traditions, the art historian Kjersti Sissener have contributed with knowledge of Norwegian estates and art, the limnologist and freshwater biologist Svein A. Fosså on fish biology and park and garden ponds and the environmental advisor Olav Myrholt into ecological aspects as well as giving examples of aquaculture from Nepal.

Co-operating and coming from far different traditions has been an interesting process. We have to relate to far different attitudes and in that process what is presented as “facts” suddenly turning out to be subjective data illuminating cultural and ecological differences.

Still, this is an edited work with individual or co-operating authors to the different chapters. The different chapters are the responsibility of the authors and does not necessarily reflect the views of other contributing authors.

A great number of other people have assisted us in the process of writing. We wish to thank them for their sharing.

Brno and Lillehammer December 2011

Gabriela Konecna and Hans-Jørgen Wallin Weihe

Introduction

The Carp (*Cyprinus carpio*) has been related to human civilizations both in Asia, North Africa and Europe. As European immigrants and colonization have arrived in other continents the carp has been introduced both to North America, the rest of Africa and Australia. The carp has been introduced both as a farm fish, as a source of food in the wild and as an ornamental fish. It has even been used as a political fish, being given as present of political good-will to potential voters and supporters. There are several carp fish used in aquaculture. In this book we will focus on the carp fishes traditionally used in European aquaculture, the most important being the Carp (*Cyprinus carpio*). Other traditional species of less importance used in aquaculture, such as the Crucian Carp (*Carassius carassius*) and the Tench (*Tinca tinca*), are also described. Information of a number of species of Asian carp fish recently introduced in European aquaculture will also be given, as well as a few other carp fish traditionally used. The strangest to most will most likely be the inclusion of the Minnow (*Phoxinus phoxinus*), which is reported to be used in aquaculture in Siberia.

A few other species of fish sometimes used in aquaculture in combination with carp, such as Eel (*Anguilla Anguilla*), Perch (*Perca fluviatilis*), European Catfish (*Silurus glanis*) and Pike (*Esox lucius*), will be briefly mentioned. However, such species will not be covered with biological or cultural data.

Carp has since historical times been used as a farm pond-fish both in Asia and Europe. Several authors have written about the contrasting philosophies of the east and west concerning human interaction with nature. The modern western culture has been accused of being in conflict with nature with attempts to dominate through science and technology, while the east humans have integrated and a benign part of nature (Borgese, 1980 and Edwards, 2007:28). In such an understanding aquaculture has a philosophical base in the east and scientific base in the west.

Other authors will dispute such an understanding and point out that aquaculture in Central and Eastern Europe has an almost 1000 year old history and that the consumption of carp is closely related to old religious and cultural traditions (Edwards, 2007:28) Some of them most likely dating back far before Christianity and quite possibly representing traditions just as old as traditions of cultivating land and doing farming. However, one of the obvious differences is between aquaculture pursued as monoculture and aquaculture pursued as polyculture. Monocultures tend to be large commercial activities and polycultures less extensive and balanced in a more ecological friendly way (Aurmo, 2008). Both types of cultures exist both in Asia and Europe with several different species of fish. In Norway monocultures of salmon in saltwater is of major commercial importance, while monoculture of carp exist in the Czech Republic.

A number of other carp fish have been used and introduced in the same way as the *Cyprinus carpio*. Partly the introductions have been done as an alternative to *Cyprinus carpio* and partly as a combination. In addition different strains of *Cyprinus carpio* has been mixed to make different breeds. Among the challenges in breeding has been both genetic differences and different tolerance to sickness and parasites (Penham, Gupta and Dey, 2005).

The European Crucian carp (*Cyprinus carassius*), tolerates colder waters and thrives in smaller ponds and under more difficult situations than the carp. The goldfish (*Cyprinus auratus*) has mostly been introduced as an ornamental fish. Other species such as the Grass

carp (*Ctenopharyngodon idella*) and the Bighead carp (*Hypophthalmichthys nobilis*) are more recent introductions partly because they eat water plants and algae and thus can open up overgrown waters and partly as a food of source and for sport. Then of course introductions also have to do with human curiosity. The result of introductions has in many cases been a multiplying carp population often out-competing local fish populations, destroying water vegetation and causing damage to the local environment.

Other Carp fish, such as the small minnows in the subfamily Leuciscinae, have to some extent been of a commercial value and used as kind of pond fish in eastern Europe, however such use seem to have been mostly local and north of where other carp thrives. In central Europe aquaculture has been dominated by the carp (*Cyprinus carpio*) and to the extent other fish have been used it has to a large extent been in combination with carp. An exception has been the more recent aquaculture of trout and salmon.

In Norway carp aquaculture has been virtually non-existing, however the Crucian carp (*Carassius carassius*) has been frequently used in ponds and was for many years a popular continental fish. Cookbooks used up to the 1930s have recipes of dishes with the fish. However, after that time the fish has been out of fashion until recently when new immigrant groups have started to use the fish for their traditional meals. Among immigrants both Asian and continental European traditions have been present. The Asian traditions are mostly among Chinese, Vietnamese and Thai immigrants and the Continental European traditions are mostly among Polish, Czech, Hungarian and to some extent Ukrainian immigrants. Likeways Tench (*Tinca tinca*) was introduced to Norway in several different time periods. The latest around 1900, when the fish was highly recommended in aquaculture (SOURCE SVENSKE LANDBRUKSTIDSSKRIFT). In the Czech Republic aquaculture and in continental Europe aquaculture with all the above three species have long traditions. Fish from aquaculture has been used in many traditional dishes and there are traditions connected both to Jewish and Christian religious practice.

The classification of fish is sometimes confusing. The Crucian Carp (*Carassius carassius*), the Prussian Carp (*Carassius gibelio*) and the wild form of goldfish (*Carassius auratus auratus*) are sometimes classified as one species and sometimes as separate species. Another example is the difference between Koi Carp and Carp (*Cyprinus carpio*), even if both carp and koi are mostly given the same Latin name. The different strains of fish can have different tolerance to sickness and have differences in ability to adapt to the environment. In many cases such differences will be of great importance to protect and preserve. In pond culture Koi carp have negatively influenced the European Carp used in pond culture by spreading herpes, on the other hand positive aspect of mixing the strains have also been achieved.

Ecological factors have lately been a great concern all over the world. Both fish in the wild and fish in aquaculture will be affected by pollution and the spread of sickness through the introduction of new species and new waterways. The introduction of Koi resulted in Koi-herpes in European Carp populations and is one example of the first. The new Danube-Odra Elbe Channel is one example of the latter. We do not know the entire consequences of that canal project, but we do know from North America that such canals might result in the spread of unwanted fish and organisms into new water systems. In the USA both the spread of lamprey into the Great lakes is one example and lately the great risk of the Chicago Sanitary and Ship Canal representing a possibility of the spread of introduced Chinese Silver Carp (*Hypophthalmichthys molitrix*) into the same lakes.

PART I GENERAL INFORMATION

Ecological factors to introductions

The protection of water and the environment has been part of early legislation. In India King Asoka's Pillar Edict V (246 B.C) gave legislation for fishing. Fish were protected during the heights of spawning season and there were periods of the month when no fishing was allowed (Borgese, 1980:17). At the same time introduction of fish into new waters and use of fish in aquaculture have long traditions. The use of fish for ornamental purposes and as an animal used as a pet, and for fighting undesirable insects seem also to have old traditions. In the same way as humans domesticated dogs and cats, fish were domesticated partly to fight insects and partly because they made nice company. The cat caught rodents; the fish caught mosquito larvae's.

In North America where carp has been introduced the fish is thought of as detrimental to native fish populations as they increase the turbidity of the water and uproot and destroy submerged aquatic vegetation that is important to survival of native species. The vegetation is of crucial importance because it provides cover, food and spawning sites (Scott and Crossman, 1998:410). Both Goldfish and Carp are omnivorous feeders and will obviously compete with other species for food. Both species will eat fish eggs and might also at times eat small just spawned fish (Scott and Crossman, 1998:390 and 410). Since the carp is a prolific breeder the fish the number of fish will under good living conditions rapidly increase in number and by sheer number often dominate waters where it is introduced (McClane, 1974:197). Considerable efforts are made by environmental authorities in many countries to eradicate or at least spread the distribution of carp and koi (<http://www.doc.govt.nz/conservation/threats-and-impacts/animal-pests/animal-pests> the 24.04.2010).

Another aspect of introduced fish has been parasites and sicknesses that might affect native fish populations. Carp has been known to carry a small parasite fauna of trematodes, cestodes, nematodes and acanthocephalans, however in small quantities. Some authors list substantially longer lists of parasites and further studies might give information of how such parasites can affect local fish populations (Scott and Crossman, 1998:410). Goldfish in overcrowded ponds have been prone to parasites, but the problem does not seem to affect wild populations (Scott and Crossman, 1998:390). One example of sickness introduced with fish is the *Thelohanellus* infection. The parasite was introduced to Europe from the Far East as a result of introduction of fish and will be a problem for fingerlings of carp. The infection is a problem for the traditional European fish farming (Molnar, 2002). The Koi herpes virus can be improved with selective breeding (Lilleholt, 2008), however such breeding might alter existing strains of carp. Thus the result of the introduction of a sickness like the herpes virus, which already has affected European carp farming negatively, might be to alter both wild and domesticated stock. We obviously do not know how such virus might influence wild populations of different species of fish.

In carp pond farming eutrophication has been a problem and in countries with such farming, like the Czech Republic, both the use of mineral fertilization and organic manure has been the subject of regulation (Adamek, Berka and Huda, 2008:53). However such restrictions are recent and not traditional pond farming, which often was combined with raising ducks and even rotation with agricultural crops. The traditional ponds had a much lower yield than modern and often functioned as an extension of other wetlands and probably benefitted the local fauna.

The old pond farmers were careful in their use of nutrients. From an ecological point of view it might be said that they used nutrients in a balanced way, while the modern sometimes nearly industrial large scale fish farms of the years after the Second World War developed fish farming into a kind of industry with grave consequences to the environment.

In the 1970s silver carp (*Hypophthalmichthys molitrix*) was imported to North America in order to control algae growth in aquaculture and municipal wastewater treatment facilities. They escaped from captivity and several populations are now established in nature. Together with the also accidentally introduced bighead carp (*Hypophthalmichthys nobilis*) they compete with native planktivorous fish and young fish of all species (Wikipedia, http://en.wikipedia.org/wiki/Silver_carp, 20.04.2010). Another introduced species the black carp (*Mylopharyngodon piceus*) feed on snails. Snails can be hosts of trematode pests that can cause substantial losses to aquaculture crops. However, there are concern of black carp being a serious threat to mollusks native to the USA and no state allows black carp to be released. Black carp used in aquaculture has to be sterile, however for breeders it is necessary to have some breeding stock of fertile black carp. In the USA there are reports of black carp caught in the Mississippi and some of the fish has been found to fertile (http://en.wikipedia.org/wiki/Black_carp 21.04.2010). Several species of Asian carp, such as grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*Hypophthalmichthys nobilis*) are used in European aquaculture and also to control growth of plankton and undesired populations of snails (Adamek, Berka and Huda, 2008:68). Like in the USA there are concerns of possible negative effects if wild populations are established. However, most north and central European waters will most likely be too cold for spawning and fish is both used as a way of ecological control (cleaning water from plankton) and as a supplement fish in aquaculture.

