INDUCED BREEDING

Types of breeding

Natural breeding Artificial propogation

1. Natural breeding

- In this types the breeding is done in large, seasonal and perenial ponds
- During monsoon months river like condition and flow of water is simulated in such ponds
- Two types of ponds are :
- A) Wet bunds
- B) Dry bunds

2. Artificial propogation / Induced breeding

- Induced breeding is a technique by which the economically important fish (which generally do not breed in captive condition) are bred through artificial stimulation.

- Induced breeding is a technique whereby ripe fish breeders are stimulated by pituitary hormone or any other synthetic hormone introduction to breed in captive condition.

- It is also known as **hypophysation**

History of Induced breeding

- The technique of induced breeding was first evolved in Argentina after producing pituitary extract by Houssay 1930 where viviparous fish was injected with the hormone to make premature birth

- In the year of 1934, Brazilians were succeeded in induced breeding by pituitary extract

- This technique was also followed in America (Merlin & Hubs) and in Russia (Gerebilisky).

- In India first attempt of induced breeding was made by Khan in 1937 on Cirrhinus mrigala

- Later in 1955 Dr. Hiralal Choudhuri applied this technique in minor carps (Esomus danricus, Pseudeotropius atherinoides)
- Ramaswamy and Sunderaraj first induced to breed Clarias batrachus & Heteropneustes fossilis
- The first successful induced breeding on major carps was done by Dr. Hiralal Choudhuri 1957– Cirrhinus mrigala, C. reba, & Labeo rohita
- Parameswaran & Alikuni successfully bred the exotic Chinese carps – Hypophthalmichthys molitrix & Ctenopharyngodon idella in 1963.

WHY FISH DOES NOT BREED IN CAPTIVITY?

- Many cultural farm fishes like IMC do not breed in captivity.
- The reason may be environmental and consequently hormonal.
- Certain environmental parameters like photoperiods, rain, temperature, current of water influence the hormonal activity from pituitary and gonads.
- Disturbances arise in environment may cause the insufficient release of hormones in captive conditions and thus, the fish does not breed in captivity.
- Other factors like poor foods or insufficient natural foods, exposure to biocides and other pollutants badly affect the maturation of ovary

Why Induced Breeding is Necessary for Fish Culture

- It gives pure spawn of certain species of fishes under cultivation.
- Spawn collected from natural water is not pure as because some undesirable wild species may come with them in culture pond.
- Sorting of pure seed is quite impossible in those stages. In later stages it is possible, but time consuming.
- It assures timely available of pure seed, where as in nature the availability of seed is quite uncertain.

- It can fulfil any quantity of demand in any time.
- It also cuts short the holding potential spawners over long periods in uncertain hope of their breeding in time.
- Many carps take their full maturity in confined water but do not breed.
- The technique is very simple and does not need too much technical assistance or knowledge. It can be easily learnt by a layman without much training.
- The cost of expenditure is very low than the natural collections of spawns.

Fish Pituitary gland

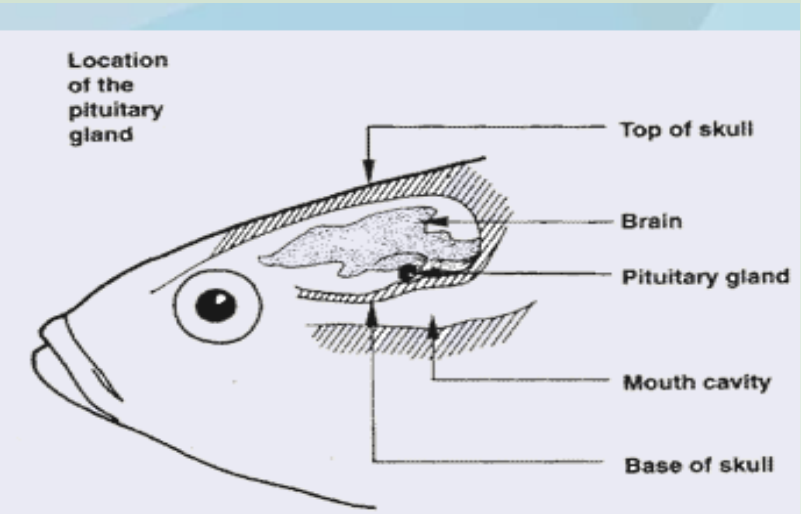
- Pituitary gland is an endocrine gland situated on the ventral side of the brain
- It is a small, soft, whitish body whose size and shape vary with species
- It is more or less round in carps, oval in catla and rohu and pear-shaped in mrigal
- Pituitary is located in a concave cavity known as sella turcica and enclosed by a thin membrane known as duramater
- It may be attached to the brain by a short stalk called the infundable stalk

