

Induced breeding of Indian major carps



INTRODUCTION

- Breeding fish with pituitary gland (hypophysis) extract is termed as Hypophysation
- The credit for developing the technique of hypophysation in the world goes to the Brazilians, while the pioneers of hypophysation of Indian major carps are H.L.Chaudhary and K.H.Alikunhi
- Induced breeding refers to inducing fish to release gametes through the application of pituitary extract or hormones or chemicals

Broodfish care:

- The recommended stocking density of carp broodfish is 1,000-3,000 kg/ha, depending upon the species
- While rohu and mrigal are stocked at a higher rate, catla is stocked at a lower rate since it requires more space for proper gonadal development
- Earlier the carp broodfish was fed with a traditional diet consisting of rice bran and oil cake (1:1) at a feeding rate of 1-2% body weight daily



Figure: Carp broodstock pond with paddle-wheel with paddle-wheel aerator



Figure: Dragging of carp broodstock pond in progress

- Grass carp also given tender aquatic weeds/terrestrial grass
- Common carp broodfish – needs separation from other carp species
- Hence, segregated sex-wise and stocked in separate ponds to prevent accidental spawning in pond
- The rest of the species can be stocked in a communal pond or stocked in separate ponds after species-wise and/or sex-wise segregation
- Catla, in particular, needs to be separated from the rest of the species as it shows poor response to hormonal injection when stocked with other species
- It is believed that catla broodfish need special care and diet such that deposition of mesenteric fat in the maturation phase does not hinder gonadal development of the species.



Figure: Floating pelleted feed for carps



Figure: Carps being fed with floating feed

Identification of sex of brooders:

- A prerequisite to induced spawning of the fish
- Fish is sexually dimorphic and sexual dimorphism is exhibited primarily by gonads and their ducts and this involves killing of fish
- Also on certain morphological/external characteristics which include size, length, weight, colouration, fin characteristics, modification in the head in the form of nuptial dress, genital opening, width of mouth, etc.
- Carps are sexually dimorphic i.e. mature male and female are morphologically different
- Some of the external morphological characters which are developed during breeding season could be used to identify sex in major carps which mature during their 2nd or 3rd year.

<u>Characteristics</u>	<u>Male</u>	<u>Female</u>
1. Scale, Operculum and pectoral fins	Rough to touch, particularly the dorsal surface of pectoral	Pectoral smooth to slippery
2. Abdomen	Round and firm	Swollen and soft
Genital opening	Elongated slit, white in colour swollen	Round and pink, not swollen
When pressure applied On abdomen	milky white fluid oozes through genital opening	a few ova may ooze through genital
Shape of body and size	Body linear, swollen	stouter, slightly larger



Figure: Male (top) and female (bottom) catla brooders

Breeding technique

- Induced breeding of carps starts with the onset of south-west monsoon, June
- The male and female brooders are conditioned for a few hours prior to injection
- Sets of brooders are formed, each consisting of 1 : 2 (female : male) ratio
- The injected brooders are released in the breeding hapa

Breeding hapa :

- A Breeding hapa is a box-shaped cloth enclosure made of long cloth, generally of size 2 x 1 x 1 m with provision to close its top after releasing brooders.
- The upper flap is attached to one side and the other sides are either tied or bottomed.
- The hapa is fixed in a canal or pond or cement cistern.
- The four bottom and four top corners are tied to four poles such that the bottom of the hapa should not touch the ground and one-third of the hapa remain above the water level



Figure: Nylon breeding hapas

Injection of brooders:

- 1. Intra-muscular injection:** It is administered into the muscle on the caudal peduncle or behind the dorsal fin, but above the lateral line
 - It is most effective, convenient, simple and less risky
 - It is widely practised
- 2. Intra-peritoneal injection :** It is give through the soft regions of the body, generally at the base of the pelvic fin or the pectoral fin.It is risky as it may damage the goads or liver.
- 3. Intra-cranial injection :** In this method, the injection is given through the cranium and is also risky as it may damage the brain.



Figure: Collection of brooders for injection



Figure: Selection of catla brooder for injection

- The pituitary extract is administered through a glass or disposable syringe, 2.0 ml capacity, having 0.1 ml graduation
- The size of the needle depends upon the weight of the brooder to be injected
- Needle number 22 is used for fish weighing 1-3 kg, No. 19 for larger fish and No. 24 for smaller fish
- Intra-muscular injection is commonly practiced
- The hormone injection (pituitary/ovaprim/ovatide) is given at the caudal peduncle region in between posterior end of dorsal fin and base of caudal fin, above the lateral line, avoiding the lateral line

Spawning:

- Brooders should not be disturbed once they are released to the hapa
- After about 6 hours, splashing will commence for breeding and be involved in courtship which will continue for one hour
- At the climax of the courtship, both the partners will be seen in an embrace with their bodies twisted around each other
- This exerts pressure on the abdomen, resulting the extrusion of gametes
- The following morning, the spent brooders are removed and then the eggs are collected and transferred for hatching in a suitable hatching device.

Examination of eggs:

- After the eggs are water-hardened, a sample of eggs is taken in a beaker for assessing quality and quantity
- The fertilized (good) eggs are transparent with a clearly visible nucleus at the centre and look-like pearls
- The unfertilized (bad) eggs are opaque white and the nucleus disintegrate within one hour



Figure: Quantitative assessment of eggs



Figure: Fertilized eggs circulating in a circular hatchery

Fertilization rate:

- It indicates the quality of developing eggs and is estimated using the formula :
- Fertilization rate (%) = $\text{No. of fertilized eggs} / \text{Total no. eggs} \times 100$

Hatching rate:

- It can be estimated by knowing the total volume of spawn /number of spawn in a known volume
- Hatching rate (%) : $\text{Total no. of spawn obtained} / \text{Total no. of fertilized eggs} \times 100$

