

# **Breeding Biology of IMC & Other Cultivable Fishes**

# Catla

- Fastest growing Indian major carp species
- Spawning season: May – July
- It attains maturity in the second year of life and carry over 1.5 lakh – 2.0 lakh eggs per kg body weight
- Eggs are non adhesive and demersal.
- It naturally breeds in rivers during monsoon season and under control conditions in bundhs as well.
- It does not breed in ponds.

# Rohu

- It attains sexual maturity during the second year.
- Fecundity varies from 2.26 Lakh – 2.8 Lakh eggs per Kg of body weight
- Rohu spawns during the monsoon (May—July).
- Egg of the rohu are round, transparent, demersal, non-adhesive.
- Under pond culture conditions it grows upto 900 g within one year.

# Mrigal

- Mrigal usually attains maturity within 1 or 2 years
- Fecundity ranges between 1.24 Lakh to 1.9 Lakh per Kg of body weight
- Eggs of Mrigal are non-adhesive and demersal
- Spawning season is linked with the onset and duration of the southwest monsoon.
- Under pond culture conditions it grows to over 1 kg in one year.

# Silver Carp

- A fecundity range of 1.45 Lakh - 2.44 Lakh per Kg of Body Weight
- It matures within 2 years.
- Eggs are dirty white, spherical, non-adhesive and demersal.
- Males mature earlier than the females
- In composite fish culture ponds it usually attains over 1.5 kg within one year of rearing

# Grass Carp

- It matures in 2 years
- Growth mainly depends on the rate of feeding.
- Fecundity ranges from 80,000 to 100,000 eggs per Kg body wt.
- eggs are semi-buoyant and non-adhesive
- Usually it grows to over 1.5 kg in composite fish culture ponds

# **Common Carp**

**It usually attains maturity within 1 year**

**It spawns throughout the year in the pond environment with two peak periods, one from January to March and the other during July and August**

**Fecundity ranges from 150000 to 250000 eggs per Kg body wt.**

**Eggs are small and adhesive in nature.**

**In composite fish culture ponds it grows to about 1 kg within one year**

# Magur

- **Generally omnivorous, and specifically carnivorous in nature, feed on variety of fish and insects**
- **Fecundity is low, and fecundity ranges from 15000 to 20,000 eggs**
- **Eggs being adhesive stick to the surrounding grass**
- **In natural, breed only once in a rainy season. In the North Eastern region breeding in June to August**

# **Pabda**

**Spawn season May to July (monsoon)**

**Fecundity 8000–13000 per 100 gram of body weight**

**Eggs were brownish in color and adhesive in nature**

# Trouts

- Rainbow Trout (*Oncorhynchus mykiss*)
- Brown Trout (*Salmo trutta fario*)
- Brook Trout (*Salvelinus fontinalis*)
- They are exotic cold water fishes.
- Sex can be distinguishable only during breeding season, lower jaw of male turned up into hooked beak shape
- Trouts attain maturity at the end of second year
- Rainbow trout spawn in spring i.e. Jan to May, brown and brook trouts breed from Oct to Jan.
- Fecundity very low i.e. 1500-2000 eggs per kg body weight.
- Eggs are soft, porous and adhesive.

# Mahseer

- Fishes commonly called mahseer belonging to two genera, *Tor* and *Neolissochilus*.
- *Tor putitora*, *T. tor*, *T. khudree*, *T. mosal*, *T. progeneius*, *N. hexagonolepis*
- *Male mature at the age of 1.5 to 2 years and female mature at 3 years of age.*
- Breeding season of most mahseer species extends from July to September with a peak in July – August.
- *Fecundity of mahseer is low i.e. 2500 -3000 eggs per kg of body weight.*
- *Eggs are heavy and demersal.*

# Grey Mullet (*Mugil cephalus*)

- Brackish Water fish of family Mugilidae
- Sex are separate and male and female are distinguishable only during breeding season
- Age at first sexual maturity is 3-4 years
- Migrate from lake and estuarine water to sea for spawning. In India, breed during post monsoon period.
- Fecundity 1300000 to 1500000 eggs per kg body weight.
- Eggs are spherical, transparent, pre-ovulatory eggs are isotonic to sea water and post ovulatory eggs are hypotonic to sea water.
- Optimum temperature is between 22 -24 degree C and optimum salinity is 32 ppt.

# Milk Fish (*Chanos chanos*)

- Grow well in fresh water and Brackish Water adult migrate to sea for spawning
- Sex are separate and male and female are distinguishable only during breeding season
- Reach first sexual maturity is 3-5 years
- In India, breed during April to August, Peak season is April to May.
- Fecundity 300000 to 1000000 eggs per kg body weight.
- Eggs are spherical, transparent, and non-adhesive.

