Chapter – 5 BREEDING AND REARING

CONDITIONS FOR BREEDING

Site Selection

- Flood free area, continuous supply of good quality water from sources like well, pond or river
- Area should be accessible through road/rail/airport
- Uninterrupted power supply for water pumping, aeration, lighting and other machineries

Water Quality And Quantity.

- Good quality water through out the year is required
- Various chemical and physical parameters of water like pH, temperature etc. should be examined
- Hydrological factors (flow rate, water inflow, flooding, water table etc) & meteorological factors (temp, rainfall, evaporation, solar intensity etc) in outdoor ponds must be considered

Biological Factors

- Biological factors ensure suitability of the species to the selected site
- Type and abundance of organisms in the water body must be checked
- Undesirable aquatic plants, invertebrate and vertebrates should be taken into account
- Predators and parasites need to be eliminated
- ensure ideal sex ratio in sexually dimorphic & monomorphic fish species is essential for breeding
- Regular observation of plankton population ensures a healthy aquatic environment

BROOD STOCK MANAGEMENT

- Brood stock or broodfish : Group of mature fishes used for breeding in aquaculture.
- Brood stock management: manipulation of environmental factors surrounding the brood stock to ensure maximum survival, enhanced gonadal development & increased fecundity

Selection of Brooders

- Mature healthy fish are chosen for spawning
- Fish should display good markings and colour
- Pairs should be compatible. Incompatibility may result in fighting or even death of a partner

- Ensure to select same species as hybrids might be sterile

- In order to keep vigour and validity in the off springs inbreeding should be avoided.

Setting Up Of Spawning Tank

- Spawn (eggs&fry) may be eaten by predators/parents, infection, unclean condition etc. hence separate tank required for spawning.
- Fry may die due to unfavourable or unclean water
- Heaters, slow moving filters, good aeration etc. has to be provided specially

Conditioning of Brooders.

- Conditioning is the manipulation of a combination of environmental factors to induce gonadal maturation & spawning.
- Various manipulating factors may include light, temp, pH, type of food, aeration, water flow etc.
- After selection male & female brooder are kept separate and are given special diet till spawning depending upon species.
- Live food preferred to artificial.
- Each brooder should be provided its required space
- They are provided with high protein diet so that they become physiologically fit for reproduction

Setting Up A Rearing Tank

- Required mainly for species which do not show parental care.
- Heaters, slow moving filters, good aeration etc are essential
- Too much of light can encourage fungal growth (3 sides covered with black paper).

Rearing of Fry And Fingerlings

- Larvae: immature stage from hatching to 1st feeding.
- Fry: Young stage from 1st feeding to 2-3cm long.
- Fingerlings: generally upto 1 yr old.
- Rearing tanks should be without gravel or other rough materials
- Needs more frequent feeding & change of water than adults.
- Larva feeds on the yolk from the yolk sac attached to its body
- Fry food: green water, egg yolk → daphnia, artemia, ground flakes.
- Fingerlings: brine shrimp, larger daphnia, insect larvae, flakes etc.
- Many species need period sorting by size to avoid larger fisf feeding on smaller ones

SETTING UP OF ORNAMENTAL FISH BREEDING UNITS

Establishment of ornamental fish breeding units consists of

- ✓ Maturation and broodstock development
- ✓ Breeding cum hatching
- ✓ Larval rearing
- ✓ Grow out sections

Other sub-sections include

- ✓ Live feed production
- ✓ Water quality testing lab
- ✓ Disease treatment
- ✓ Quarantine section
- ✓ Packaging cum sales section
- ✓ Feed preparation cum storage section

BREEDING REQUIREMENTS OF DIFFERENT GROUPS OF FISHES

Based on reproductive strategy fishes are of 2 types:

- EGG LAYING FISHES
- LIVEBEARERS

Egg Laying Fishes

1. Egg Scatterers:

- These species scatter their eggs while spawning
- 2 types eggs: adhesive & non-adhesive.
- Adhesive eggs attach to the substrate while non-adhesive eggs remain floating
- Do not show parental care.
- Family – Cyprinidae.
- Breeding tank preparation for egg scatterers:
    - Since egg scatterers eat their eggs breeding tank has to set in a way that the eggs fall beyond their reach
    - Non-adhesive eggs: spawning tanks are furnished with substrate having marble/nylon netting out of the reach of brooders. Laid eggs fall through the netting and get out of reach of brooders
    - Adhesive eggs: fine leaf plants to be provided for the eggs to adhere
    - Parents to be removed after spawning is over.

