TRAINING MANUAL ON CATFISH HATCHERY AND FINGERLINGS PRODUCTION

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Objectives: This manual is to enable trainees to:

- Explain the importance of fingerlings production
- Describe the materials required for hatchery
- Describe brook-stock
- Use hormone for inducing brooder-stock
- Carry out artificial propagation
- Manage brood-stock
- Feed and Protect fingerlings in the hatchery

Expected outcome: At the end of the training, trainees should be able to set up a small hatchery for producing fingerlings for sale.

Study materials

1 Hatchery with materials needed, nursery troughs

2 Brood-stock Ponds, Brood-stock

3 Materials such as bowl, hormone, saline, injection needles etc.

Practical

1 Demonstrate how to identify female and male brood-stock

2 Demonstrate how to prepare the female Catfish for injection

3 Demonstrate how to inject female brood-stock with hormone

4 Demonstrate how to remove the milt in male

5 Demonstrate how to strip the eggs from the female

6 Demonstrate how to propagate the eggs and milt

7 Demonstrate how to incubate, feed the fry and manage fingerlings in the hatchery.

Structure of the Training Manual

This training manual is designed to be users-friendly by simplifying the technical terms and making the manual as practical as possible. The manual is arranged in units based on steps involved in Hatchery management so that trainees can follow systematically.

Unit 1: Introduction and Importance of Fingerlings Production

Unit 2: Description of Hatchery

Unit 3: Description of Brood-stock and Hormone Inducement

Unit 4: Brood-stock Management and Artificial Propagation

Unit 5: Feeding and Safety of Fingerlings in the Hatchery

Bibliography

Revision Questions

Unit 1: Introduction and Importance of Fingerlings Production

Fingerling production and availability of quality fish feeds have been found to be a challenge for the development of fish farming in Nigeria for over 40 years.

African Catfish is much appreciated for its hardiness and taste. Consumers in Nigeria have made the catfish (*Clarias and Heterobranchus Species*) these most consumed fish in restaurants, placing these fish in high demand in market. Since these species can survive in almost zero oxygen conditions for some times as they have accessory breathing organ. They are sold live in market and held in shallow tubs with little water, making them an ideal for African consumers who often lack refrigerators or means to hold meat and fish at home.
All catfish (*Clarias species*) are commonly found in swampy waters or slow moving streams and reproduce naturally during the raining season.

However, due to the difficulties of getting consistent, fast growing, disease resistant and uniform sized catfish fingerlings and juveniles, the African Catfish Hatchery came into existence.

In the African Catfish Hatchery, catfish fry 'come out' from eggs under an artificial condition in commercial numbers. These fry grow into fingerlings and they later become juvenile (young catfish).

The past practice of capturing African catfish fingerlings or juveniles from the wild (natural habitat) often encouraged disease infested stocks and therefore supplies of the fingerlings in large numbers from the wild are not always consistent. This practice has never been commercially reasonable since the man hours expended in capturing the fishes are not commensurate with the fishes caught.

Similarly, the semi-natural or hormone-induced propagation of catfish in ponds/ tanks has not proved to be a reliable method for mass production of fry. Therefore, artificial propagation under controlled environmental conditions in a hatchery has become a necessity to ensure a mass production fry and fingerlings.

Artificial propagation by induced breeding through hormone treatment, followed by artificial fertilization and incubation of fertilized eggs and subsequent rearing up to fingerling size has been found to have several advantages. These are:

- better rates of fertilization and hatching

- protection against enemies and unfavourable environmental conditions
- better conditions for growth and survival.

Steps in Artificial Propagation

The artificial propagation of *Clarias gariepinus*, is a chain of activities which are more or less similar to those of natural reproduction. This involves the intervention of man in the male and female fish reproductive products (called the milt and eggs respectively) coming together to form fertilized eggs and subsequently forming fingerlings, juveniles and ultimately adult fish. The artificial propagation involves the following:

- Building of Hatchery
- Important factors for a successful hatching
- Materials needed in the hatchery
- Brood-stock
- Size of brood-stock
- Hormone treatment
- Brood-stock management
- Procurement of ripe eggs by stripping
- Procurement of milt by dissection of a male donor
- Artificial fertilization
- Incubation and hatching of eggs
- Rearing of larvae and fry

Unit 2: Description of Hatchery

Definition of Hatchery

Hatchery is a "place" for artificial breeding. In the case of fish, eggs are hatched under artificial conditions and rearing through the early life stages i.e. from the stage of eggs – larva – fries – fingerlings/juveniles before transferring them to the constructed ponds or natural waters.