In the management of undesired aquatic plants (weeds) grass carps have been found to be of considerable help and a far better alternative than the use of chemical and/or physical removal of such plants (Cafferey, 1999). However, introductions might pose other environmental challenges such as spread of sickness, microorganisms and introduction of new breeding populations of undesired fish. The destruction of aquatic plants can in some cases be a desired effect, but in other cases an undesired causing problems to natural vegetations of benefit to other fish and birds, and often creating unclear water with more sediments (Crivelli, 1983).

Even the use to control algae can sometimes cause problems. Some algae, like the toxic *Microcystis*, have been shown to produce more toxins in the presence of silver carp. The *Microcystis* can pass through the gut of silver carp unharmed. Still, the system of the silver carp can contain enough toxins from the algae to make it hazardous to eat for humans (Wikipedia, http://en.wikipedia.org/wiki/Silver_carp, 20.04.2010). It is not known if such toxins can harm predator fish and animals eating silver carp.

Carp fish of different species are frequently added to bodies of stagnant water to reduce mosquito populations. One example is the use if gold fish to prevent the spread of the dangerous West Nile Virus. However, introductions have often had negative consequences for local ecosystems, even if they have reduced the amount of disease spreading mosquito (<http://wikipedia.org/wiki/Goldfish> 21.04.2010).

The habitat use and movement of introduced carp has been the focus of studies (Økland, 2001). Obviously introduced species might out-compete local endemic species as the same time as serving as an additional alternative food source both for humans and animals. In some

cases fish are introduced to lakes which have no prior population of fish. Introducing fish to lakes or ponds lacking fish might lead to dramatic changes for invertebrates and amphibians such as frogs, toads and salamanders (Gederaas, Salvesen and Viken 2007:35). Both gold fish and Crucian carp have been introduced to such lakes with the predictable result of severely diminishing local populations of such species. The goldfish is a common aquarium fish and has often been released by the owner or the parents of the owner after tiring of the work of their hobby (Gederaas, Salvesen and Viken 2007:44).

Introductions and politics

In 1876 the United States Fish Commission received 345 adult carp from Europe and placed them in breeding ponds by Druid Hill Park in Baltimore in Maryland. Some of those fish and their offspring were sent to Washington DC. The politicians in Washington rapidly got the idea that giving carp to constituents in their home districts would increase support and votes. The Fish Commission saw the political popularity of the fish as a great opportunity to gain support to their organization and developed special refrigerated railroad cars in order to ensure safe and efficient transportation. The result was that many politicians in Washington ordered more carp and live carp both for ornamental ponds, stocking in waters and fish-breeding became a standard political gift and expectation from political constituents. Hundred thousands of carp were given away as gifts each year and the adaptable carp were soon found all over the United States and soon spread into Mexico and Canada (McClane, 1974:197).

In the southern part of Africa carp was repeatedly introduced from the 1700 hundreds. The introductions were successful and today there are a number of carp populations established in reservoirs, rivers and lakes (Skelton, 1993). The fish introduced provided a much needed source of protein. Thus the fish was part of the politics of providing a whole new infrastructure needed to develop agriculture, industries, trade and urbanization (Skelton, 1993 and Økland, 1993).

Carp and religion

Both in Christianity and Judaism there are long traditions for use of carp and fish during fast and certain festivities. Most likely those traditions are far older than both Christianity and possibly also Judaism. The Greek philosopher Aristotle mentions carp in his writings dated as early as 350 B.C (McClane, 1974:197).

Fish in general and carp specially is an important symbol in Buddhist religion and are thought of as signs of the Footprint of Buddha. The fish on the Buddha footprints signified freedom from all restraints. Buddha taught that everything in the world is connected by series ties that makes the meshes in a net used to catch fish. Each mesh has its place and responsibilities in relationship to other meshes (Borgese, 1980:89-90). Part of the Buddhist philosophy is that man is part of the environment and that continuity exists between man and nature. Every article entrusted to us is not "ours" but entrusted to us temporarily and must be used with good care in some useful way. The eastern aquatic poly culture has an inbuilt relationship to such values, thus making the practice of fish farming an integrated part of agriculture, human life and spiritual practice (Borgese, 1980).

Food and traditions of the table

In many countries the use of carp is seasonal and connected to Christmas. In the Czech Republic around 65 % of all carp production is sold for the Christmas Eve dinner. Usually the carp is consumed in the forms of thick carp soup and deeply fried breaded carp steaks. Prior to the meal the carp is often kept alive for a few days in the home. Quite often two carps are bought one to be released and one to be eaten for the Christmas meal. Carp scales are thought of as a symbol of happiness and wealth and the Christmas meal is connected to religious practices. Still, in secular a secular society like the Czech Republic, the tradition is maintained even by people who do not identify with the Christian religion (Adamek, Berka and Huda, 2008:52-53).

Folk medicine

The Chinese Black carp (*Mylopharyngodon piceus*) has been widely cultivated for use in Chinese traditional medicine (Chu, 1989).

Fish can be prone to a number of sicknesses and ways of treating fish with traditional medicine has been developed in many parts of the world. One example is from Cambodia where fungus infestations was traditionally prevented by dumping cow dung and the bark of certain trees, or a mixture of salt, mud and leaves into cages of fish during transportation the markets (Borgese, 1980: 198). The treatment of the fish gives insights into old practices of folk medicine and contains an inbuilt knowledge of the use of plants, bark and possibly different types of mud.

Folk traditions

In the 1620s goldfish was highly regarded in the south of Europe because of their golden scales that were thought to bring luck and fortune. It was a tradition that a man should give his wife a goldfish for the first year anniversary as a symbol for the prosperous years to come. The tradition disappeared as gold fish became more easily available (<http://wikipedia.org/wiki/Goldfish> 21.04.2010).

In Chinese the word for abundance and fish (yu) are pronounced in the same way. The fish in Chinese symbolizes wealth. At the Chinese new year festivities “luck money” is sometimes given in envelopes decorated with carp or symbols of long life such as peach and pine trees.

In addition fish symbolizes harmony, martial happiness and reproduction. Fish multiply rapidly and many large fish such as carp often swims in pairs. According to Chinese legends people placed messages in the belly of fish. In that way the fish is often used as a symbol of affection and wish to communicate with a distant loved one or a close friend.

The carp is in Chinese tradition carp is a powerful symbol of strength and perseverance. The scales and whiskers of the carp resemble the dragon, a great symbol of power and even the emperor. .

Pond farming

Borgese (1980:15) dates the beginnings of agriculture and aquaculture back to 10,000 B.C. In many parts of the world, like in China, the two systems have always been inseparably linked. Some of the oldest known aquacultures in the world seem to have been in China. Practically every Chinese traditional farm with aquaculture has brood pond, a spawning pond, a hatching pond and a nursery pond. The polyculture pond system fills different ecological niches with different kind of carp. The grass carp (*Ctenopharyngodon idella*) feeds on large surface vegetation, the silver carp (*Hypophthalmichthys molitrix*) feeds on phytoplankton, the bighead carp eats zooplankton and at the bottom the common carp (*Cyprinus carpio*) and the mud carp (*Cirrhus moliorella*) feed on detritus and the black carp (*Mylopharyngodon piceus*) at snails. In some ponds the bream will be used in combination or instead as a bottom feeder. The Chinese name for carp is “family fish or “home fish” reflecting the domesticated state and often very personal relationship to the fish. One example is the fast growing crossbreed between Mirror Carp and Common Carp, which will come when called (Borgese, 1980:203). Even if both the types of carp will be of *Cyprinus carpio* they represent different strains, and those crossing seem to produce good results both in the development of personality and from the point of growth.

Asiatic aquaculture uses a number of different species of fish. Some of them are used in combination with carp species and some of them in other kinds of polyculture. Catfish, Tilapia and Gourami are frequently used in Thailand, Cambodia and Vietnam, while carp dominate further north in China and Japan. Water conservancy and water management is part of both the system of agriculture and aquaculture requiring co-operation often at the state level. An imperial Chinese edict of 111 B.C states; “Agriculture is the basis of the whole world. Springs and rivers, irrigation ditches and reservoirs make possible the cultivation of the five grains. In the empire there are innumerable mountains and rivers, but the small people do not understand their proper use. Hence the Government must cut canals and ditches and build dikes and reservoirs to prevent draughts” (Borges, 1980:200-201).

Historically land farm animals, like pigs, have provided the organic manures for both cropland and ponds. The Chinese have a saying that 15 pigs is required to fertilize one hectare of water. Land between the ponds has produced grass to feed grass carp and the wastes from grass carp other fish. On the average one grass carp has provided the feed for three other fishes. Wastes not used by other fish accumulate on the bottom of the ponds and is collected three or four times a year as fertile humus to fertilize cropland.

In rice fields fish, like carp and tilapia will eat insects that harm the rice plants, they stir up the mud and in that way increase the nutrient intake of the rice plants and they fertilize the water with their manure (Borges, 1980:202). It is estimated that one acre of paddy field will produce up to 350 kg of fish (Borges, 1980:73). The fish is harvested through draining the fields. After having done that and harvested the rice ducks are grazing the fields and eating whatever they find, which will include some stranded fish. The ducks will also manure the fields with their droppings (Borges, 1980:75).

A Sanskrit poem made by King Somesvara III (1126 – 1138) gives detailed instruction on how to feed various kinds of fish and the Javanese law Kutara Menawa prescribes punishment for those who steal fish from fishponds (Borgese, 1980:18).

In the Czech Republic pond aquaculture represents a long historical tradition dating back at least to the 11th century. In the late middle ages carp farming became an economic force and it is estimated that about 75.000 ha of carp ponds existed in the 14th century increasing to around 180.000 ha by the end of the 16th century. The production is thought to have been annually around 30 kg/ha in the 14th century and 40 kg/ha by the end of the 16th century). In the beginning of the 17th century central Europe was affected by the Thirty-Year War (1616 – 1648), the economy disrupted, carp culture ceased (Adamek, Berka and Huda, 2008:52). Pond farming might be divided in the commercial farming like pond activity and local ponds, largely left to nature, delivering fish to own consumption or on the local community level. Such ponds are not always registered and are most likely not represented in official statistics. Thus the fish is not bred according to careful selection and breeding principles pursuing certain strands, but due to natural selection without any other human interference than the harvesting of carp.

The historical carp culture process was usually divided in a process with specialized ponds;

- A. First year: Spawning and fry rearing.
- B. Second, third and fourth year : For stocking fish
- C. Fifth and sixth year: Market size fish

(Adamek, Berka and Huda, 2008:52).

However, the division of ponds might vary even if the three stage system remains. Edwards based upon both Czech and Hungarian information (2007:28-29) divides differently in ponds usually drained annually.

- A. Nursing ponds with size of up to 1 ha and 0.5 depth. The same ponds would often be used later in the season with deeper water. Production of fish up to one year old.
- B. Summering ponds up to 10 ha in area and used to produce 2 year old fish
- C. Marketing ponds of at least 50 – 100 ha stocked with 2 year old fish and raised until they are 3 – 4 years old and at a marketable size of 1,5 – 3 kg.

However, at the end of the 19th century carp pond aquaculture was revived and rapidly became an important part of the economic sector. Even if there were other carp fish, such as tench, pike and European catfish, carp remained the most important and favoured fish for pond farming. The high fecundity, good growth rate, high resistance to pollution and unfavourable climatic conditions in addition to ability to utilize low-protein feeds, high disease resistance, high value and capability to withstand handling and transportation made carp the favourite fish (Adamek, Berka and Huda, 2008:52).

