INDUCED BREEDING AND HATCHERY MANAGEMENT

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What is induced breeding ?

Fish seed is generally is collected from breeding grounds in rivers but such a collection is a mixture of economic and uneconomic species. It is also mixed with eggs of predatory species and it is difficult to separate them. In India in the year 1957 (10^{th} July) Dr. Hiralal Chowdhury developed a new technique of artificial breeding by using hormone collected from pituitary gland of carp which is popularly known as Induced Breeding

GONADOTROPIC HORMONES IN PITUITARY GLAND

Pituitary is the most important endocrine gland of fish and it secretes a large number of hormones. Of these, the gonadotropic hormones – follicle stimulating hormone (FSH) and luteinizing hormone (LH) play decisive role in maturation of gonads and stimulate ovulation in female and spermiation In male, culminating in spawning of fish

COLLECTION OF PITUITARY GLAND AND ITS PRESERVATION

Pituitary glands are collected from fresh as well as ice preserved gravid fish With a sharp butcher's knife, a portion of the scalp of Mature fish is removed and the brain exposed. The pituitary gland Is located ventrally just posterior to the optic nerve – crossing covered by a thin membrane. On removal of this membrane, the gland is exposed and can be removed with a pair of forceps. The glands after removal are immediately put in absolute alcohol for preservation which dehydrates and defattens the gland. After 24 Hours, the glands are transferred to separate phials containing Fresh absolute alcohol

Rearing of brood stock

1. Pond for brood stock should be perennial, 0.3 ha – 1.0 ha with depth 1.5 to 2.0 mt.
2. Before stocking of brood fish pond should prepared scientifically
3. Potential brood fish are collected from various sources and released in ponds during post winter months of January – February when the temperaturegradually increases
4. The fishes are in 2 – 4 kg size and are stocked normally at the rate of 1500 –2500 kg/ha
5. Artificial feed at the rate of 1 – 2% of body weight is to be applied

SEX DISTINGUISHING CHARACTERS IN CARP

The males are easily distinguished by the denticulations and roughness of the dorsal side of the pectoral fin. The pectoral fin of females are very smooth to touch and sexual organ is swollen.

SELECTION OF BROOD FISH FOR SPAWNING:

A fully ripe male oozes milt when the abdomen is gently pressed. The female spawners can be recognised by the By the comparatively larger bulging and soft abdomen and Swollen, reddish genital opening.

PREPARATION OF PITUITARY GLAND EXTRACT:

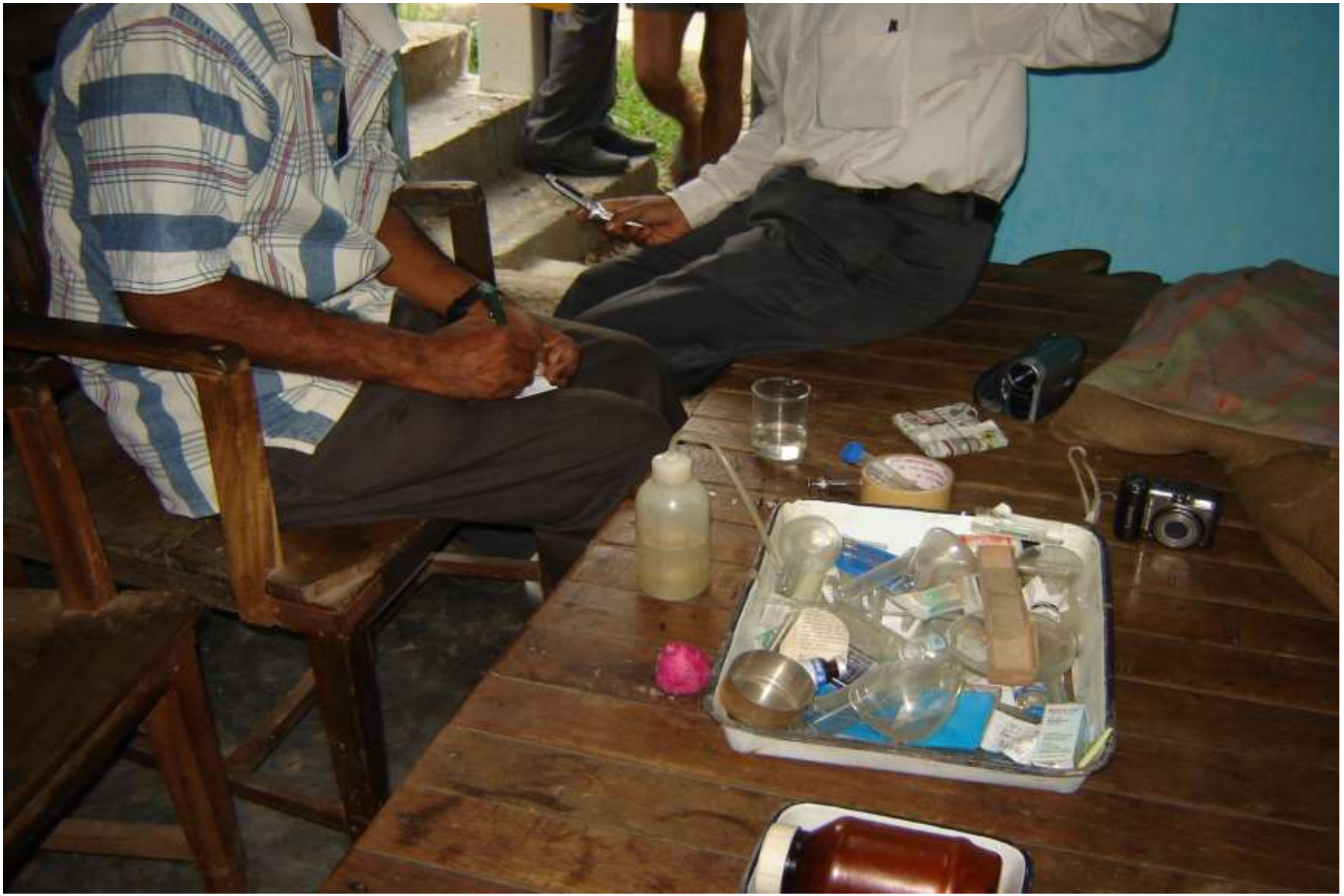
Once the proper dosage is determined, the quantity of glands required for injecting the recipients are calculated according to the weight of the fish. The requisite quantity of gland is then Taken out and macerated in a homogeniser in a little distilled water. The homogenised gland is then diluted to known volume. The Dilution is generally made at the rate of 0.2 ml per body weight of the recipient fish. The homogenised extract is then centrifuged to Remove the tissue particles which settle down at the bottom of the tube. The supernatant fluid contains the hormones

Cetrifuse machine

Hormone extracted from piyuitary gland

DETERMINATION OF DOSAGE:

It depends mainly on the extent of ripeness of the gonad of the recipients and the prevailing environmental and climatic Conditions. A female recipient requires more hormones than the male. The females are given two injections, the dosages of which are determined on the of weight of the recipient. A preliminary dose of 2-3 mg per kg body weight followed by a second dose of 5-12 mg per kg body weight, after an Interval of 6 hours are administered to the female. A dose of 2-3 mg per kg body weight is injected to the males at the time of second injection to the female.



Preparation of dose

ADMINISTRATION OF HORMONES:

Intramuscular injection of pituitary extract is administered in The region of the caudal peduncle a little above the lateral Line. The needle is is inserted under the scale and is pierced In the muscle at an angle of 30^0 . A hypodermic syringe of 2 ml capacity graduated to 0.1 ml divisions is usually used for administration of injection. While injecting, the brood fishes are kept inside a hand net and placed on a cushion.

BREEDING ENVIRONMENT:

Immediately after the final injection to the female and the first injection to the male, the brood fishes are released inside the breeding pool. The carps breed within a wide range of water temperature (24 – 33^0 C)

SPAWNING IN BREEDING POOL:

Spawning normally takes place within 3-6 hrs after the second injection. Before spawning occurs, the recipient fish demonstrate some sort of sex play. Normally the female spawner is chased by the male. The female swims faster splashing water and releasing eggs and the male follows the female releasing its milt. The act of releasing eggs and milt is synchronised, culminating in fertilisation in water. The non-adhesive, demersal carp eggs swell up gradually to 3.5 to 5.5 mm in diameter after spawning

