

AQS 324 FRESHWATER FISH  
AND CULTURE TECHNIQUES  
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# Week1-Common Carp, *Cyprinus carpio*

- ▶ There are three recognized varieties of common carp: the orange-coloured scale carp (*C. carpio* var. *flavipinnis* ), the partially-scaled mirror carp (*C. carpio* var. *specularis* ) and the virtually scaleless leather carp (*C. carpio* var. *nudus* ). There is also a variety with only one row of big scales on the lateral sides. The normally coloured or orange-coloured scale carp and the mirror carp are the varieties preferred for culture, mainly because of their faster growth rates

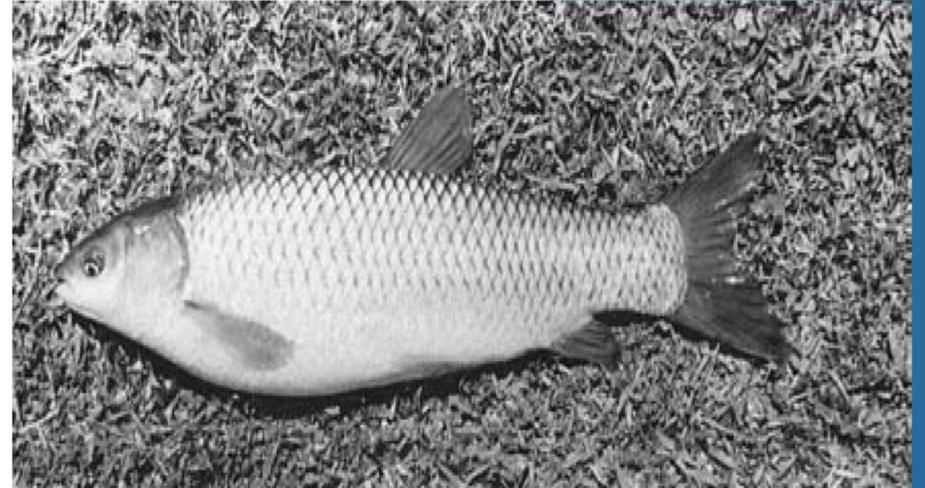
# Week2 Nutrition in carp

The common carp is an omnivore and in nature and in culture ponds it feeds on a wide variety of plant and animal matter. The young carp, up to a length of about 10cm, feed on protozoa and zooplanktonic organisms such as copepods and cladocerans. Above that size, they start feeding on benthic organisms, such as insect larvae (especially chironomid larvae), worms and molluscs, together with large quantities of vegetable matter and epiphytic organisms. The carp's habit of sucking food organisms in the mud on the pond bottom and margins makes the water muddy and weakens the base of pond dikes.



# Week 3 Chinese carps

A group of carp that has become equally or more important in aquaculture consists of the five species popularly known collectively as the Chinese carps: the grass carp (*Ctenopharyngodon idella*), the silver carp (*Hypophthalmichthys molitrix*) (fig. 16.7), the bighead (*Aristichthys nobilis*) (fig. 16.8), the black carp (*Mylopharyngodon piceus*) (fig. 16.9) and the mud carp (*Cirrhina molitorella*). The historical reason for the origin of their



# Week 4 Culture Systems for carp

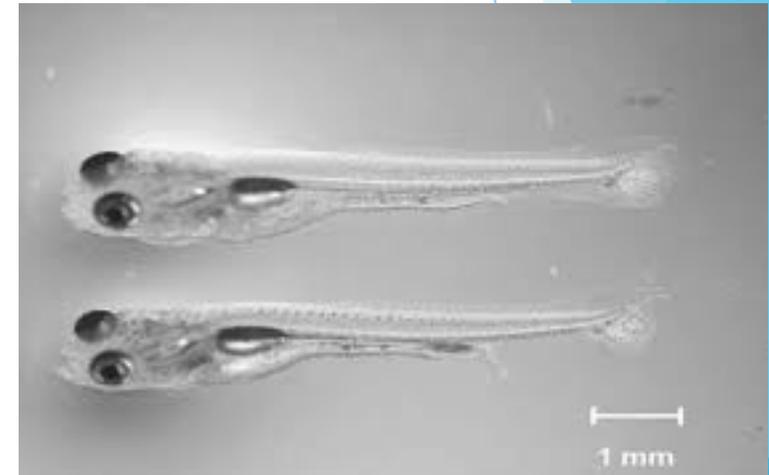
Among the important carp species used in aquaculture, it is only the common carp that spawns naturally in ordinary fish ponds. Until about two decades ago, the culture of Chinese carps and most Indian major carps was dependent on eggs, larvae or fry collected from riverine spawning areas. With the widespread practice of induced breeding, the use of wild seed has completely disappeared in China. In India and Bangladesh, some of the seed required are still collected from the wild, with different types of collecting nets. A very common spawn-collection tool consists of a funnel-shaped, close-meshed net with a cloth receptacle attached at the cod-end to hold the catches