After the Second World War, during the communist time, mineral fertilization of ponds were used. In the same time large areas of arable land were created and the application of organic manure decreased. The result was in many cases massive out-flushing of clay particles and heavy sedimentation of ponds. When the socialistic political/economic system ended in 1989 the situation gradually changed, however many of the changes were long lasting and created structural changes in pond-farming (Adamek, Berka and Huda, 2008:53-54). The major changes with the capitalist system came in the marketing and the distribution of fish. Today carp from the Czech Republic is exported to several other EU countries.

In Hungary during the communist time ponds were often drained only every third year and rotated with crops such as lucerne, maize (corn) or soyabean. However, this practice has been discontinued after the farms were privatized (Edwards, 2007:29)

Today around 42.000 ha is used for carp pond farming in the Czech Republic, however production is high and around 450 kg/ha (Adamek, Berka and Huda, 2008:53). Edwards experienced with Asian carp production (2007:29) reports of much higher yield and reports 600 – 1.500 kg/ha, which he characterizes as low yield. His data from the Czech Republic is 50.000 ha in the Czech Republic and around 25.000 ha in Hungary. The reason for his larger numbers might be that he includes ponds used for private local consumption and thus not being part of the commercial market.

Even if a number of other fish species are used for pond farming carp remain the most important fish and account of 88- 90 % of the production total. Modern pond farming is solely done with artificially spawned and well bred carp from the 20 carp strains in the Czech gene bank. In many cases specialized breeding aquaculture mass produce eggs and fry for other operators (Horváth, Coche and Tamás, 1985).

Only 25 – 30 % of carp production is based upon supplemental feeding and most of the production is based upon natural food such as zoo plankton and zoobenthos (Adamek, Berka and Huda, 2008:53). The supplemental food is energy-rich grain (barley, maize (corn) and wheat). Fertilizing, if used, is usually cattle manure, but might also be from poultry and pigs (Edwards, 2007:29).

However, there have been a number of challenges for carp pond production. Water management is increasingly a concern and many ponds have large deposits of sediments and in the need of having excessive mud removed. Removing sediments is very costly and not likely to occur without considerable public subsidy. However, ponds are important in order to regulate water in cases of heavy rain. In 2002 a considerable part of the Czech Republic was affected by heavy floods and damage to downstream regions limited because some ponds retained enormous volumes of water. For the fish farmers another problem has been loss due to predators such as Great cormorants (70 %), European otters (23 %), Grey herons (5 %) and the American mink (2 %). Czech law give recompensation losses caused by protected animals (Adamek, Berka and Huda, 2008:68).

Pond production of the market-size fish in the Czech Republic in tons (Adamek, Berka and Huda: 2008:53)

Fish species	2000	2001	2002	2003	2004	2005
Carp (Cyprinus carpio)	17.106	17.421	16.596	16.935	16.996	17.814
Tench (Tinca tinca)	300	212	228	243	213	288
Chinese Carps Grass Carp (Ctenopharyngodon idella) Silver Carp (Hypophthalmichthys	709	1.151	1.041	1.026	850	1.023

molitrix) Bighead Carp (Hypthalmichthys nobilis)						
Predatory fishes Pike (Esox lucius) Pikeperch (Stizostedion lucioperca) Perch European Catfish (Siluris glanis) Eel	180	170	218	232	194	211
Other fish species Rainbowtrout	365	348	384	523	437	392
Total	18.660	19.302	18.467	18.959	18.690	19.728

Aquaculture is of considerable commercial interest. Establishing carp breeding programs and aquacultures in new areas might be done both from political, economical and ecological reasons (Djordjevic, 2004).

Ornamental aspects

The golden, red and yellow variations of Gold fish and Koi carp is frequently used for ornamental purposes both in garden ponds and parks. Since the brightly coloured gold fish are easily to get hold of, relatively low-priced and hardy they are frequently used. Gold fish and Koi carp might interbreed, but produce a sterile offspring (<http://wikipedia.org/wiki/Goldfish> 21.04.2010). Some variations of goldfish will have strange body shapes and will not be able to survive in ponds unless cared for and protected by humans. The same is true with Koi carp and it is recommended that both species of fish should be actively protected against animals of prey. Deep areas where the fish is protected against herons, shaded areas against birds of prey like osprey and areas outside of the reach of land based animals like foxes, cats and badgers is one of the requirements. Then fish that eat other fish should be avoided like pike and the European catfish (*Silurus glanis*). Mink and otters might hunt for even very large species of Koi and might cause major problems in ponds. Then fishing ducks like merganser (and loons might diminish populations rapidly if they come to a pond.

In ornamental ponds the fish should be visible for visitors. Often ornamental plants are combined with ornamental fish, which might be difficult due to the bottom feeding activity of Koi and Gold fish. Plants should then be selected with great care and often planted in such a way that they survive the activity of the fish.

Art

In Chinese and Japanese art carp fish is often used as a motive reflecting the importance of the fish in Japanese and Chinese folk traditions (<http://www.chinesepaintings.com/chinese-fish-paintings.html> the 24.04.2010). Even in tribal and subcultures Koi is frequently used as symbolism for example in tattoos (http://www.tattoofinder.com/Koi_tattoos_designs_ideas_gallery.asp 24.04.2010).

Sport

Carp fishing is mentioned from ancient times. Aristotles mentions carp in his writings dated to 350 B.C (McClane, 1974:197). However there are differences between sport fishing and fishing solely as a way of obtaining food just as it is between farming and gardening. Europeans brought their tradition of sport fishing to other continents. One example is Thomas, H. S. (1876) *The Rod in India* describing the urge of British colonials of pursuing their very English pastime activities in India. One of the main targets was the Indian carp Tor khudree reaching up to 45 kg and possibly even more.

In the internet there are thousands of websites giving information on carpfishing, fishing equipment and bait for carp. Proud fishermen, nearly always men, display the fish they have caught and most often affectionately release the fish after taking photos, measuring weight and length. In Youtube a number of films of such sessions can be seen among them the present sport fishing record common carp (34,65 kg) displayed by the fisherman Christian Finkelde (<http://www.youtube.com/watch?v=ys3Y5ZMtp34> dated 27.04.2010). Carp sizes can vary greatly and in the Nordic country the record fish is a carp of 19,48 kg (<http://www.prologicfishing.com/viewnews.asp?newsId=239> dated 27.04.2010.)

Carpfishing often require substantial waiting time. The author of one website reports that he has spent 17 days, and I assume nights, under an umbrella in France waiting for carp. He emphasize the need not to get drunk, waiting for such a length of time will often include some drinking, and the warning is probably from experience. Some carp fishermen obviously shorten the time drinking beer (<http://www.carp.dk/index/php/stories/uk/26-carp-lakes-in-Denmark> dated 27.04.2010). Obviously drunken fishermen catching fish are both prone to accidents, such as drowning, and mishandling of both fish and equipment. Thus, sometimes such behaviour giving the carp fishermen a bad reputation in the same way as drunken football hooligans.

Carpfishing with hook and release has given us lessons of how carp react to pain and negative experiences. A carp hooked and released is likely to remain difficult to catch for at least a year (Beukema, 1970). It is reasonable to conclude that being caught with a hook is a painful experience (Tinarwo, 2006:458 -459). Fishing or not fishing is largely an ethical issue to be addressed later in the book.

Carps feeding by filtering plankton from the water (such as Bighead carp and Silver carp) are difficult to capture by normal angling methods. (http://en.wikipedia.org/wiki/Asian_carp 21.04.2010). Such carp can be captured by the "suspension method" or by snagging them by jerking a weighted treble hook through the water. In USA the jerking method is not allowed in many states as it might injure fish and is completely indiscriminate. Silver carp, which tend to jump from water when startled, might be shot in the air by bow and arrow. All carp feeding near the surface can be shot in the water by bow and arrow. Hunting carp with bow and arrow is very popular and in the USA encouraged as a method to control undesired populations of filter feeding bighead carp and silver carp (http://en.wikipedia.org/wiki/Bighead_carp 20.04-2010). The record size of bighead carp caught in Missisipi by bow and arrow is 42 kg.

The carp(Cyprinus carpio) is an extremely popular fish for angling both in Europe, north America and other places the fish is established. Frequently such fishing is catch and release and many fishermen gets very affectionate and has a nearly personal relationship to the fish they catch. In some cases even to the extent of giving the carp an individual name.

The grass carp (*Ctenopharyngodon idella*) used for weed control in Europe and America can be fished with bait consisting of vegetables and fruit. They are strong fighters, but can be difficult to catch. Chumming with corn or other feed gives increased chance of success. In places used for weed control they should be released. In USA there are places where bowfishing is allowed and grass carp is a popular, but difficult target for bowfishers (http://Wikipedia.org/wiki/Grass_carp 21.04.2010). **Being speared by an arrow is obviously a painful way of being caught and fish might easily become wounded in such a way that they die slowly.**

In Europe carp fishing is a popular activity in many countries. There are a number of Carp Societies or sport fishing clubs. Most of them concentrate on fishing the Carp (*Cyprinus carpio*), however specialized fishing for the Crucian Carp (*Carassius carassius*) is also done in areas where carp is non existing or rare. The Norwegian Carp Society is one example of a society in a country where carp only exist in a few lakes and ponds in the South eastern part of the country. All the fishing of the members is done according to the principle of catch and release. The members have a near personal affectionate relationship to their carp and many of the fish caught has been through a number of catches and photographic sessions. The fishing is nearly a contemplative activity often requiring long periods of waiting. In the web site of the society it is a picture of one of the record carp (16.93 kg) that required waiting time of "120 hours, but worth each second" (<http://www.carp.cc/karpefiske.html> date 26.04.2010).

Accidental introductions

Baitfish

Ballastwater

Cooling waters and the age of steam

New waterways

PART II CASE EXAMPLES

Case examples Norway

Bogstad Park and estate

Bogstad estate and park is one of Norway's oldest landscape parks and was established around 1780 and includes a number of carp ponds (Von Essen and Espeland, 2009). However, the fishponds were established even before that. In the estate evaluation of 1765 two old overgrown ponds are mentioned. The mentioned ponds might have been established by Nils Leuch (1700 – 1760) and were part of the vegetable and spice garden. The first private owner of the estate was Morten Lauritzen in 1649, but the farm was in use during the Catholic times as part of the monastery at Hovedøya – an island just outside the centre of Oslo. As with many Norwegian farms the farm was not in use for a number of years after the Black Plague (1349 – 1350). At the time of the reformation in 1536 the farm became part of the estates of the King or state.

We do not know if there was any fish farming or fish ponds during the Catholic times. However, it is quite possible that carp ponds were established by the monks and Helgøya. Even if labelled as carp ponds it is possible that the ponds included both the Crucian Carp (*Carassius carassius*), the Carp (*Cyprinus carpio*) and a number of other introduced farm species. While ponds during the Catholic times mainly were used for raising fish for food, the ponds during the estate period were ornamental and the fish was partly there for ornamental purposes. The garden and park became modelled as landscape parks in Europe and England with a wide variety of exotic trees, shrubs and perennials and greenhouse plants in summer.

Kinnshaugen

Kinnshaugen is a small lake on a spruce covered hillside about 10 km west of the town of Lillehammer close to the valley of Saksumdal. Some time in the 1700s members of the German/Danish officer family Reichwein established a hunting lodge by the lake. Reichwein were officers in the regiment at Fåberg just north of Lillehammer and together with fellow officers and members of the upper classes they hunted and partied (Weihe, 2007-II).