Role of pituitary gland in Induced breeding

- Pituitary glands secretes the gonadotrophins, ie; Follicle stimulating hormone (FSH) & Luteinizing hormone (LH)

- FSH causes growth and maturation of ovarian follicle in females and spermatogenensis in the testis of males

- LH causes luteinization in females and promote the production of testosteron in males



Induced Breeding Techniques

1. Removal of glands
2. Preservation of glands
3. Preparation of gland extract
4. Brooders selection
5. Injection to brooders
6. Spawning

1. Removal of glands

i) Removal through foramen magnum

- The foramen magnum was first exposed by removing vertebral parts adhering to skull.

- Fat is removed first by means of forceps and then cotton piece.

- A pair of forceps then inserted into foramen magnum dorsally to the brain and anterior part of the brain now detached and remaining is carefully lifted out through the foramen magnum.

- The gland is then located and removed

ii) Removal of gland by dissecting head

- This technique is not used commercially as because the heads are damaged by this process.

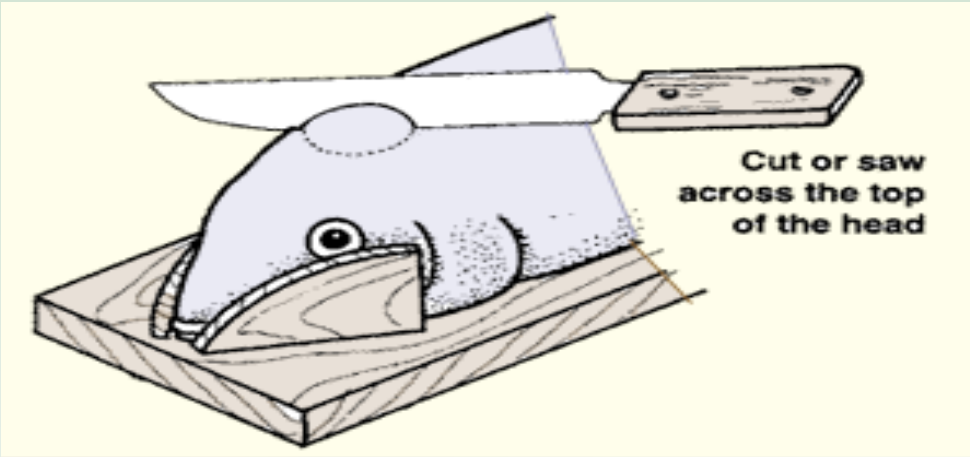
- The first method of removal is less time consuming and economical as the heads are used for human consumptions later.

- At first the head is dissected using sharp butcher’s knife, a portion of scalp is chopped off in a clean cut with one stroke.

- Fat surrounding the brain is removed with the help of cotton. Olfactory and optic nerves are now severed, and then brain is lifted up and removed. Locate the gland.

- The gland may come up along with the brain or may remain behind on the floor of brain cavity often covered with a membrane.

- In any case the gland is carefully removed after separating it from membrane or the brain proper. The gland must not be damaged or torn.

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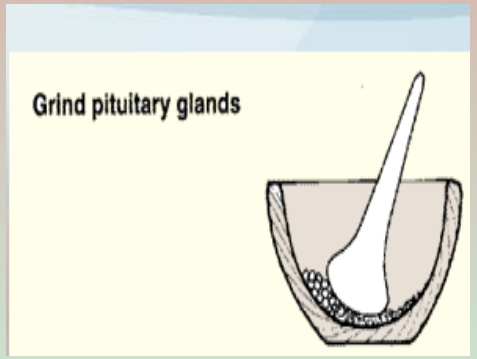
2. Preservation of Gland

- Glands can be preserved in 100% ethyl alcohol
- Acetone can be used for preservation in temperate countries
- Glycerin is also used as preservation media

3. Preparation of Gland Extract

- Known amount of gland is taken by estimating the total quantity of fish to be breed.