2. Egg Depositors:

- Egg depositors release the eggs on substrates like stones or plant leaves
- Generally lay less eggs than scatterers.
- 2 types : take care of eggs (cichlids & cat fishes) & do not take care of eggs (cyprinids).
- Breeding tank preparation for egg depositors:
    - Substrate material such as glass sheets, plates, broad leaves etc should be provided
    - Flowering pots upside down, caves, coconut shells etc.
    - Parents that take care of eggs should be kept in the pond while those which do not care should be separated

3. Egg buriers

- These fishes usually live in shallow waters that dry up during dry season
- Eggs remain dormant in dry conditions until it rains
- Little acidic water can stimulate hatching.
- Breeding tank preparation for egg buriers:
    - Peat moss in bags is best suited substrate
    - Peat moss where eggs are laid can be stored in plastic bags for varying period of time
    - Peat with eggs is immersed in soft water to stimulate hatching.

4. Mouth brooders

- They incubate eggs or carry larvae in mouth.
- Ovophile: eggs hatch in mother's mouth, can breed in original aquarium.
- Larvophile: lay eggs on substratum & guard till they hatch; need separate tank for breeding.
- Breeding tank preparation for mouth brooders:
    - Eggs can be bred in their original aquarium because eggs are protected in the mouth cavity of the parents
    - Mouth brooders are usually segregated due to their aggressive behaviour
    - Larvophiles should be provided separate tanks as eggs are not protected in the mouth

5. Nest builders

- Many fishes like, gouramies, anabantids, cat fishes etc build nest for depositing eggs
- Breeding tank preparation for nest builders

- Materials required for nest building (fine leaves, floating plants etc) should be provided
- There should be no water current to disturb the nest
- Some species may require substratum with gravel/sand to build nest

INDUCED BREEDING

- **Induced breeding** is a technique by which ripe **fishes** are stimulated by pituitary hormone introduction to **breed** in captivity. The stimulation promotes a timely release of eggs and sperms from ripe gonads.
- The active factors like LH and FSH are present in **fish** pituitary.
- Many cultural farm fishes like Indian Major Carps do not breed in captivity. The reason may be environmental and consequently hormonal.
- The **technique** of breeding the **fish** by administering pituitary gland extract injection is known as induced breeding or **hypophysation**. The gland secretes several hormones, of which Gonadotropin is most important for breeding

Induced breeding in carps

- Induced breeding is successfully carried out in carps
- The primary requirement is the availability of good brooders

Brooders

- Ripe healthy female & male are kept in the ratio 1:1.
- Weekly check up for health & gonadal maturation is done
- Pond maintenance & feeding is given utmost importance

Collection of Pituitary Gland

- Donor fish: Indian major carps & Cyprinus carpio.
- Pituitary gland is collected during breeding season.
- For collecting pituitary, head of the fish has to be severed from the body
- The skull bones are removed
- Brain along with optic nerve is removed with forceps
- Care should be given not to break the gland

Preservation and Storage of Gland

- Glands are transferred into vials containing absolute alcohol & kept at room temp. / refrigerated.
- Can be kept in absolute alcohol for 2 yrs.

Preparation and Preservation of Pituitary Extract

- Gland of known weight is used to prepare extract
- Gland of known weight → remove alcohol with filter paper → gland is put in tissue homogeniser with distilled water and macerated → further diluted to make desired volume → injected after centrifugation or without centrifugation.

Determination of Pituitary Dosage

- 2-4mg in 0.1ml of extract and a dilution of 0.2ml/kg body weight of recipient fish.
- 1-3 whole glands from donor fish of same size.

Injection of Pituitary Extract to Breeders

- 2ml hypodermic needle with 0.1ml graduation is preferable
- Thin short needle is applied for aquarium fishes
- Intraperitoneal injections are given at the base of pelvic skin.
- Intramuscular injections are given in the region of caudal peduncle.
- Some need 1 injection (late evening).
- Some need 2 injections (4pm & 10pm).
- If stripping has to be done in morning 1st injection given 6-7pm & 2nd given 6 hrs later previous day.

Stripping and Artificial Insemination

- Stripping is a method of collecting eggs or milt from the ready to breed fishes by applying pressure on the belly
- Milt from male & female collected in a tray mixed with bunch of bird feathers.
- After a few minutes fertilized eggs are washed for 3-4 times to remove excess milt and blood clots
- Fertilized eggs are transferred to hatching tank.

NEW GENERATION DRUGS FOR INDUCED BREEDING

1.Ovaprim
2. Choriogonin
3. hCG
4. LH- releasing hormone
5. Progesterone derivatives

OVAPRIM – a hormone analogue

- It contains analogue of salmon GnRH and a dopamine inhibitor that removes inhibition on GnRh release
- It immediately promotes the release of the gonadotrophins from the pituitary
- Both male and female fishes are given hormone treatment simultaneously

- Hormone analogue stimulates milt production for a longer period and maximises reproductive potential