Most likely the lake at the time had a population of perch (*Perca fluviatilis*) and possibly some trout (*Salmo trutta*). In addition the Reichweins stocked the lake with Crucian carp. They wanted to have a continental fish and from their German Danish background carp was sort of the fish of the upper class.

The Reichwein family had imported a stock of Crucian Carp (*Cyprinus carassius*) and possibly Carp (*Cyprinus carpio*) to ponds at the Aker farm close to Hamar. The carp did not do well due to the cold winters and often cold summers, but the Crucian carps survived the winters very well and a number of small ponds and lakes were stocked with the fish. The fish multiplied in the small lake, which still has a small population of the Crucian carp co-existing with perch and some trout.

Since the lake is at a high altitude (600 meters) and often is covered with ice from November until late in May conditions are marginal for the Crucian carp. Some summer water temperature is too cold for spawning. However the Crucian carps survive the cold winters and the summer temperature is high they will spawn. Still, growing up in a lake with a huge population of perch might be a problem. Only a few fry will survive the predators.

The local population never acquired a taste for the Crucian carps and always preferred the local trout, perch or pike. Still, for the high officers, the educated and those who read cookbooks and were familiar with continental traditions, Crusian carp was a popular fish well after 1900. As nationalism grew and the connection to the continent faded the national fishes, like trout and salmon, became the fish of choice and eastern and continental “invaders” lost their popularity. Today no one is fishing for the carp and the stocked trout, the lake has no proper place to spawn for trout, is the sought after fish of the lake. Then fishing has also changed to being a leisure activity of the common man , the Kinshaugen lake is the summer bathing place of Saksumdal and the memory of the continental upper-classes and their hunting lodge is nearly lost.

The Maihaugen museum ponds

In 2004 the Maihaugen museum in Lillehammer celebrated the 100 years anniversary (Engen, 2004). The museum consists of a large collection of traditional houses from Gudbrandsdal and Lillehammer as well as a number of new houses. The houses are placed in a beautiful hilly landscape with four artificially constructed ponds. The ponds have a population of trout, minnows *Phoxinus phoxinus*, perch and crucian carp (*Cyprinus carassius*).

The Saug pond

The Saug farm is one of the large farms on the fertile farmland just south of Moelven close to lake Mjøsa in Norway. Surrounded by fields in a small forested area the Saug pond is rich in vegetation birdlife and have a large population of Crucian carp (*Cyprinus carassius*) and some perch (*Perca fluviatilis*) (Syvertsen and Weihe, 2009 and Weihe, 2007-I)

From the 1870s and up to the 1950s the pond was used to produce ice for cooling dairy products for a couple of large farms. In addition perch and Crucian carp was fished and used partly for human food and partly for feeding cats, pigs and hens. The perch was a problem in the ice production as the fish sometimes froze into the ice. Perch had a tendency to stay just underneath clear ice on sunny days and sometimes the fins froze stuck in the ice and in the span of time the whole fish froze into the ice. Such ice could not be used and had no value. The Crucian carp on the other hand was popular as they helped to clear the water of vegetation. Crucian carps were introduced to many ice producing ponds and lakes in order to clear the lakes of vegetation. Particularly that was so along the coastline where ice was a big export product to England and the continent in the period from 1850/1860 until about the First World War. A number of other fish, like tench (*Tinca tinca*), the Ide or Orfe (*Leuciscus idus*), Bream (*Abramis brama*) and Carp (*Cyprinus carpio*) were used in the same way.

It is possible that the Crucian Carp was introduced as part of the ice production, but it is much more likely that the introduction happened either in the 1700s by officers or priests being part of the Danish-Norwegian elite who used carp and crucian carp as fashionable food or even before during the Catholic time by monks or priests. The latter introduction might have been as early as in the 1200s or the 1300s. Many of the monks and priests had continental background and used carp and crucian carp for food. They had a traditions brought from the continent of raising such fish in ponds. The large neighbour town of Hamar had a cathedral and was an important centre for the Church.

Today the crucian carp is actively fished by Polish farm workers, who seasonally pick strawberries on the farms. Some of them has settled locally and a large polish immigrant community has been established locally both in the county of Hedmark and Oppland.

Case examples Czech Republic

Other case examples

PART III SPECIES OF CARP

General comments on the selection of species

We wish to emphasize that the selection of species is done solely from the point of carp fish used in aquaculture and not from the point of strict scientific classification and description of different species of carp. In the case of the minnow (*Phoxinus phoxinus*) it is not used in traditional western and central European aquaculture, but has been reported to be used in aquaculture in the northern part of Russia (Siberia) and the areas around the White Sea.

The Tench (*Tinca tinca*) is included as it is in the carp family and a traditional fish in aquaculture.

The Cyprinidae in latin is called the Carp family in Norway (Jonsson and Semb-Johannsson, 1992:151) and the Czech Republic (Terofal,2006:8; Čihař and Knotkovi,2003.30), the Minnow family in USA (McClane, 1978:50)

Bighead carp (Other names used in English: Chinese Carp, Family Fish, Home Fish,Carp) (English)

Nomenclature:

Hypthalmichthys nobilis (Richardson 1845)

Large quantities reported to be imported alive into Ontario and one specimen removed from a fountain in Toronto. The fish is released into nature, but status is not known (Scott and Crossman, 1998:VIII)

Common names in other languages:

Etymology

History

Description

Biology

Asian carp can be very large and grow to more than 40 kg and one meter. They grow very rapid and need to eat 40 % of their body weight each day. Most Asian carp eat plankton and thus can out-compete fish fry from many other species. However, in many waters and in lakes fertilized by run-off from agriculture plankton growth can be large and plankton eating carp can help to clean the water.

Bighead carps are filter feeders. Like all *Hypthalmichthys* species they have no stomachs and depend upon constantly feeding mostly on phytoplankton, but also on zooplankton and

detritus. Female Asian carp can reproduce at rapid rates and can produce from 200.000 to on million eggs in their lifetime (http://en.wikipedia.org/wiki/Asian_carp 21.04.2010 and http://en.wikipedia.org/wiki/Bighead_carp 20.04.2010)

Size

Record sizes of 45 kg, but rarely more than 18 kg

Spawning

Age

Food

Black carp (Other names used in English: Chinese Carp, Family Fish, Home Fish Carp)
(English)

Nomenclature:

Mylopharyngodon piceus (Richardson, 1846)

Common names in other languages:

Etymology

History

The black carp is indigenous to China where it is cultivated for food and Chinese folk medicine. It is the most exclusive of the four domestic fishes (Black carp, bighead carp, silver carp and grass carps) traditionally used for polyculture in China. The history of such polyculture goes back at least thousand years. The diet of the black carp is rather exclusive and it is the most expensive of all carp fish sold.

In aquaculture in the USA black carp is sometimes used to control snails. Snails can be hosts of trematode pests that can cause substantial losses to aquaculture crops. However, there are concern of black carp being a serious threat to mollusks native to the USA and no state allows black carp to be released. Black carp used in aquaculture has to be sterile, however for breeders it is necessary to have some breeding stock of fertile black carp. In the USA there are reports of black carp caught in the Mississippi and some of the fish has been found to fertile. (http://en.wikipedia.org/wiki/Black_carp 21.04.2010)

Description

Biology

Size

The Black carp grows to about one meter (three feet) and can be up to 32 kg (70 pounds).

Spawning

Age

Food

The fish is feeding on snails and mussels.

Carp (Other names used in English: Common Carp, German Carp, European Carp, Mirror carp, Leather Carp, Old World Minnow, Family Fish, Home Fish) (English)

Nomenclature:

Cyprinus Carpio (Linnaeus 1758)

Cyprinus carpio (Scott and Crossman 1969)

Cyprinus carpio carpio (Western Eurasian strain of carp)

Cyprinus carpio haematopterus (East Asian strain of carp – the dominating in traditional variations of koi carp)

Common names in other languages:

Carpe (French)

Karpe (Norwegian)

Etymology

Cyprinus is the ancient name of the carp, most likely derived from Cyprus, abode of Venus. The name is possible in allusion to its fecundity. Carpio is a Latinized form of carp.

History

The Carp was indigenous to temperate parts of Asia, but also occurred from early times in continental Europe. Aristotles mentions carp in his writings dated to 350 B.C (McClane, 1974:197). In England it was introduced during the rule of Henry VIII and rapidly became popular as a pond fish and as source of food (Smallwood and Smallwood, 1929). In one the standard fishing Encyclopedia of McClane the introduction to England is dated to around the end of the medieval period in 1450, however there are legends of earlier carp populations in monastery ponds. The earliest reference to carp as a stockfish is from 1462 and the first angling reference is from Dame Julia Berners in 1496 (McClane, 1974:197).

It is known that carp was brought to a private pond in New York in 1831 and 1832 and that some were released into the Hudson River. In 1876-1877 the US Fish Commission successfully introduced carp and stocked waters several places in the USA and Canada (Smallwood and Smallwood 1929). Today Carp is widespread both in USA and the southern part of Canada (Scott and Grossman 1998: 408 and McClane 1974:197). The carp is known to hybridize with goldfish.

Carp is popular as a game fish in USA and Canada, however thought of as a negative introduction as the fish uproots aquatic vegetation that is essential to the survival of native populations of fish and to waterfowl.

The habit of carp of rising to the surface in inshore waters and exposing their long dorsal fins have given some Americans the impression of shark fins. The latter reflects the negative attitude of many Americans to introduced species of fish (Scott and Grossman 1998: 410)

Description

Triangular head, robust body, upper jaw slightly protruding and toothless, two pairs of barbels around the mouth and gill rakers 21- 27. All the fins are slightly opaque, the caudal is forked. The scales are cycloid, large and thick with about 35 -39 in the lateral line. On the mirror carp the scales are scattered and few or absent on the leather carp.

Colour can vary, but usually olive-green on the back, and yellowish on the underside. The lower half of the caudal fin and the anal fin can be reddish. Large adults have stronger colouration than young species.

In captivity selective breeding has resulted in many variations. Partially scaled or mirror carps, which might be a line mirror with its scales distributed along the lateral line (often called Israeli carp) and the scattered mirror with scales spread haphazardly over the bod. Another type has no scales and is called leather carp (McClane, 1974:199)

Biology

Size

Carp in the USA and Canada has been reported up to the size of 58 pounds (Scott and Grossman 1998: 410). The world record of carp caught by a sport fisherman is at present 34,650 kg in a gravel pit made into a pond in Germany. The proud fisherman, Christian Finkelde, displays the fish in youtube (<http://www.youtube.com/watch?v=ys3Y5ZMtp34> dated 27.04.2010).

World record carp 83 pounds 8 ounces from Pretoria in South Africa (McClane, 1974:198)

Spawning

Carp is a very prolific species and egg numbers have been ranging from 36.000 eggs to 2.208.000 for a large fish of 851 mm. The eggs, each about 1 mm in diameter, are adhesive, deposited randomly and will be attached to submerged plants or roots. The eggs will normally hatch after 3- 6 days after fertilization depending on the temperature of the water. Spawning will normally occur after the temperature of the water reach to a minimum of 17 degrees Celsius in early spring or summer. Some places spawning is reported to happen at late as in august. The Russians have through selective breeding produced a cold-resistant “king” strain for stocking Arctic waters and being capable of breeding at lower temperatures (McClane:199). Since selective breeding might occur in nature as a natural selection process some carp populations might adapt to colder environment and possible spread into colder waters far outside of what would be consider normal conditions and breeding range.