# Sea Bass (*Lates calcarifer*)

- Grow well in fresh water and Brackish Water adult migrate to sea for spawning
- *L. calcarifer* is a protandrous hermaphrodite, being a male initially changing to a female later
- In 3-4 years old population both sexes can be found
- It is year round spawner with peak season from April to August.
- Fecundity 300000 to 1000000 eggs per kg body weight.
- Eggs are small, non-adhesive and pelagic.

# Fecundity

<b>Species of carp</b>	<b>Approximate number of eggs/kg body weight</b>
<b>Catla</b>	<b>125 000 – 200 000</b>
<b>Rohu</b>	<b>250 000 – 300 000</b>
<b>Mrigal</b>	<b>150 000 – 200 000</b>
<b>Silver carp</b>	<b>100 000 – 150 000</b>
<b>Grass carp</b>	<b>Around 100 000</b>
<b>Common carp</b>	<b>150 000 – 250 000</b>

## **Size of water hardened eggs:-**

**Catla :- 25000 nos./Lit**

**Rohu :- 30000 nos./ Lit**

**Mrigal :- 25000 nos./Lit**

# Method for Measuring Fecundity in fishes

Fecundity is a measure of the reproductive capacity of a female fish and can be defined as **the number of ova that are likely to be laid by a fish during the spawning season**. It varies from species to species and different individual of same species may also exhibit variation depending upon size, age, nutritional status, environmental factors and genetic composition.

The fecundity of a species can be measured by any one of the following

**(i) Volumetric Method:** The mature ovaries are taken out of the abdomen and total volume is determined. Now small pieces of the ovary are taken as random samples from anterior, middle and posterior parts. The volume of each sample is determined and number of ova in each is counted under a lens. The total number of ova in the total volume of the ovaries is then calculated.

# Method for Measuring Fecundity in fishes

**(i) Gravimetric Method:** mature ovaries are preserved in 10% formalin for estimating fecundity. Weight of the ovaries is determined. And three samples of 100 mg each are taken at random from anterior, middle and posterior parts. The number of ova in each sample are counted under a binocular microscope. The total volume of the ova are calculated as follows

**Fecundity=average number of ova from three samples of 100 mg each X total weight of ovary/100**

## **Factor affecting fecundity**

- 1. Age and length of the fish: fecundity increases with size and age of fish**
- 2. Weight: it is after thought that fecundity is closely related with weight than length. However, in many fish the somatic weight changes significantly towards spawning due to nutrient flow from somatic tissue to ovarian tissue.**
- 3. Egg size: Fishes, which spawn many eggs must to be smaller in size. If the egg size is larger, number of eggs will be less. The size frequency diagram of ovarian egg gives the idea of the spawning cycle of a fish. The fish group with same egg size frequency in ovary indicate about a single spawner and the fish group with different egg size frequency in ovary indicate about the multi-spawner.**
- 4. Physiological condition: physiological disbalance due to extensive or intrinsic factor affect greatly to fecundity as the progress of maturation is severely affected due to above reasons.**
- 5. Any kind of disease or parasitic infection also reduces fecundity.**

**6. Spawning time:** the spawners which first spawn, are less fecund due to transfer of somatic reserve to gonadal maturity. takes longer period and in less fecund group of fish like Tilapia, maturation takes short period.

**7. Stocking density:** high stocking density leads to overcrowding and subsequently food shortage which results in a lower fecundity.

**8. Environmental & nutritional:** light, temp, running water, ph and physico-chemical qualities- water interaction which could affect the food intake and keep the fish under stress are found to be less fecund. An increase in food supply with increase in food intake not only increase the growth rate but also increase the gonadal weight due to exogenous flow of yolk(vitellogenin) for a given age. Therefore, the fecundity for a given length increases.

# Gonadosomatic Index (GSI)

The Gonadosomatic index of a species can be calculated by the following formula

$$\text{GSI} = \frac{\text{Weight of the gonads}}{\text{weight of the fish}} \times 100$$

Gonadosomatic index of a species has been widely used to indicate the maturity and periodicity of the spawning of the fish. The GSI increases with the maturation of the fish and is maximum during the peak period of maturity. It decrease abruptly after spawning.

# **Egg Colour**

**Reddish tinge yolk in catla**

**Reddish yolk in Rohu**

**Pale brownish-yellow in Mrigal**

**Pale bluish in Calbasu**

**The major carp eggs have a large perivitelline space between the vitelline membrane and the egg proper in the centre of the egg. The yolk of the egg is more or less round in shape in the early period of development. It then gradually takes an oval shape.**

# **Factor affecting Maturity & Spawning**

- ❖ Temperature**
- ❖ Duration of day light**
- ❖ Currents**
- ❖ Tides**
- ❖ Moon stages**
- ❖ Availability of food**
- ❖ Water quality**
- ❖ Environmental condition**