Breeding pool

Preparation of breeding in breeding pool

1st dose to female

2nd dose to female on the other side of the body

Single dose to male

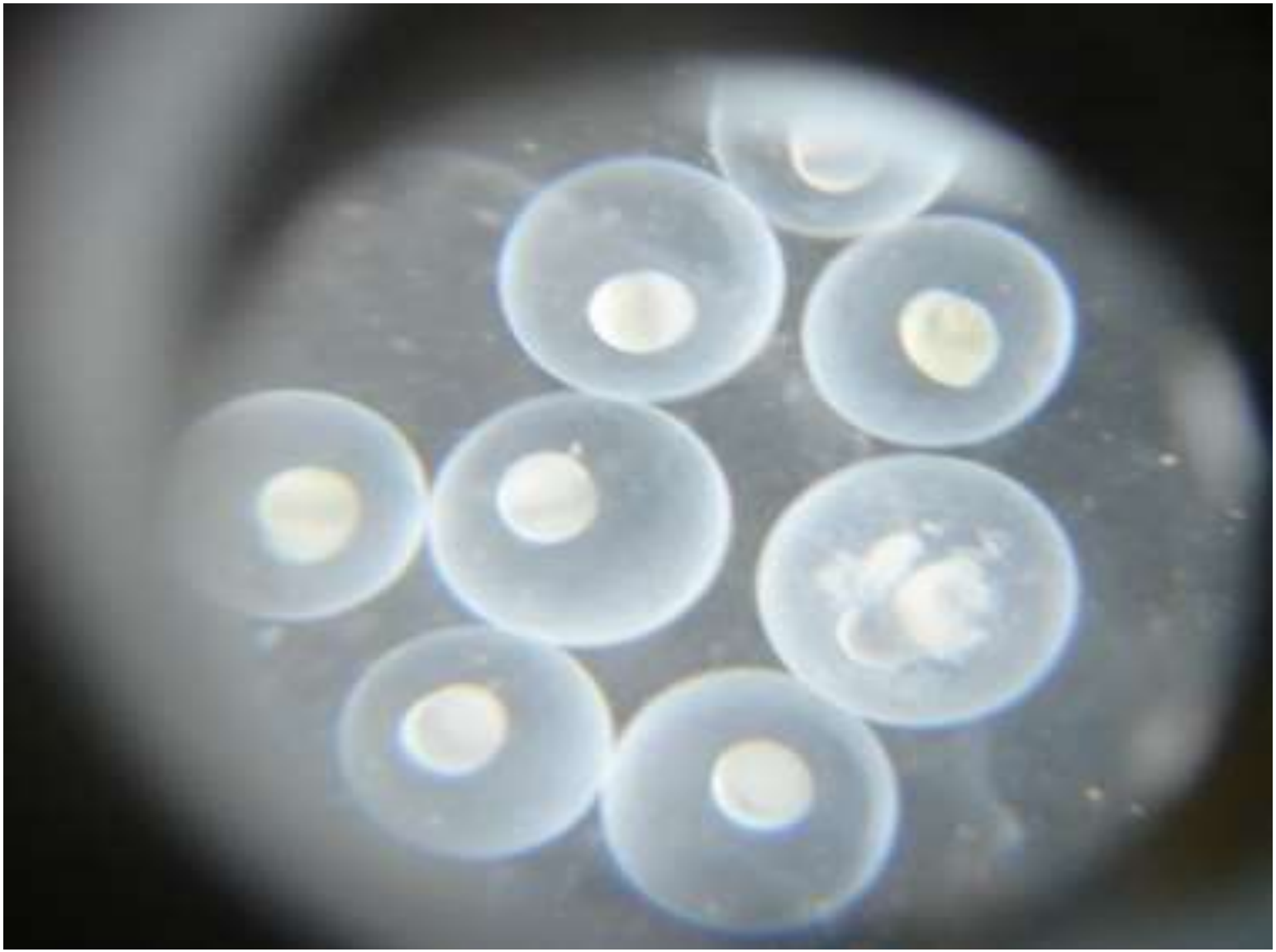
Spawning in breeding pool

HATCHING IN HATCHING POOL:

Usually, 6 – 8 hrs after fertilisation the eggs are to be transferred into the hatching pool from the breeding pool. The viable eggs are transparent and easily distinguishable from the dead ones which are opaque. The eggs usually hatch out in 15 to 18 hrs. after fertilization at normal temperature. The developing embryo twitches in the perivitteline fluid, encapsulated in the chorion. Within 16-18 hrs. of incubation the twitching embryo breaks the chorionic membrane and comes out as hatchling. It measures About 4-5 mm. Hatchling that are 24 and 48 hrs old measure 5-6 mm; and 6-7 mm respectively. The hatchling that are 72 hrs old are termed as spawn. These measures upto 8 mm in length and weighs up to 2 mg. First and second day hatchlings are known as yolk sac larvae. Third day larvae are called spawn which are suitable for stocking in the nursery pond.