Fig. 1: Set up of Hatchery

Factors for Successful Hatching

- Availability of good water quality is very essential
- Good parent stock (brood fish) quality from a reliable source i.e. at least a year and above.
- Proper calculation and administration of hormone dosage.
- Proper testes collection and sperm preparation.
- Accurate determination of the time of ovulation in females
- Good stripping and fertilization techniques.
- Good daily and occasional management practices.
- Quality feed and timely feeding period.
- Intensive record keeping.
- Bio-security

Materials Needed in the Hatchery

i. Work Tables

ii. Water Test Kit

iii. Back Up Generator for 24hrs electricity

iv. Scale or balance to weigh

xvi. Air pump with air lines & air stones

xvii. Siphon hoses (1/4, 3/8, 1/2 inch, etc.)

xviii. Feather for mixing eggs + sperm

xix. Hatching frames/screens

v. Torch Light

vi. Pair of Scissors, Blade, Knife

vii. Syringes

viii. Towels or Napkins

ix. Plastic Basins of 20 liters, 60-80 liters

x. Small Plastic Bowls

xi. Thermometers

xii. Hormone (Motilium or Ova Prim)

xiii. Suprefact (Accelerator)

xiv. Quinaldine (Anesthetic)

xv. 0.6% - 0.7% Nacl (Saline Solution)

xx. Kakabans for hatching

xxi. Dip nets – fine mesh and larger

xxii. Cleaning sponge on stick

xxiii. Chlorine cleaner for tanks, basins

xxiv. Formalin

xxv. Grader of different sizes

xxvi. Fish Grading table

xxvii. Plastic Buckets-20 liters

xxviii. Fish Counting Table

xxix. Artemia Tank – 200 liters

Unit 3: Description of Brood-stock and Hormone Inducement

Definition of Brood-stock

Brood-stock or Brood-fish are a group of mature individuals used in aquaculture for breeding (reproduction).

Brood-stock can be a population of animals maintained in captivity as a source of replacement for, or enhancement of, seed and fry numbers.

Fig. 2: Brood-stock

Identification of adult male and female catfish

1. **Size:** In some species males are smaller and narrower than females. The females can grow up to 1 inch larger than males.
2. **Size of the Head:** The head of the male is larger and wider than the female. The male head can be up to 1 inch larger than the female.
3. **Width of the body:** Females are wider than males in the belly area; the extra room is needed to carry many eggs. The female is also rounder than the male.
4. **Dorsal Fins:** Males have longer fins than that of Females. Males also have brighter colored fins.
5. **Openings (Genital):** Both have two openings at the lower belly, one for the anus and the other for the genitals. Right before spawning (eggs are produced), the female genital area will be reddish and swollen

Fig. 3: **Female:** the genital area is flat and has an opening that is rounded **Male:** the genital are raised and shaped like a nipple

Selection of brood-stock for artificial propagation

The breeders maintained in the hatchery can be captured by lowering the water level in the tank and using a rectangular hand-net or a round sieve. Those from ponds are captured using a seine net.

In practice, it is convenient to select the breeders in the morning and to inject the hormone solution in the evening. After selection, breeders are segregated and kept in plastic pools or basins filled with well oxygenated, clean water and covered with a board to avoid escaping.