Age

Carp can be very old and wild species exceeding twenty years of age are not uncommon. However, reported ages of 150 years are grossly exaggerated (Regan, 1911). In nature 20 – 25 years is supposed to be the maximum living age, but in captivity carp up to 47 years old has been recorded (McClane, 1974:198).

Food

Carp are omnivorous feeders eating small larvae, aquatic insects, plants, molluscs (snails and clams). Since some carp can be big in size they can eat fairly large insects, small fish and consume large quantities of aquatic plants. Carp is known to feed on floating animals organisms and plants.

Crucian Carp (Other names used in English: Prussian Carp, European Crucian Carp)
(English)

Nomenclature:

Carassius carassius

Cyprinus gibelio

Cyprinus carassius (Lin)

Common names in other languages:

Karas obecný (Czech)

Karuds, Karusse (Danish)

Ruutana (Finnish)

Kaurausche (German)

Karuss (Norwegian)

Ruda (Swedish)

Etymology

Carrassius is latinization of the vernacular names Karass or Karusche that are applied to the European crucian carp. Opinions vary as if the Prussian carp is a distinct subspecies *Cyprinus gibelio* (rare and very old). The Prussian carp is also described in another chapter under the name Prussian carp.

History

Crucian carp is considered to be the European version of a fish with both a European and Asian fish with a ancestral home most likely around the Caspian Sea. The first British reference of “carrushens” is from 1744 when the fish was reported to be lately introduced. The fish was most likely introduced from Hamburg in Germany. The first known wild populations were in London in the river Thames and the fish is thought to have spread through the interlocking canal transportation system built as part of the industrial revolution (McClane, 1974:242).

The crucian carp is a popular fish to study for biological studies and many scientific studies have been made of various aspect of both the biology, parasites and behaviour of the fish (see for example Hamdani, 2000; Midtgaard, 1995; Lastein, 2008 and Ellefsen, 2008). The fish is easy to study in laboratory conditions and small ponds.

Description

Biology

The crucian carp heart has an innate ability to tolerate anoxia supported by etanol production. Other carp such as the Koi and European Carp (*Cyprinus carpio*) lacks the ability and will be negatively influenced and often die under the same cold conditions (Larsen, 2009, Ellefsen 2008)

Size

Maximum size perhaps 6 pounds (McClane, 1974:242)

Spawning

Age

Life expectancy about 25 years or more (McClane, 1974:242)

Food

Goldfish (Other name used in English: Golden Carp) (English)

Nomenclature:

Cyprinus auratus auratus(Linnaeus 1758)

Carassius auratus (Günther 1868)

Common names in other languages:

Poisson doré (French)

Gullfisk (Norwegian)

Etymology

Carassius is latinization of the vernacular names Karass or Karusche that are applied to the European crucian carp. Cyprinus carassius auratus the last part auratus means gilded.

History

The goldfish is native to eastern Asia and in the golden colour it originated in China. During the Tang Dynasty (618 -907) it was popular to raise carp in ornamental ponds and watergardens(<http://wikipedia.org/wiki/Goldfish> 21.04.2010). It is known that goldfish were commonly used as ornamental fish in the early days of the Sung Dynasty about the year of 960(Scott and Grossman 1998: 389-391). However, the tendency to produce red, orange or yellow colour mutations was first recorded in the Jin Dynasty (265 – 420) (<http://wikipedia.org/wiki/Goldfish> 21.04.2010)

From the 11th century they were commonly used for ornamental purposes in China. The first record of other colours than red and gold was in 1276. The golden variety (yellow) was in 1176 construction of a special pond to collect the red and gold variety. People outside of the imperial family were forbidden to keep gold fish of the golden variety as yellow was the imperial colour (<http://wikipedia.org/wiki/Goldfish> 21.04.2010)

The time of the introduction to Japan is rather uncertain most likely from around 1500(Scott and Grossman 1998: 389-391). In Wikipedia the introduction to Japan is dated to 1502 (<http://wikipedia.org/wiki/Goldfish> 21.04.2010)

The first introduction of goldfish was to Portugal in 1611 (<http://wikipedia.org/wiki/Goldfish> 21.04.2010). In England they were first introduced in the early 17th century or the early 18th century and can be regarded as a common fish in England from the middle of the 18th century(Scott and Grossman 1998: 389-391).

The time of the introduction to America is not known, however it is known that a goldfish farm was established in Maryland in 1889(Scott and Grossman 1998: 389-391). Wikipedia dates the first introductions to about 1850(<http://wikipedia.org/wiki/Goldfish> 21.04.2010). . Wild populations are widespread throughout til USA and the southern part of Canada (Scott and Grossman 1998: 389-391). Goldfish have also been used as laboratory fish and as a baitfish.

Goldfish is the result of selected breeding for colour. In the wild state gold fish will have a dark olive-green to greyish black colouration. In Canada and USA almost any pet store will have a stock of goldfish and many are released in the wild. The goldfish is also a popular

baitfish and bred for use as bait in the southern USA (Dobie and several more 1956). In Canada it is prohibited to use goldfish as a baitfish.

Goldfish hybridize with carp and offspring might be difficult to identify. However, the absence of barbells, teeth in a single row and not molarlike and the number of gill rakers will be different. In addition the size is substantially smaller than a carp and the colouration of gold fish different. Still, in the wild state gold fish readily reverts to the dark olive-green colour.

Description

Stout body, thickset, average size up to 254 mm, but in overpopulated waters (like small ponds) quite small. Colouration varies from olive-green to gold often with black patches. Some young fish can be nearly black or olive-green.

The head is broadly triangular, gill rakers 37- 43, heavy translucent fins with same colour as the body. One stout spine with serrated trailing edge, and 15 – 18 (on the average 17) soft rays. The caudal is broadly forked. Scales cycloid, large and firmly attached to the body. From 27 – 30 scales in the lateral line.

Compared to the Crucian carp the gold fish never has more than 31 scales along the lateral line, while the Crucian have 33 scales or more. Further the Crucian carp has a well rounded snout, while the gold fish a more pointed one. Still, the gold fish is regarded to be domesticated version of the Crucian carp (*Carassius carassius*) (<http://wikipedia.org/wiki/Goldfish> 21.04.2010)

Varieties of domesticated goldfish (adapted from(<http://wikipedia.org/wiki/Goldfish> 21.04.2010)

Name	Colouration	Other information
Black Moor (Popeye, telescope, kuro demekin in Japan and dragon-eye in China)		Telescope eyed variety
Bubble Eye		A small fish with upward pointing eyes accompanied with two large fluid-filled sacks.
Ce (Chinese might also be called grass)		Goldfish without fancy anatomical features. Includes the common goldfish, comet goldfish and Shubukin.
Celestial Eye (Choten gan)		Double tail and a breed defining eyes upturned, telescope eyes with pupils gazing skyward.
Chinshurin (Pearlscale)		Spherical-bodied with finnage similar to the fantail.
Choten gan (Celestial Eye)		Double tail and a breed defining eyes upturned, telescope eyes with pupils

		gazing skyward.
Comet (Comet tailed goldfish)		The most common fancy variety in the USA. Similar to the common goldfish, except slightly smaller and slimmer and the deeply forked tail.
Comet tailed goldfish (Comet)		The most common fancy variety in the USA. Similar to the common goldfish, except slightly smaller and slimmer and the deeply forked tail.
Common goldfish	Comes in a variety of colours including red, orange7gold, white, black and yellow or lemon.	The shape will be the same as the Crucian or Prussian carp.
Dragon-eye (Globe eye, Black Moor, Popeye, telescope, kuro demekin in Japan and dragon-eye in China)		Telescope eyed variety
Egg		Goldfish with no dorsal fin and “eggshaped body” for example the Lionhead. Bubble Eye with no dorsal fin belongs to this group.
Fantail (Fantail goldfish)		Egged shaped body, a high dorsal fin, a long quadruple fin and no shoulder hump. A western form of the Ryukin.
Fantail goldfish (Fantail)		Egged shaped body, a high dorsal fin, a long quadruple fin and no shoulder hump. A western form of the Ryukin.
Globe eye (Globe eye, Black Moor, Popeye, telescope, kuro demekin in Japan and dragon-eye in China)		Telescope eyed variety
Grass (Chinese might also be called Ce)		Goldfish without fancy anatomical features Includes the common goldfish, comet goldfish and Shubukin.
Hana fusa (pompomor pompon)		Bundles of fleshy outgrowth between nostrils on both sides of the head.
King of goldfish		Hooded goldfish

(Japanese) (Ranchu)		
Kuro demekin (Globe eye, Black Moor, Popeye, telescope, kuro demekin in Japan and dragon-eye in China)		Telescope eyed variety
Lionhead		The lionhead has a hood. This fish is a precursor of the ranchu variety
Oranda		A prominent raspberry like hood also known as wen or headgrowth. The hood encases the whole head except for the eyes and mouth.
Panda Moor	Black and white colour patterns	Protruding eyes
Pearlscale (Chinshurin in Japanese)		Spherical-bodied with finnage similar to the fantail.
Popmpom (Pompon or hana fusa)		Bundles of fleshy outgrowth between nostrils on both sides of the head.
Pompon (Pompom or hana fusa)		Bundles of fleshy outgrowth between nostrils on both sides of the head.
Popeye (Globe eye, Black Moor, Popeye, telescope, kuro demekin in Japan and dragon-eye in China)		Telescope eyed variety
Ranchu (In Japan called king of goldfish)		Hooded goldfish
Ryukin		Short deep body, with a characteristic shoulder hump.
Red brocade (Shubukin)		Fancy and hardy Japanese strain. Translated called Red brocade) Single tail with nacreous scales and a pattern known as calico.
Shubunkin (Red brocade)		Fancy and hardy Japanese strain. Translated called Red brocade) Single tail with nacreous scales and a pattern known as calico.
Telescope		Telescope eyed variety

(Globe eye, Black Moor, Popeye, telescope, kuro demekin in Japan and dragon-eye in China)		
Veiltail		Extra long flowing double tail.
Wen (Chinese terminology)		Gold fish with a fancy tail (Fantails and Ventails). Wen is also the name of the characteristic headgrowth on such strains as Oranda and Lionhead.

Biology

Size

The size can vary considerably and as goldfish thrives in stagnant small ponds populations often become overpopulated and the size fairly small. Maxium length of 58 cm and 4 kg has been recorded (<http://wikipedia.org/wiki/Goldfish> 21.04.2010)

Spawning

Spring spawning in warm, weedy stagnant waters in May to June, though some populations are reported to spawn as late as august. Adhesive eggs 1,2 – 1.5 mm in diameter and hatch in about 3 – 5 days. The eggs will attach themselves to aquatic plants or roots like willow roots.

Age

Gold fish ca live to more than 40 years, however most goldfish live 6 – 8 years (<http://wikipedia.org/wiki/Goldfish> 21.04.2010)

Food

Goldfish are omnivorous feeders eating small larvae, aquatic insects, plants, molluscs (small snails and clams)

Grass carp (Other names used in English: Chinese Carp, Carp, White Amur, Family Fish, Home Fish) (English)

Nomenclature:

Ctenopharyngodon idella (Valenciennes in Cuvier & Valenciennes, 1844)

Common names in other languages:

Etymology

Genus Ctenopharyngodon described by Staindacher (1866).