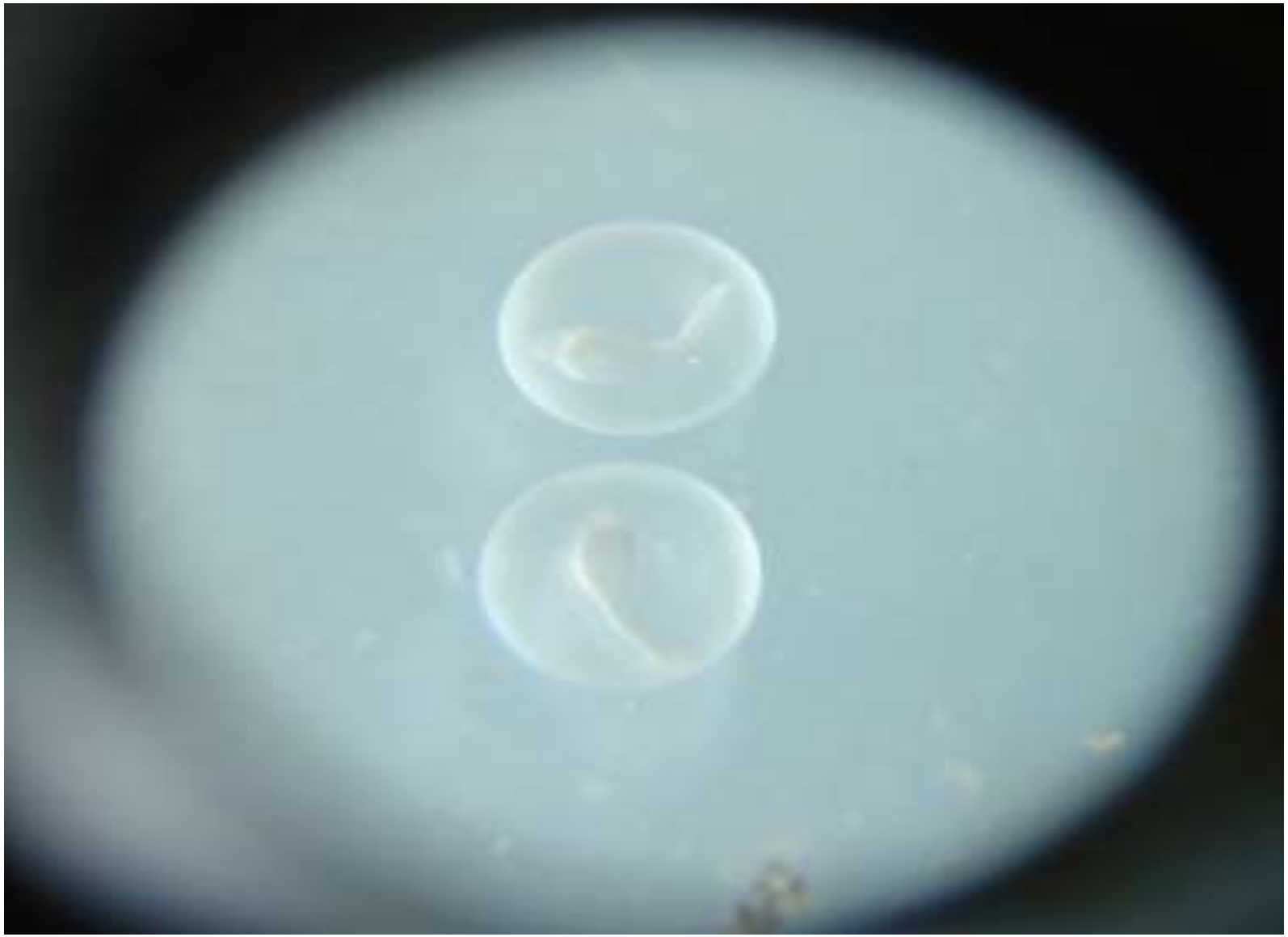
Hatching pool

Fertilised egg in hatching pool



View of egg

Hatchling



Twiching movement of embryo

MOVEMENT AND LOCOMOTION:

The Characteristic feeble myotomal movement is observed in newly hatched larvae as it is seen in the twitching embryo. Within next six hours, hatchling occasionally comes to the water surface but it mostly lies laterally. Vertical movement is observed in 12 – 24 hrs. spawn with horizontal jerks resulting in zigzag motion. This is a typical locomotory movements for early spawn, which is commonly known as wriggling movement. This is continued till the appearance of the folds and air bladder. Shooting and darting horizontal movement is observed in second day of hatchlings. Third day spawn swarms in groups and preferably swims against the water current.

FORMATION OF BODY PARTS OF HATCHLING:

The newly hatched larvae are non pigmented, transparent with prominent eye and palpilating heart but without operculum and mouth. The body has a distinct head, trunk and tail. The fin fold appears within 12 hours of hatching. The pectoral fins appear in 24 hours. Dorsal fin as well as ventral fin rudiments and caudal fins appear by 72 hours. Air bladder rudiment appears from second day, which is the first swimming aid for the early spawn. Mouth, gut and gill with operculum appear by 48 hrs.

One day hatcling

Two day hatchling

Three day hatchling (Spawn)

FOOD AND FEEDING:

The new hatchlings can not feed on natural food from external Sources till the third day. During these three days spawn live on the yolk, which is stored in the yolk sac. When the spawn starts feeding on the exogenous food, its choice food is live feed organisms such as zooplankton.

HEALTHY SPAWN:

Appropriate pigmentation and proper swimming movement are the signs of healthy spawn. Lack of pigmentation in 2 and 3 day old spawn is an indicator of partial or mass mortality in the in the incubation chamber or hatching pool.

FACTORS AFFECTING EARLY AND LATE HATCHING:

Certain factors like low dissolved oxygen (less than 3 ppm), high water speed (more than0.6m/sec), high total alkalinity (more than 100 ppm), low pH (less than 6.5), water temperature (more than 35^0 C), and over crowding of eggs determines the survival of the premature hatchlings in the incubation sysyem. Factors like low temperature (less than 25^0 C), low total alkalinity (less than 60 ppm) etc causes late hatching

OXYGEN DEPLETION IN HATCHING POOL:

Spawn mortality in the incubation chamber or hatching pool is very common in many hatcheries. Rate of oxygen consumption is different in different stages of developing embryo. Highest oxygen uptake is found at the time of hatching of eggs. Experiments showed that stocking of eggs at 7 lakhs density/m^3 in incubation chamber maintained the dissolved oxygen level between 3.6 – 5.5 ppm during 0-18 hrs.

OTHERS PROBLEM IN HATCHERY

LEUCO – LARVA SYNDROME: After induced breeding in the hatchery, the hatchlings turn white on the second day. In this case the yolk sac region turns white first followed by rest of the portion of the spawn also becoming white. The white spawn start surfacing and die on the same day. This situation often comes in the system where the total alkalinity goes beyond 150 ppm especially in carbonate alkalinity. Use of alum in the hatchery water reduces the mortality rate. This disease is also called white spawn syndrome.

SPHEROCOELOMIC SYNDROME: This syndrome appears on the second after hatching where the yolk sac region of hatchlings becomes oedematous. Watery fluid is accumulated in the coelum and the yolk mass is seen through the fluid as a translucent bead. Such hatclings die within 3 days. This syndrome is also known as yolk sac dropsy

GAS BUBBLE SYNDROME: In this case , most of the spawn in the incubation system start swimming on the water surface keeping their abdomen up with an air bubble in it. This disease occur due to super saturation of dissolved oxygen.

FUNGAL INFECTION: Several fungal infestation is noticed in dead eggs or dead spawn which leads to mortality of the early hatchlings. The fungal infestation often occurs in the hatchery with poor sanitation. Slow water flow than the desired current also allows the fungal to develop on the egg and spawn.