Fig. 4: An example of a breeder

The selected breeders are not fed between the period of their selection for reproduction and stripping. Handling and transportation of wild breeders should be done with care. This can be facilitated using tranquilizers (MS 222, Quinaldine or Phenoxyethanol at a rate of 10g/100 l; 2.5ml/100 l and 30ml/100 l respectively). At arrival at the hatchery, the wild breeders should be

disinfected and parasites removed with a formaldehyde bath (15 ppm for 6 hours). A bactericide (Furaltadone or Furazolidone, 10 ppm for 1 hour) together with a fungicide (Malachite green 0.2 ppm) should be applied daily during 4 days in order to prevent infections, especially on those parts of the skin which have been injured during handling/transportation. Biting during transportation may also be one of the reasons for injuries.

Criteria for selecting brood-stock (Females/Males

FEMALES

1. Choose only female fishes that weigh above 1kg and must be a year and above old.
2. Female fish should have a well-rounded and soft abdomen.
3. Eggs, showing clearly the nucleus in the centre.
4. Genital opening is swollen and sometimes reddish or rose in colour.
5. When pressing out the female eggs for "inspection" choose only the one that have eggs that separate from each other and are golden in colour
6. Make sure that the outlet where the egg of the female fish will come out is slightly dark in colour.
7. Make sure that the tummy of the female fish slightly protrudes out, when placed flat-faced down

Fig. 5: Features of the female breeder

Males

1. Choose only male fishes that weigh above 1kg and must be a minimum of a year old.
2. No clear external symptoms to indicate the maturity
3. Elongated and slender in body shape
4. Swollen urogenital papilla and the male organ "crosses" and its pink at the dot end.

Fig. 6: Features of the male breeder

Size of Brood-stock

Weight of the breeders

Individual brood fish of weight 1.0 kg and above is preferable because they have a substantial quantity of mature eggs and are easy to manipulate.

Incubation capacity

A moderate hatchery (annual production of 500,000 fingerlings) required a total incubation capacity of 800g of fertilized eggs batch. This amount of eggs can be produced by about 8 females of 1kg and incubated in 4 incubation troughs.

Length of nursery period

The period of indoor rearing of fry up to early fingerlings of about 1 g (depending on water temperature and feed quality) varies between 6 to 8 weeks. This would mean that artificial propagation should be carried out every 6–8 weeks. If nursing is done in ponds, artificial breeding should be carried out once or twice every month in order to produce about 500,000 fingerlings annually.

Repeated artificial propagation

It has been found that the same female brood-fish can be induced to reproduce artificially every 4–6 weeks without affecting either quality or quantity of eggs obtained after stripping.

Use of Hormone for Inducement

There are two methods of inducing a matured brood-stock for egg production: (i) use of pituitary glands and (ii) use of hormone to induce the brood-stock**.**

Hormone Administration

Ova prim has been the hormone of choice by most fingerlings producers in Nigeria. It is usually in a 10 ml bottle. The hormone is injected at 0.5ml/kg of fish weight. One bottle of the hormone can inject 20kg of females or about 10 females at 2kg weight or 20 females at 1kg each.

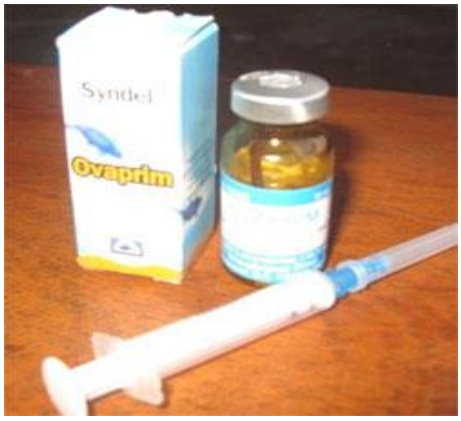


Fig. 7: Ova Prim, an example of a synthetic hormone.

The most commonly adopted technique to administer the hormone (0.5mls of Ova prim) solution, is injecting intra-muscular into the dorsal muscles above the lateral line, just below the anterior part of the dorsal fin using a graduated syringe (2–5ml). When you want to inject the fish, please do not inject the fish on the lateral line.