- Gland is dried in air by using blotting paper
- Gland is taken in tissue homogenizer with little amount of distilled water
- The dilution rate is 0.2 ml/kg of body weight of the fish
- The pituitary extract is then centrifuged and only the supernatant solution is used for injection

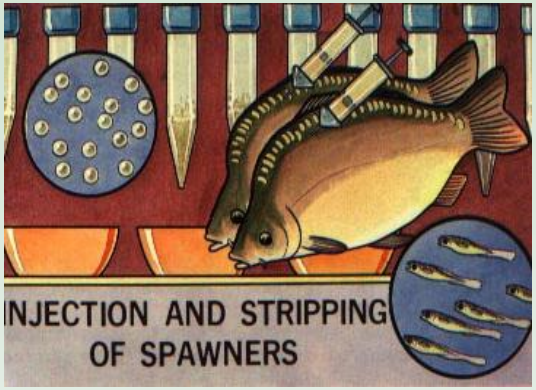
Types of injections

a) Homoplastic injection: Injecting pituitary from one fish to another fish closely related to the donor fish

Eg: Carp pituitary gland extract to carps

b) Heteroplastic injection: Injecting pituitary from one fish to another fish distantly related to the donor fish

Eg: Carp pituitary gland extract to catfish and vice versa



4. Brooders Selection

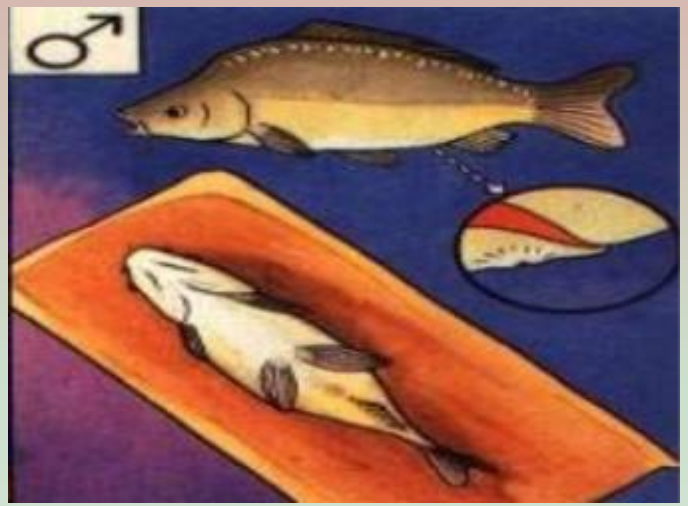
- The brooders must be healthy enough and ripe
- Breeders should be collected in 1:2 ratio for female and male respectively
- Fishes should be almost same size and weight
- 2 –4 years of age is generally selected
- 1 –5 kg body weight is preferable

Identifying characters of brooders

Female brooder

1. Smooth pectoral fin
2. Abdomen is soft and bulging
3. Pinkish vent
4. The vent of fully riped females are slightly elevated

Male brooder



1. Rough pectoral fin
2. Abdomen is smooth and not bulging
3. Vent not pinkish
4. Whitish secretion called milt come out on pressing the vent

5. Injection to the Brooders

- The pituitary extract is administered into the body of breeders by means of hypodermic syringe either intra muscular or intra peritoneal

- Determination of correct dosage of pituitary extract to be given to the breeders is very important and depends upon the size and state of maturity of the recipient (breeders) as well as upon the state of maturity of the donor for the glands

- The females receives 2 injections and the male recieves only 1 injection (at the time of second injection to females)

- I dose/ Provocative / Priliminary dosage

&

- II dose / Effective / Resolving dosage

- Usually the female is given a preliminary dose of 2-3mg/kg of body wt.

- The preliminary dose is not given to the male.

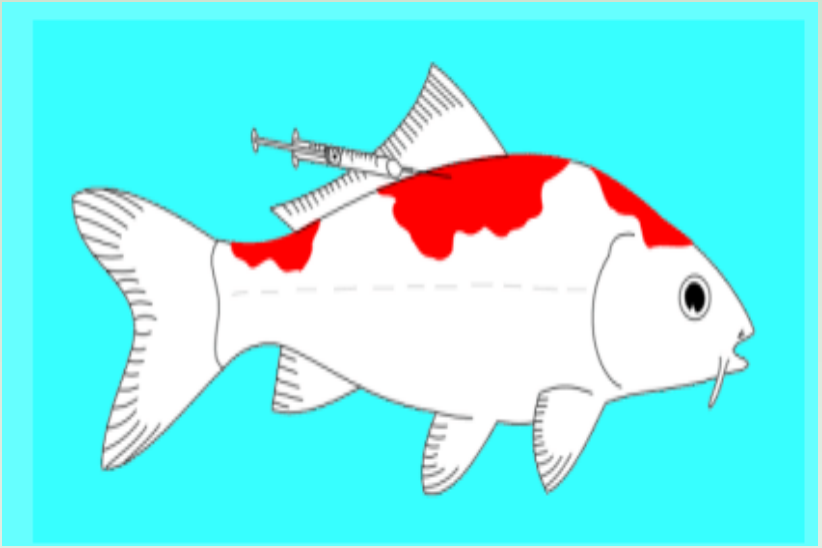
- After an interval of time about 6 hrs a second dose of 5 – 8mg are given per kg of body wt of female.