History

Grass carp is cultivated in China for food. The fish has been introduced both to Europe and America for weed control. In the USA it was introduced in 1963 and to the Netherlands in 1973. The population in the Netherlands is maintained artificially and used for weed control. In weed control sterile, triploid fish are used.

Accidentally introduced to New Zealand with a stock of goldfish.

The grass carp is native to Eastern Asia from North Vietnam to the river of Amur on the Siberian/Chinese border (http://Wikipedia.org/wiki/Grass_carp 21.04.2010)

Description

Body colour dark olive green shading to brownish-yellow on the sides, a white belly and large slightly outlined scales. Elongate, chubby, torpedo shaped body with mouth slightly oblique with non-fleshy and firm lips. The teeth are broad and ridged. The fish has no barbels, a lateral line with 40 – 42 scales, the dorsal fin 8 – 10 soft rays and the anal fin is set closer to the tail than most cyprinids (http://Wikipedia.org/wiki/Grass_carp 21.04.2010)

Biology

Grass carp occurs in ponds, pools and backwater of large rivers, preferring large – slow flowing or standing water bodies with vegetation. In the wild grass carp spawn in fast flowing rivers where the eggs can drift downstream. Eggs will die if they sink to the bottom, which means that spawning in stagnant pools or bodies of water will not be successful.

Size

Adults can often attain 1,2 meters length and a weight of 18kg. Average living age about 5 – 9 years, but some grass carp live up to 11 years (http://Wikipedia.org/wiki/Grass_carp 21.04.2010)

Spawning

Grass carp usually spawn at tempratures of 20 – 30 degrees Celsius, but there are records of spawning at temperatures as low as 15 degrees Celsius ([http:Wikipedia.org/wiki/Grass_carp](http://Wikipedia.org/wiki/Grass_carp) 21.04.2010)

Age

Food

Koi Carp (Other name used in English: Carp) (English)**Nomenclature:**

Cyprinus carpio haematopterus
(The East Asian strain of carp)

Common names in other languages:**Etymology**

The word “koi” comes from Japanese and means carp. The Japanese “koi” includes both the dull grey fish and the brightly coloured fish normally called “koi” in Europe. In Japanese “koi” is a homophone for another word that means affection and love. Koi is a symbol of love and friendship in Japan. Similar traditions have existed in Europe with goldfish. In Japan “koi” is called “nishikigoi” or literally “brocaded carp”.

History

Koi carp are an ornamental strain of the carp (*Cyprinus carpio*) with highly variable in colour with irregular blotching of black, red, gold or pearly white. They are in captivity selectively bred according to colouration and used for ornamental purposes in garden ponds and parks. Wild populations will revert to the same colours as other carps. Regardless if deliberately or accidentally introduced they are considered to be harmful to water quality, waterplants and habitat for fish and birds. Most attempts to eradicate koi have been unsuccessful and often very costly. However, such attempts have often served to at least diminish populations and some times to control the spread of koi into other waters.

The Koi carp was developed from carp in Japan in the 1820s and the Japanese terminology and traditions of breeding still dominate Koi breeding. Koi has been introduced to every continent except Antarctica. Koi carp are, in many varieties, sold in Europe, America, Asia and Africa.

Koi in ponds and parks will be at disadvantage against predators if not protected by deep areas, overhanging trees, good hiding places. Fish like pike and large trout, herons, cats, badgers, foxes, osprey, mink, otters and in the USA racoons will be able to prey on the fish and in small ponds emptying the ponds completely.

Description

Koi variations differ in coloration, patterning of colour, scales, eyes and the shape of fins. The possible colour variations are nearly limitless, but some main categories exist with colours in olive, orange, white, black, blue, red, yellow, cream and lately with mixed in strain bronze with large scales. The most popular category is the Gosanke, which includes the Kohaku, Taisho Sanshoku and Showa Sanshoku varieties.

Varieties of Koi (Developed from http://en.wikipedia.org/wiki/Koi_carp the 24.04.2010)

Name	Colouration	Other information
Ai Goromo (A variation of Koromo)	See Koromo A.	

Armor Koi (A variation of Doitsu-goi)	See Doitsu-goi D.	
Asagi	A koi that is light blue above and usually red, but occasionally pale yellow or cream below the lateral line and on the cheeks	The Japanese name means “pale greenish blue”. Sometimes incorrectly written as “light yellow”. The incorrect writing might have to do with the European tradition of drinking black tea as in opposite to the asian of drinking green tea.
Bekko	A white, red or yellow skinned koi with black markings (sumi)	The Japanese name means “tortoise shell”. The white variation is called “Shiro Bekko, the red variation “Aka Bekko” and the yellow variation is called “Ki Bekko”.
Butterfly koi	A hybrid of koi and Asian carp with long flowing fins. Colouration might vary according to the koi-stock used in breeding	Some breeders consider butterfly koi not be Nishikigoi.
Chagoi	Tea coloured koi ranging in colour from pale olive-drab green to copper or bronze and darker subdued orange shades.	Famous for docile, friendly personality and large size. The fish is considered a sign of good luck among koi breeders.
Doitsu-go	A. The most common type have a row of scales beginning at the front of the dorsal fin and ending at the end of dorsal fin. Thus the fish has scales on each side of the dorsal fin. Four variations B. A row of scales beginning where the head meets the shoulder and running the entire length at both sides of the fish. C. As the B., but with line with large scales running along the lateral line and also called a Mirror Koi. D. Armor Koi the rarest type covered with large scales that resembles plates of armor.	Originated by cross breeding numerous different established varieties with scale less European (German) carp (fish with only a single line of scales along each side of the dorsal fin.
Ghost koi	A hybrid of Ogon and wild carp with metallic scales	Some breeders consider ghost koi not be Nishikigoi.

Ginrin (abbreviation for Kinginrin)	A koi with metallic (glittering metal-flake) appearing scales. The name can be translated to “gold and silver scales”	There are very popular “Ginrin” versions of almost all variations of koi. Gin-rin refers to sparkling, glittering scales as opposed to the smooth, even metallic skin and scales seen in Ogon varieties.
Goshiki	A dark koi with red (Kohaku style) hi pattern. Appears similar to an Asagai with little or no hi below the lateral line and a fishnet pattern (reticulated) over the scales. The base colour range from nearly black to very pale sky blue.	Very similar to Asagai (see note on colouration)
Hikari-moyomono	A koi with coloured markings over a metallic base, a koi in two colours	
Kawarigoi (Kawarimono)	A term for all types of koi	This is a competition category for many new varieties of koi.
Kawarimono (Kawarigoi)	A term for all types of koi.	This is a competition category for many new varieties of koi.
Kinginrin (Often abbreviated Ginrin)	A koi with metallic (glittering metal-flake) appearing scales. The name can be translated to “gold and silver scales”	There are very popular “Ginrin” versions of almost all variations of koi. Gin-rin refers to sparkling, glittering scales as opposed to the smooth, even metallic skin and scales seen in Ogon varieties.
Kin-Kikokuryu	A metallic skinned version of the Kumonryu with a Kohaku-style hi pattern.	Developed by Mr. Seiki Igarashi of Ojiya city. There are at least six different sub-varieties of this general variety.
Kikokuryu	A metallic skinned version of Kumonryu	
Kōhaku	White skinned koi, with large red markings on top	The first ornamental strain to be developed in Japan (late 19 th century)
Koromo	A white fish with Kohaku style pattern with blue or black edged scales only over the hi pattern. Three different versions: A. Ai Goromo which is	The variety first arose in the 1950s as a cross between a kohaku and an Asagai

	coloured like a Kohaku, except that each of the scales within the red patches has a darker burgundy like colour overlay that gives it the appearance of bunches of grapes. B. Tsumi-Goromo very rare and similar to the Gumi-Goromo but the hi pattern is so dark that it appears black	
Kumonryū	Kumonryū is a black doitsu scaled fish curling with white markings	The patterns are reminiscent of Japanese ink paintings of dragons. They famously change colour with the seasons. Kumonryū competes in the Kawarimono category.
Mirror Koi (A variation of Doitsu-goi)	See Doitsu-goi C.	
Ochiba	Light blue/gray koi with copper, bronze or yellow (Kohaku style) pattern reminiscent of autumn leaves on water.	The Japanese name means “fallen leaves”.
Ōgon	A metallic koi of one color only. The most common colours are gold, platinum and orange. Cream specimens are very rare.	Ōgon competes in the Kawarimono category and the Japanese name means “gold”. The variety was developed by Sawata Aoki in 1946 from wild carp he caught in 1921. Recently the metallic skinned Ōgon is being crossed with ginrin scaled fish to create the ginrin Ōgon with metallic skin and sparkling metal flake scales.
Sanke (abbreviation for Taisho Sanke or Taishō Sanshoku)	Similar to Kōhaku, but with small black markings called sumi	First exhibited in 1914 by the Koi breeder Gonzo Hiroi during the reign of Taisho Emperor The abbreviation is commonly used in USA.
Showa (abreiviation for Showa Sanke or Shōwa Sanshoku)	Black koi with red (hi) and white (Shioji) markings	First exhibited in 1927 during the reign of Showa Emperor The abbreviation is commonly used in the USA.

Showa Sanke (Shōwa Sanshoku) (Often abbreviated to Showa)	Black koi with red (hi) and white (Shioji) markings	First exhibited in 1927 during the reign of Showa Emperor
Shōwa Sanshoku (Showa Sanke) (Often abbreviated to Showa)	Black koi with red (hi) and white (Shioji) markings	First exhibited in 1927 during the reign of Showa Emperor
Shūsui	The Japanese name means “Autumn water”. The fish has only one single line of mirror scales dorsally extending from head to tail. The most common type of Shūsui have a pale, sky-blue/gray colour above the lateral line and red or orange (a rare occasions bright yellow) below the lateral line and on the cheeks.	The Shushi was developed in 1910 by Yoshigoro Aikyama by crossing Japanese Asagai with European (German) mirror carp.
Taisho Sanke (Taishō Sanshoku) (Often abbreviated to “Sanke”)	Similar to Kōhaku, but with small black markings called sumi	First exhibited in 1914 by the Koi breeder Gonzo Hiroi during the reign of Taisho Emperor
Taishō Sanshoku (Taisho Sanke) (Often abbreviated to “Sanke”)	Similar to Kōhaku, but with small black markings called sumi	First exhibited in 1914 by the Koi breeder Gonzo Hiroi during the reign of Taisho Emperor
Tanchō	Any koi with solitary red patch on the head	Named from the very rare Japanese crane (<i>Grus japonensis</i>) which also has a red spot on the head.
Tosai	Variation in colour	Lower-grade pond quality fish selected during the first year
Tsumi-Goromo	See Koromo B.	
Utsurimono	A black koi with white, red or yellow markings	The oldest attested form is the yellow form called “black and white markings” ((Kuro Ki Han) in the 19 th century, but renamed “Ki Utsuri” by Elizabeth Hoshino an early 20 th century breeder. The red variation is called “Hi Utsuri” and the white “shiro Utsuri”. The word “Utsuri” means print as the black markings might resemble ink stains and sometimes even Japanese signs.

Biology

Koi have a immune system that turns off at temperatures lower than 10 degree Celsius. Thus in cold climate, like in Norway, they will be at a severe disadvantage and is often stored in tanks indoor in winter time.