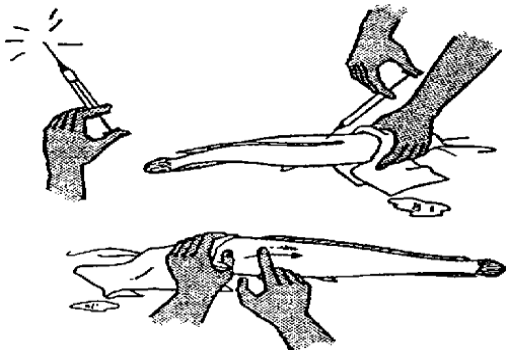


Fig.8: Syringe and how to inject the brooder-stock

Thereafter, isolate the injected fish in a comfortable, big bowl and wait for 10 to 12 hours before stripping the eggs (i.e. pressing the eggs out of the fish). This period is known as **latency period.** When more than 10 females are selected, it is advisable to separate them into two groups of equal numbers and to inject them with a time interval of about 30–60 minutes between each group. This will give the operator more time for stripping the females at the right moment.

Fig. 9: Isolated African Catfish after injecting with synthetic hormone.

Females are generally injected in the evening or early in the morning. The injection time is calculated according to the water temperature and the desired time of stripping.

Handling of breeders should be done with care using a wet towel. After injection the females are gently replaced in their covered containers.

There is no need to suture the genital orifice of catfish to prevent wastage of ovulated eggs since the females do not scatter their eggs without the presence of a male.

Unit 4: Brood-stock Management and artificial propagation

It is important to realize that not all females will be selected for injection. Experience has shown only about 1/3 of females are actually injected. It is also important to have several ponds of brood-fish because continual seining of the same pond likely will stress females and result in poor production.

It is also important to stop feeding about 3 days before selecting females for spawning since one of best indicators of their suitability for spawning is a soft, full abdomen indicative of large, well developed ovaries (egg sacs).

If the fish have been recently fed it is difficult to tell if the fullness of the abdomen is due to feed in the stomach or large ovaries. If the fish have been fed by mistake, wait a few days until the feed has cleared and then check them again.

To select fish, hold females by the tail with their head hanging down and keep females that have a full, swollen belly. Another indicator of readiness for spawning is a red, swollen vent. However, decisions on choosing a female for spawning is generally based on how full the belly looks since it is a rapid method to screen a larger number of fish. Fish with flat or only slightly swollen bellies are generally poor candidates for spawning and should not be used.

The same pond can be screened again at a later date and some of the fish that were not ready the first time may be good candidates later in the spawning season. If you do not find enough good quality females to meet your needs, you should reduce the number of fish you plan on spawning or check another pond for better quality fish. It is a waste of money to inject poor quality females with hormone.

It is important to minimize stress during the selection procedure. Avoid low oxygen and if the weather is warm try to seine in the mornings when the water is cooler. Do not pull the fish up and leave them concentrated in the seine for extended period of time. Handle the fish quickly but carefully and load them onto transport tanks with adequate aeration and use pure oxygen when possible. Avoid rough handling, since it could result in damage to the ovary and lead to bleeding and clotting inside the ovary. Blood clots in the ovary make timing of ovulation and stripping females more difficult and will have a negative effect on spawning results.

Male catfish have a pronounced genital papilla and the opening is rounded and females have a recessed papilla and the opening is slit like. However, testes development varies widely among individuals and is difficult to predict an individual's testes development (and therefore its usefulness for fry production) based on the fish's external appearance or size. Using current methods, the status of testes development is not known until after the male has been killed and the testes have been surgically removed. We suggest harvesting about twice the number of males

you think you will need for a round of spawning to ensure sufficient testes/sperm for fry production.