The fertilized eggs settle on the shallow areas and can easily be collected with small pieces of close-meshed netting for incubation and hatching in improvised hatching pits, double-walled hatching hapas or cement cisterns. There is, as yet, no consensus of opinion regarding the factors which prevent these carps from spawning in ordinary ponds or the exact conditions which facilitate spawning in bundhs. It is believed that the cumulative effect of the conditions created by heavy rains and flooding of shallow areas induces gonadal hydration, contributing to final maturation and spawning. It would appear that the change of environmental conditions caused by heavy dilution with fresh rainwater triggers spawning.

Some of the recent developments in the use of bundhs for carp breeding are aimed at increasing the percentage of successful spawn-

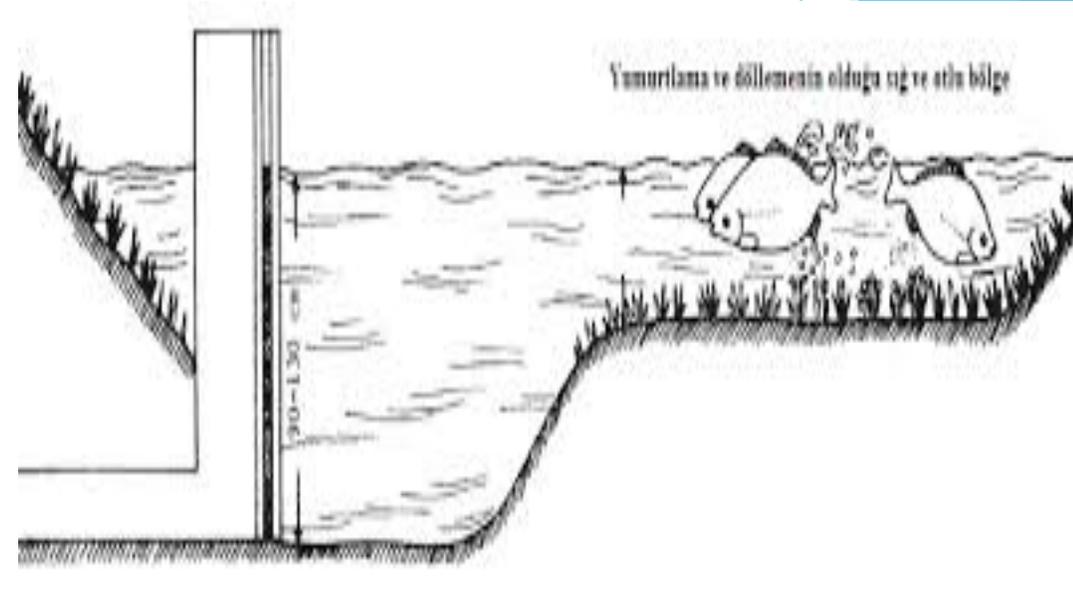
# Week 5- Breeding of common carp

As the common carp breeds naturally in confined waters, several methods of propagating the species have been developed in different areas. The simplest allows uncontrolled breeding in communal ponds, with shallow marginal areas covered with grass or aquatic vegetation which serve as substrates for their adhesive eggs. A more advanced method uses special spawning ponds for spawning, hatching and larval rearing. The most familiar type of carp spawning pond is probably the Dubisch pond.