- The male was given then the first dose of injection with female @ 2-3mg/kg of body wt.

Methods for injecting fish brooders

1. Intra-muscular

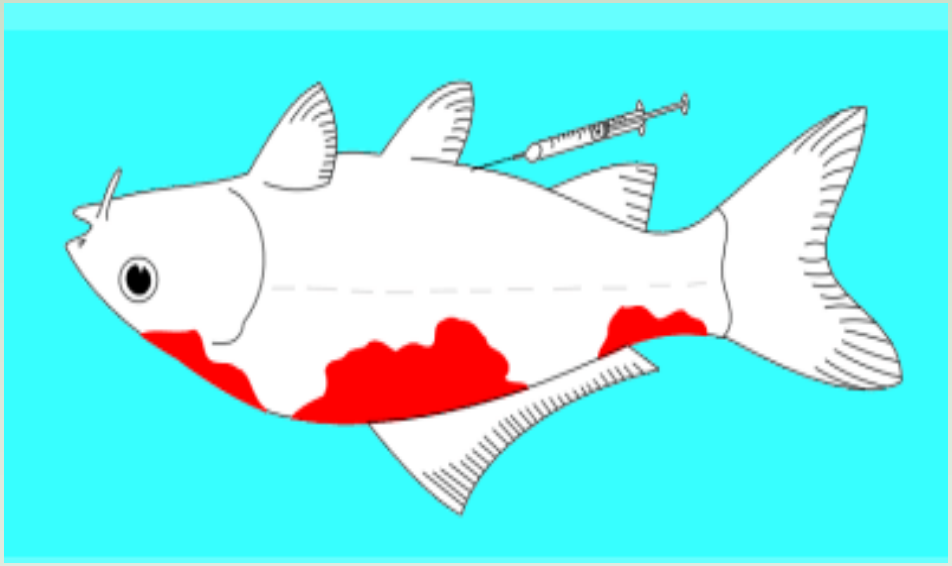
- It is administered into the muscle on the caudal peduncle or behind the dorsal fin, but above the lateral line
- It is most effective, convenient, simple and less risky
- It is widely practiced



2. Intra-peritoneal

- It is given to the soft regions of the body, generally at the base of the pelvic fin or the pectoral fin

- It is risky as it damage the gonads or liver



6. Spawning

- After injection to the brooders a set of brooders are released into breeding hapa

- In hapa breeding the hapa is the fine netting, rectangular in shape and is held by four bamboo poles one at each corner

- Closed meshed mosquito netting is preferred for that purpose, as its meshes will allow a good circulation of water and will also not let the laid eggs and milt escape through the meshes

- The hapa measures the range of 3m × 1.5m × 1m for breeders weighing to 3 to 5kgs. The height of the hapa should remain about 20cm above to the level of water.

- The roof can be open or closed
- The spawning takes place with in 3-6 hrs following the second dose
- It turns out the midnight if the second injection was given in the evening
- Successful induced breeding results in the spawn of fertilized eggs
- The fertilized eggs are transparent, pearl like where as unfertilized eggs are opaque or whitish


1.2
3.4

Factors Influencing the Spawning of Fish

- **Climate**–24°C to 31°C with cloudy days and rainy periods. Light drizzling following heavy rains is ideal. In absence of rain artificial showers are used.
- **Water**–Flowing water is preferred.
- **Turbidity** –100ppm 1000ppm.
- **Light** –It is known to bring that light may help in early maturation and spawning of fish.

Substitutes of fish pituitary gland

1.HCG (Organon)

- In the case of silver carp, successful spawning could be achieved by injecting HCG (Organon) alone and also with HCG and carp pituitary

2. Synahorin

- Synahorin along with carp pituitary gland was successful in breeding rohu and silver carp, but failed to induce spawning when tried alone in rohu

3.Ovaprim

- It is the new inducing hormone for fish and absolute substitute of pituitary extract though it's costly.

- Ovaprim is far superior to carp pituitary in inducing spawning in several species of carps