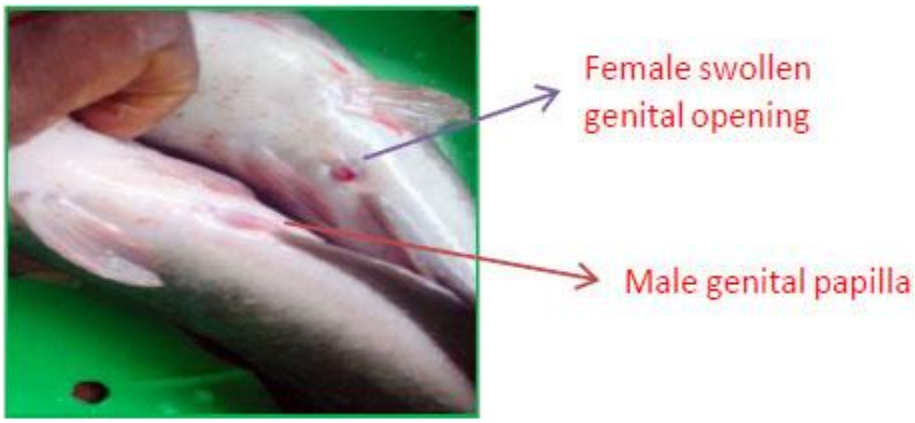


Fig. 10: Female genital opening and male genital papilla

As a general rule of thumb, one male with well-developed testes will fertilize eggs from 8-10 average sized female catfish, so use 4-5 males with adequately developed testes to fertilize eggs from 32-50 females. Some producers weigh testes and use 1g of testes per 250 to 500 ml of eggs. It has been suggested that a lower ratio of 1 male for 3-5 females, or based on testes weight they recommend 0.5g of testes be used to fertilize 100 ml of eggs (100 grams or slightly less than a quarter pound of eggs). The ratio of males to females required depends on the size and development of the testes, the quality of the sperm, and the quantity of eggs produced by each female. It is important to use sufficient males/sperm to ensure high fertility.

Procurement of Ripe Eggs by Stripping

The fish that are selected for stripping (pressing of eggs out of the fish) are sedated. When the fish is sedated, remove it from the anesthetic condition by dipping it in fresh water to wash off the sedative material and then dry the fish off with a towel.

When the fish has been dried, grasp the fish at the base of the tail with your left hand and place the head of the fish in the crook of your right elbow with the fish belly down. The fish head should be slightly elevated so gravity will help the eggs flow towards the vent.

Touch under the fish with your right hand and put your thumb on one side of the belly and fingers on the other side just ahead of the pelvic fins and gently squeeze as you slide your hand back toward the vent.

Eggs should begin to flow out of the vent, continue this 'milking' process and move further up the abdomen as eggs begin to empty out of the rear portion of the ovary.

Fig. 11: How to gently press the Female African Catfish abdomen to collect the eggs

Continue this process, until the eggs stop flowing and/or the ovaries appear to be empty.

When you strip a female, a good indicator of proper timing is smooth flowing, yellowish green eggs, with few clumps or blood clots. A fish that the eggs do not flow well and has lots of egg clumps is usually a sign that ovulation was just starting or incomplete. Although putting these fish back in the tank and stripping them again later is an option, however, success with this practice has been found to be poor. A fish that the eggs flow freely but the eggs come out somewhat stuck together or 'ropey' with a dull color and some whiteness is a good indicator that the eggs were ovulated earlier and have begun to degrade. Although some of these eggs may be viable, fertility may be typically low and hatching poor.

Collect the eggs in a dry plastic bowl and weigh.

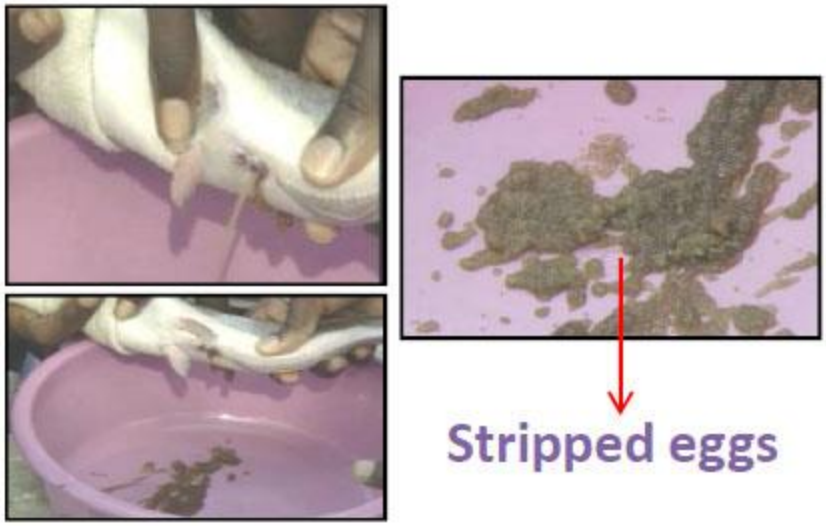


Fig. 12: Stripped eggs and at the onset of blood coming out with the eggs, stop the exercise

The approximate time available for stripping, bringing about an optimal hatching percentage is 20–30 minutes, 60–90 minutes and 120–240 minutes for an average water temperature during latency time of 30°C, 25°C and 20°C respectively.