# Week 6-continue

- ▶ It is a square or rectangular-shaped
- ▶ shallow pond (8-10m<sup>2</sup>), generally surrounded
- ▶ by a reed fence for protection from chill in temperate
- ▶ climates. It has a peripheral 40-50cm
- ▶ deep ditch, the rest of the pond being only
- ▶ 20-30cm deep. In the centre of the pond is a
- ▶ sloping spawning area covered with meadow
- ▶ grass. The Hofer type of pond is a variation of
- ▶ this, without a peripheral ditch but with a harvesting
- ▶ ditch near the monk. In a carp farm, a
- ▶ number of such spawning ponds may be built
- ▶ to spawn an adequate number of fish, when the
- ▶ temperature conditions are suitable. Before
- ▶ the spawning season, the ponds are dried and,
- ▶ if necessary, treated with lime to eradicate
- ▶ unwanted organisms. The ponds are filled when
- ▶ the water is sufficiently warm (above 18°C) and
- ▶ selected brood fish are introduced at the ratio
- ▶ of up to six males to three females. They usually
- ▶ spawn within 24-48 hours.



Dubish pond

# Week7 Selection and segregation of brood stock

- ▶ Generally, two-year-old fish weighing about
- ▶ 2-3 kg are used for breeding, and they can be
- ▶ bred every year for several years. Larger fish
- ▶ may be more difficult to handle, but large
- ▶ females spawn more and larger eggs, and the
- ▶ hatchlings are also larger and survive better.
- ▶ About 100000-150 000 eggs are produced per
- ▶ kg body weight.
- ▶ At least three to four months before the
- ▶ breeding season, the brood stock are removed
- ▶ and stocked in segregation ponds. Males and
- ▶ females can be distinguished by external features
- ▶ during the spawning season



# Week 8 Trouts

The trout species of the greatest importance in

aquaculture is undoubtedly the rainbow trout (*Oncorhynchus mykiss* ). Native to the Pacific Coast drainages of North America, the rainbow trout has since 1874 been introduced to waters on all continents except Antarctica. Its range extends into low latitudes, at higher elevations. Trout waters are maintained in the upland areas of many tropical and sub-tropical countries of Asia, East Africa and South America, and commercial trout farming has developed in Central and South America and to a limited extent in some Asian and African countries like India and Kenya. As can be expected in a widely distributed and adaptable species like the rainbow trout, several local forms have developed, some of them described as distinct separate species or subspecies



# Week 9 Culture systems

The techniques of brood stock development, stripping, fertilization, incubation of eggs and larval rearing are very similar for rainbow and brown trouts.

Although the natural methods of spawning, fertilization and incubation of eggs in redds (depressions or nests) on the stream bed are used for some salmons, they are hardly used in propagation

# Week 10 Cage aquaculture

Cage farming of trout is a rapidly expanding system and is increasingly being used in both fresh- and salt-water environments. Though presently restricted in its use to sheltered areas of the sea and inland impoundments considerable development is taking place in the design and construction of cage farm units which can be operated in more exposed areas and can withstand rough weather conditions. Thus unforeseen opportunities for extending cageculture systems of trout and other salmonids are opening up.



# Week 11 Larval rearing

The time taken for hatching varies mainly with the temperature of the water and ranges roughly between 100 days at 3.9°C and 21 days at 14.4°C. From the 'eyed' stage (when the eyes can be seen through the egg shell) until hatching, the eggs are quite tough and can withstand handling and transport. Rainbow trout eggs take about 370 day-degrees (number of days after fertilization multiplied by water temperature (°C) over the period) for hatching. If heated water can be used, the hatching can be speeded up; for example, eggs fertilized in January can be hatched at the end of February or earlier. The hatchlings remain in the hatchery baskets until they reach the swim-up stage and all the yolk has been absorbed. It is advisable to remove the egg shells from the basket with a suction device.



# Week 12-Fry rearing

The swim-up fry can be reared in the hatchery tray itself for some days, after removal of the egg baskets. In the case of battery incubators, it is essential to transfer them to a rearing tank. Indoor concrete or fibreglass tanks are considered most suitable for fry rearing. It is easier to maintain a regular current of water in such tanks and this helps maintain a uniform distribution of the fry.