Koi reproduce through spawning with thousand of offspring from a single spawning. Regardless of the parents the fry will exhibit a wide range of colour and qualities. In selective breeding the new fish needs to be culled at various stages. Culled fry will usually be destroyed or fed to other fish. Fish selected at older age, like during the first year called Tosai, are often sold as lower-grade “pond quality” pond.

Koi is less likely to be attacked by the *Thelohanellus* infection than the common European carp (*Cyprinus carpio carpio*).The parasite was introduced from the far east as a result of introduction of fish and will be a problems for fingerlings of carp (Molnar, 2002).

Size

Spawning

Age

Food

Kuria Labeo (Other name used in English: Indian Carp) (English)**Nomenclature:**

Labeo gonius (Hamilton 1822)

Common names in other languages:**Etymology****History****Description**

A carp found in freshwater sources around the Bay of Bengal and rivers in Afganistan, Pakistan, India, Bangladesh, Nepal and Myanmar (Burma). Kuria laeo is not normally found in ponds, but the fish can be cultured in ponds.

(<http://www.fishbase.org/SpeciesSummary.php?id=10254>)

(http://en.wikipedia.org/wiki/Kuria_Labeo the 21.04.2010) (Talawar and Jhingran, 1991)

BiologySize

Maximum published length is 150 centimeters.

Spawning

Spawning during the southwest monsoon.

AgeFood

Largescale Silver Carp (Other names used in English: Chinese Carp, Silver Carp, Carp, Flying Carp, Family Fish, Home Fish) (English)

Nomenclature:

Hypthalmichthys harmandi

Aristichthys harmandi (no longer used)

Common names in other languages:

Etymology

History

The large scale silver carp is closely related to silver carp (*Hypthalmichthys molitrix*), but with a native range further south and mostly in Vietnam. The fish has not been commonly introduced for use in aquaculture, with the exception of one known introduction in the Soviet Union. The population introduced to the Soviet Union hybridized with the also introduced silver carp (Wikipedia, http://en.wikipedia.org/wiki/Silver_carp, 20.04.2010).

Description

Biology

Size

Spawning

Age

Food

Minnow (English)**Nomenclature:**

Phoxinus phoxinus

Phoxinus aphyia (Lin)

Common names in other languages:

Střevle potoční (Czech)

Elrits, Elritse (Danish)

Mutu (Finish)

Elritze (German)

Ørekyt, Gørleie, Boindsild, Gørkyte, Åkyte (Norwegian)

Elritsa (Swedish)

Etymology

True minnows are of the subfamily Leuciscinae and can be divided in a number of different families. The Eurasian minnows belong to the genus Phoxinus.

History**Description****Biology**SizeSpawningAgeFood

Mud Carp (Other name used in English: Chinese Mud Carp, Family Fish, Home Fish, Carp) (English)

Nomenclature:

Cirrus molitorella (Valenciennes 1844)

Leuciscus molitorella

Chirrhinus chinensis (Günther 1868)

Common names in other languages:

Etymology

The Latin *cirrus* means curl fringes.

History

A carp found in freshwater sources in Vietnam, Laos, Thailand, Cambodia and southern China (Red river). The fish is used in aquaculture and fished in the wild. It is an important food fish in the Guangdong Province in China.

Description

Biology

Size

Maximum published length is 55 cm and maximum recorded weight 500g.

Spawning

Age

Food

Prussian Carp (English)**Nomenclature:**

Carssius gibelio

Cyprinus gibelio (McClane, 1974:242)

Carassius carassius gibelio(McClane, 1974:242)

Common names in other languages:**Etymology****History**

Some authors claim that Carssius gibelio is a variation of the Crussian carp (Careassius carassius). Today most authors seem to define the Prussian as a variant of the Crussian carp, or a feral goldfish. However, many define it as a distinct subspecies Carassius carassius gibelio (McClane, 1974:242)

Description

Those that accept Carassius gibelio as an independent species of Carassius carassius points out that Carassius gibelio has a grey /greenish colour while the Carassius carassius are always golden bronze, juvenile Carassius carassius have a black spot on the base of the tail that disappears with age while gibelio this tail spot is never present (Wikipedia, <http://en.wikipedia.org/wiki/Goldfish>, 21.04.2010).

BiologySizeSpawningAgeFood

Silver Carp (Other names used in English: Chinese Carp, Flying Carp Carp, Carp, Family Fish, Home Fish) (English)

Nomenclature:

Hypothalmichthys molitrix (Richardson 1845)

Common names in other languages:

Etymology

History

The silver carp is a variety of the Asian carp native to the north and northeast of Asia. Silver carp has been cultivated in China since ancient times and is today commonly used in aquaculture several places in the world among them in the Czech Republic and Hungary. Silver carp is usually used in polyculture with other carp the Asian major carps, European carps and Indian major carps. The fish has been deliberately introduced or accidentally spread into waterways in at least 88 countries around the world. The deliberate introductions have been both enhancement of wild fisheries and water quality control (Wikipedia, http://en.wikipedia.org/wiki/Silver_carp, 20.04.2010)

In the 1970s silver carp was imported to USA in order to control algae growth in aquaculture and municipal wastewater treatment facilities. Some of the carp escaped from captivity and wild populations were soon established. By 2003 wild silver carp populations were established in the Mississippi, Illinois, Ohio and Missouri rivers and are close to invading the Great Lakes via the Chicago Sanitary and Ship Canal. Substantial effort has been made to limit the spread of the fish. There are concerns that the fish will compete for food with native planktivorous fish such as the paddlefish (*Polyodon spathula*), gizzard shad (*Dorosoma cepedianum*), and young fish of almost all species. In addition Silver Carp is a danger to high speed watercraft and water skiers because of the tendency of leaping from the water when startled. The fish can grow to more than 18 kg and can leap up to three meters into the air when startled (Wikipedia, http://en.wikipedia.org/wiki/Silver_carp, 20.04.2010).

Description

Biology

Silver carps are filter feeders and can filter remarkable small particles. The gill rakers are fused into a sponge-like filter and an epibranchial organ secretes mucus which assists in trapping small particles. Like all *Hypothalmichthys* species they have no stomachs and depend upon constantly feeding mostly on phytoplankton, but also on zooplankton and detritus. Certain part of toxic blue-green algae like *Microcystis* can pass through the silver carp unharmed. Silver carp is naturally protected against such toxins, but might contain enough algal toxins to become dangerous to eat (Wikipedia, http://en.wikipedia.org/wiki/Silver_carp, 20.04.2010).

Size

Spawning

Age

Food

Tench

Nomenclature:

Tinca tinca

Common names in other languages:

Lin obecný (Czech)

Suter (Norwegian)

Sutare (Swedish)

Tench (English)

Etymology

History

Description

Biology

Size

Maximum 70 cm and 8 kg (Nielsen and Svedberg, 2004:93) (Jonsson and Semb-Johansen, 1992:158)

Maximum 60 cm and 7,5 kg (Terofal, 2006:92)

Maximum 70 cm and 7 kg (Čihař and Knotkovi 2003:118)

Maximum 12 pounds (McClane, 1974: 1022)

Spawning

Age

Food

Tor khudree (Other name used in English: Indian carp)(English)

Nomenclature:

Tor khudree (Sykes, 1839)

Common names in other languages:

Maha seer(Local Indian names)

Mahseer(Local Indian names)

Etymology

History

The fish is a large freshwater fish of the carp family found in fast flowing rivers in India and Pakistan. The fish is found all over the Indian peninsula, but in greatest quantity in mountain streams and rocky streams.

In some cases the fish is used in aquaculture, however such use is limited to the Indian peninsula. The fish is a very popular sport fish in India. During the British period it was considerable interest in fishing (Thomas, 1876 and Day, 1889)

Description

A large carp fish with thick lips, an uninterrupted fold across the lower jaw, and with both the upper and lower lips in some specimens produced in the mesial line. The maxillary pair of barbells are longer than the rostral, and extending to below the last third of the eye. The dorsal fins arises opposite the ventral, and is three fourth as high as the body. The last undivided ray of the dorsal fin is smooth, osseous, strong, and of varying length and thickness.

The colour is silvery or greenish along the upper part of the body, becoming silvery shot with gold on the sides and beneath. Lower fins reddish yellow

Fish in Himalaya, Bengal and Central India generally have the spine strong, and from one half to two thirds the length of the head. In Canara, Malabar and Southern India the lips are largely developed, the spine is very much stronger and as long as the head excluding the snout. The pectoral is as long as the snout and reaches the the ventral, which is a little shorter. The anal laid flat does not reach the base of the caudal, which is deeply forked, the lateral line complete, 2 – 2,5 rows of scales between the lateral line and the base of the ventral fin; 9 rows before the dorsal (Wikipedia, http://en.wikipedia.org/wiki/Tor_khudree, 20.04.2010).

Biology

Size

Large fish up to one meter and 45 kg have been recorded in the past, however such sizes are no longer found.

(Wikipedia, http://en.wikipedia.org/wiki/Tor_khudree, 20.04.2010).

Spawning

The fish moves to upper reaches of small streams to spawn.

Age

Food

The fish feeds on plants, insects, shrimps and mollusks

(Wikipedia, http://en.wikipedia.org/wiki/Tor_khudree, 20.04.2010).

PART IV THE ETHICS OF CARP

Our relationship to other living beings

Humans kill other beings to eat them and sometimes to display them as trophies. We inflict pain and we kill. We keep animals in order to make them gain weight and make a profit. Some sport fishers inflict pain to fish in order to conquer them, display them and then affectionately release them. In the opinion of the German philosopher and writer on ethics Edgar Kupfer-Koberwitz a human will in order to be truly ethical help all living beings and avoid inflicting harm to all other living beings (1947 and 1970). The consequence of his opinion will be vegetarian and regarding all other living species, including fish, to have a moral value equal to humans.

In many cultures, and certainly in Europe, a dominating thought has been that man has been created in the image of God. In such an understanding humans have thought of themselves as separate from other beings granted the dominion of nature (Flannery, 2010). In the words of the American philosopher Oehlschlager (1991) we have an anthropocentric view of nature and consider ourselves separate from our surroundings and in command of them. Darwin illuminated that we were related to other beings and met strong reactions (Darwin 1895 and 2005). Many humans, even today, do not accept the thought of man being anything else than created in God image.

According to Adorno a necessary condition for human freedom is the ability to master nature. In his opinion human relationship to nature is dialectic and humans will have to acknowledge themselves as part of nature in order to gain their freedom (Adorno, 1992 and Lübcke, 1988:14). Modern society have obviously a hard admitting that dialectic relationship and mostly behave like humans can independent of, rule and master nature (Weihe, 1999:246-247). In a way behaviour in modern societies seem to indicate that we need to be re-taught the lessons of people living in close contact with and integrated with nature. In an interview the Bishop of Greenland emphasized the inbuilt spirituality of living a sustainable life adapted to the surroundings (Weihe in Huse, 2008 127-132). In many areas of the world people have strong traditions and conditions that make them acknowledge their integrated part of nature. In other urban, modern society people can distance themselves and gain the illusion of being separate.

In China the carp is often called the family fish or home fish reflecting the often very personal relationship the carp. Often that would be to one or a number of fish growing to old age and representing the reproducing fish kept to spawn or to fertilize eggs. We all know that humans can develop close relationships to certain animals. Most often that would be to cats, dogs, horses and cage birds, but as many sport fishermen can attest a close and affectionate relationship might also exist to large sized carp. Still, most people feel separate from animals and certainly to fish.