Collection of Milt/ Sperm from Male Brood Stock

About an hour before stripping, the milt must be obtained from a male brood fish. The milt is obtained by sacrificing one male and dissecting the testis. Some small incisions are made into the cream coloured lobes of the testis.

Fig.13: How to cut open the Male African Catfish in order to remove the Milt sac

Milt can easily be squeezed out and collected into a vial or small bottle with aid of a syringe. In this way, several droplets of milt can be obtained, after which the milt is diluted with saline solution (0.6–0.7% NaCl).

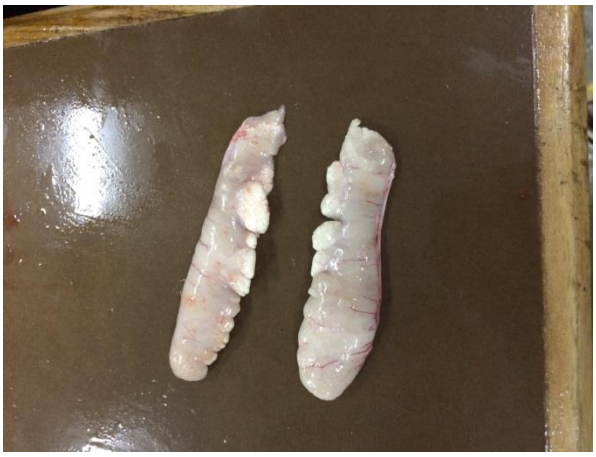


Fig.14: The milt sac in the Male Catfish

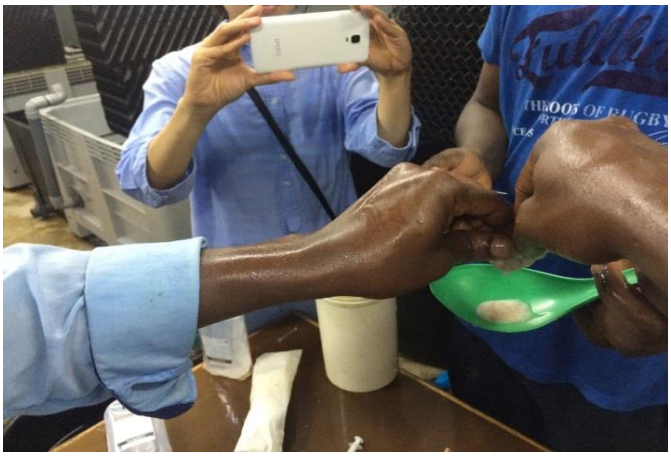


Fig.15: The milt is being diluted with saline solution

Improper handling and storage of milt/sperm can lead to poor or zero fertilization, also it is essential to avoid any contact with water otherwise the sperm will lose fertilization activity.
The milt solution can be stored in a refrigerator for one or two days without affecting its activity.

The suitability of sperm solution may be controlled by mixing a drop of this solution with a drop of water. After mixing, ripe sperm will become active and will move vigorously for a period of about 30–60 seconds.

How to Determine when to Strip a Female Brood Stock

The key to successful stripping-spawning of catfish (and other fish species) is to accurately determine when the female has ovulated. If you attempt to strip the female prior to ovulation, the eggs are not released and the yield of eggs and quality of eggs will be poor, if you wait until too long after ovulation, the fish will release the egg in the holding tank which will reduce the quantity of egg, the quality will also be poor and fertilization will be low. The best way to determine when a female has ovulated and is ready to strip is through experience. The easiest

method to determine if ovulation has occurred in most fish species, including catfish, is to see if gentle pressure to the abdomen results in the flowing of eggs from the vent and can also be determine by placing the thumb on one side of her abdomen and forefinger on the other side and gently squeeze thumb and finger together as the hand moves down the abdomen towards the vent. Do this 3 or 4 times and if eggs are flowing from the vent the fish is ready for stripping.