In the view of G. A. Bradshaw, studying elephants, they are us and we are them (Bradshaw, 2010). Such an attitude focuses upon the common heritage of living beings and the commonality among living species. In the book "Animals maker us human" the diagnosed autistic professor Temple Grandin argues that her autism enables her to have a special empathy with other not human creatures (Grandin and Johnson, 2010). In her opinion even creatures raised for meat have the right to a happy life which means freedom from hunger, pain, fear, distress, discomfort, injury and disease; and freedom to express normal behaviour. The latter being a difficult challenge as different species, even of fish, will require different

conditions and what might be good for one species might be just the opposite for another (Flannery, 2010:14).

The Chinese fishpond, or for that matter European traditional polyculture fishponds, are attempts to utilize different environment for different fish. Even if the fish in such ponds utilize different niches they will have to live with fear or the danger of predators, as that is part of their natural living conditions.

Relating to a different species we often regard “the other” as part of a group; as “fish”, “birds”, “elk”, “deer” and so on, and not as individual beings. Thomas (2010) points out, after carefully studying a group of deer, that they were all individuals with a far range of personalities. In Chinese thinking that is very much the same for fish (Borgese, 1980:203). In ethical thinking acknowledging the individuality of the other is often a prerequisite of giving the other moral rights and behaving in a considerate way (Weihe 2008, 2009 I and II). Not doing that we risk making the other an object. Still, we know that people readily give both human they know and other beings pain, even if acknowledging their personalities.

It is a common claim among fishermen that fish do not feel pain and fear. They struggle against the fisherman, but do not in the fisherman’s opinion have pain like humans and higher animals. **In what Peter Singer calls; “an eloquent polemic against human abuse of animals” Mathew Scully argues that; “the animals role among us is to awaken humility, to turn our minds back towards the mystery of things, and to open our hearts to that most impractical of hopes in which all creation speaks as one” (Scully, 2011:198).**

The carps relationship to humans

The perspective of the carp on those living above the surface of water and humans in particular is mostly not taken into consideration. If we do we will have to relate to the rights of carp and other species of fish for having a life according to their need. We will also have to relate to other rights such as the right of having unpolluted water or water with a nutritional value adapted to the need of the fish. Obviously such needs will be different depending upon the species of fish. Trout after all requires different water quality than carp.

The carp is very much the victim of human activity and deterioration of aquatic environment. Thus humans and human activity will often be an obstacle to the life of carp. At the same time human activities have given carp opportunities and carp have existed in a relationship to humans from ancient times.

To wait for the kill and have the anticipation of the destiny of life requires a certain kind of consciousness and perhaps even communication across generations. The latter is possible in the wild state, but never in a fishpond situation. The relationship between parents and children are obviously different from what exists between fish and fry. Still, there is knowledge and still there is communication. All fishermen know that fish to communicate and do send signals of distress and warning.

If carps could decide according to their needs and expand their environment they would obviously have more water, less pollution and obstacles like water-power stations. Still, we have to relate to the carp not from the perspective of having human like reactions and imperialism. Carp is after all a peaceful living fish living a life, in the natural state, in a Buddhist like contemplative state. They require plenty of aquatic vegetation, shade from trees and seem to be happy left alone and have no need to interact with humans.

The manipulated environment and the global market

Channels, water pollution, air-born-pollution, global warming, water-power stations, introduction of diseases and new species, construction of ponds and lakes, drainage of water and so on are all part of the human influence upon the environment.

As pointed out by many authors the global market is a vehicle for spreading diseases, microorganisms and animals as well as well as animal products, services and attitudes towards production as well as towards animal welfare (Millar, West and Nerlich 2009). We have no way of predicting the outcome of such processes; however we can try to influence them.

In an article in Science Hites (2004) discuss global contamination in farmed salmon. Even if the example is salmon, the issue raised is rather general and of importance as well for other farmed fish such as carp. Environmental contamination in farmed fish has created a big stir worldwide. In an article the controversy is interpreted as a clash between two fishes, “a healthy fish” and “a dangerous contaminated fish” (Skarstad, 2006: 452). Issues as the healthiness of use of fish and contaminants in fish are of crucial importance to fish farming and for consumption of fish. Even if the issue can be related specifically to fish farming and carp, it is also a general relating to global food production and industrial farming as well as global food wars (Lang and Heasman, 2004). In addition the issue is related to challenges such as pollution, clean air and clean water.

For the producers of fish from fish farms and for fishermen catching fish in the wild, the question is not merely a question of ethics, but also of survival and economics. The issue is simply if the market will pay for a higher quality of fish. Many studies have been done to look into the issue from the point of view of different food products. One such study done looked into the demand for organic salmon in the European market (Reithe and Tveterås, 1998). Obviously the markets exist, but the question of what the market is willing to pay will eventually have to be measured in the market itself.

The ethical considerations

Even if not taking the extreme point of Kupfer-Koberwitz (1947 and 1970), arguing that we only can be truly ethical if we inflict no harm to any other living being, how we behave to other beings like the carp and how we manipulate our environment is of obvious ethical importance. Other writers, like Matthew Scully, argue that animal welfare is not just a moral problem, but also a moral opportunity (Scully, 2011).

As pointed out by Lund and Mejdell (2006:440) “fish is not traditionally included in the moral community or given welfare concerns”. From the point of many communities with a short history of fish farming it is also a matter of a “mental conversion” from hunting and harvesting to that of husbandry. Such a change might illustrate the need for use of knowledge and traditions from cultures with a long history of such husbandry. However even if a country like the Czech republic and even more China have long traditions of fish farming it is important to look into the change occurring to the periods of collective farming, state regulations and central planning. In many cases that period meant a break with old traditions and transferring the economy to an engineering approach to agriculture as well as fish farming.

The question of ethics will for some people be a question about eating fish or not eating fish or for that matter other beings that have to be killed. Secondly it might be a question of either only eating farmed or wild fish. Some will feel that wild fish should be left alone and that eating farmed fish will be acceptable. Others will argue that only wild fish would be acceptable for consumption (Vanhonacker, Verbeke and Sioen, 2006). Then of course comes the issue of methods for fishfarming or for catching fish in the wild. Many sport fishermen will argue that only certain ways of sport fishing will be acceptable others will argue that fish caught in the wild should be released (catch and release).

The issue of animal rights as well as animal welfare is much discussed (Arluke and Sanders, 1996; Millar, West and Nerlich 2009; Ryder, 1989; Sandøe and Christiansen, 2008). In the global world attitudes might be influenced in many ways. The logic of efficient production is often totally alien towards animal welfare, but still logical from the point of view of efficient production and cheap prices. Still, it might be claimed that both prices and welfare will depend upon attitudes, ethics and legislature.

The behaviour of humans towards fish in fishfarming includes feeding them, the space and living conditions and finally the slaughtering and transportation. Just before Christmas fish are often marketed in big tubs of water on the streets in Brno and other towns. At sale the fish might be bought alive or slaughtered at the place. Many of the fish sold will have wounds and some look un-healthy. Many people tell that they do not want to buy fish at the street because they experience the slaughtering and behaviour towards the fish is cruel. Ambrose Tinarwo (2006) has looked into the ethical slaughter of farmed fish. Obviously many people claim that it can be no ethics in slaughtering, just more or less painful and cruel slaughtering.

Methods of killing fish and their effects (Adapted from Tanarawo, 2006:459)

Generic	Method	Typical species	Time to unconsciousness	Fish welfare
Asphyxiation	In air	Carp, trout	Slow	Bad

Asphyxiation	In ice	Carp, trout	Slow	Bad
Mechanical	Concussion	Carp, salmon	Immediate	Very good
Mechanical	Spiking	Carp, salmon	Immediate	Good
Mechanical	Spear/arrow	Carp, pike	Slow	Bad
Mechanical	Hook	Carp and several other species	Slow	Bad
Chemical	CO2 Narcosis	Carp, salmon, trout	Slow/intermediate	Bad
Chemical	Narcosis	Carp, salmon, trout	Slow/intermediate	Bad
Electrical		Carp, salmon, trout	Immediate	Very Good

The question of how fish feel pain has frequently been discussed. However, today it is overwhelming evidence that fish do feel pain, and respond in analogue manners to those of mammals (Kestin with several more, 1994 and Tinarwo, 2006: 458). As regards to carp research shows that carp once caught with hook is likely to remain difficult to catch for at up to one year (Beukema, 1970).

The spirituality of being part of

The Norwegian author Sven Kærup Bjørneboe (2010:45) describes in one of his books visit to Urfa in Turkey with the Aynzelika Lake and the sacred Halil pond. The lake is named after the step daughter of Nimrod who was called Zelika. In despair after having fallen in love with Abraham she threw herself into the flames of a fire. The fire turned into a spring that created the lake and the pond. King Nimrod had started the fire after Abraham started to destroy the sacred objects of his belief. The fire turned into water and was cold towards Abraham and the firewood turned into giant carp. According to tradition the carp is sacred and some of them immensely old, perhaps even born at the time of the Ottomans.

Carp is eaten in Anatolia served according to the tradition baked in a thick shell of salt. Before eaten the shell is crushed with a club. As a side dish bread and thick rich Turkish Yoghurt is served. The meal of carp is sacred and connected to a spirituality dating back from before the Christian time, then connected to Christianity and then to Islam. Abraham is after all a prophet both in Islam and Christianity. The two religions have the same origin and are interwoven in ways not always easy to understand.

Salt, fish, bread and milk (yoghurt) all have some religious symbolism and representing links between humans and the environment.

PART V GLOSSARY OF TERM,
LITERATURE AND INDEX

Glossary of terms**Aquaculture**

Fish, seaweed, seashells or other biological production controlled by humans in either freshwater or saltwater.

Monoculture

Aquaculture or agriculture with one species

Polyculture

Polyculture is aquaculture or agriculture with several species of fish, seaweed or seashells in the same production area. In aquaculture a typical example would be several species of fish utilizing different part of a pond like grass carp eating vegetation, another species of carp eating plankton, black carp eating snails and ordinary carp feeding on the bottom. In some cases other fish will be used to eat small carp of the various species or undesired species like minnows.

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Polydon spathula
Pompom
Pompomor pompon
Ponds
Pools
Popeye
Portugal
Predators
Prussian Carp

R

Railroads
Rainbowtroat

Ranchu
 Red brocade
 Russian
 Ryukin

S

Salt
 Sanke
 Second World War
 Showa
 Showa Sanke
 Shōwa Sanshoku
 Shubukin
 Shūsui
 Silver Carp
 Silurus glanis
 Snails
 South Africa
 Soviet Union
 Soya beans
 Sport
 Sterile
 Stizostedion lucioperca
 Střevle potoční
 Summering ponds

T

Taisho Sanke
 Taishō Sanshoku
 Tanchō
 Tang Dynasty
 Tattoo
 Telescope
 Tench
 Thai
 Thailand
 Thames
 The Norwegian Carp Society
 Thelohanellus infection
 Thirty-Year War
 Tilapia
 Tinca tinca
 Tor Khudree
 Tosai
 Toxins
 Triploid
 Trout
 Tsumi-Goromo

U

Ukrainian
United States Fish Commission
Utsurimono

V
Veiltail
Vietnam
Vietnamese

W
Washington
Waterfowl
Wen
West Nile Virus
White Amur

Z
Zelika

Ø
Ørekyte

Y
Yoghurt

Å
Åkyte