Fertilization

Store sperm solution on ice in a cooler if not immediately use. Add enough sperm for fertilization to the eggs and quickly stir it around. At this point the sperm are activated and the eggs are fertilized.

After a few minutes move the container with fertilized eggs to a hatching trough placing it inside the incubator or tank with enough water, carefully submerge the container and allow the water to flow over them (flow through system). After 24 hrs fries will be generated.

After stripping one or several female spawners, few drops of milt solution is added onto the eggs and the sexual products are mixed by gently shaking the bowl. Mixing may be facilitated by adding some physiological salt solution.

Fig.16: A mixture of saline solution and milt from the male catfish being added to the eggs

The eggs are fertilized by adding approximately the same volume of clean water. The water and egg mass are thoroughly mixed by gently shaking the bowl. The Saline solution added to the milt (sperm) keeps the sperm alive but not active. The saline solution makes it easy for the entire stripped eggs to be saturated with the milt. The subsequent addition of fresh, clean water now makes the sperm active and motile. It is the addition of clean water that initiates the external fertilization process. This whole process of fertilization lasts for only about 60 seconds. That is why it is strongly advised that you increase percentage fertilization by stirring the mixture during the 60 seconds. Continue mixing to prevent eggs from sticking together.

Spread the eggs inside the incubator on the spawning sponge

The spawning sponge is completely immersed in water. It however sits on the spawning net which keeps it suspended in the water

After 20 to 36 hours, remove the sponge and spawning net. By now the fry would have emerged from the hatched eggs and would have gone to the bottom of the net.

The un-hatched ones, now attached to the spawning sponge and spawning net are removed from the water since they would be attacked by fungi if left for too long. These fungi would inevitably attack the hatched eggs at the bottom of the net.

Fig. 7: Newly hatched African catfish eggs

Unit 5: Feeding and Safety of Fingerlings in the Hatchery

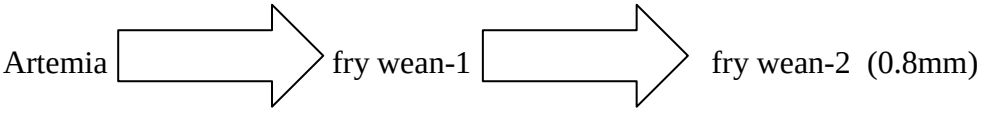
Feeding in the hatchery

There are various types of catfish feeds. The type being used at any particular time is a function of size of fish being fed, whether the fish are feeding at the surface or in the water column, and if an antibiotic is incorporated.

Catfish fry in hatcheries are fed finely ground meal-or flour-type feeds containing 45-50 percent protein. Fines or crumbles from 28 or 32 percent protein feeds for food fish grow-out are suitable for fry stocked in nursery ponds until they reach 1-2 inches in length. Larger fingerlings should be fed small floating pellets (1/8 inch diameter) containing 35 percent protein. Advanced fingerlings (5-6 inches) and food fish are generally fed a floating feed of approximately 5/32 - 3/16 inches in diameter containing 28-32 percent protein. Some producers switch to a slow-sinking feed during the cold season.

Antibiotics are administered to catfish through incorporation in feeds. Depending on the particular antibiotic chosen, the feed may either be floating or sinking.

Feed stages and grade



These artificial fish feed concentrates from fry to fingerlings stage are readily available in any aquaculture feed outlets.

Time and Method of Feeding

Early fry must be satisfactorily fed up to 6 times a day between 6.00 am and 8.00 p.m. Feeding every 3 – 4 hrs within 24 hrs is even better. The water supply is stopped during feeding to avoid washing out of food items. During each feeding, the feed is administrated in two or three portions. The next portion is only given when all food items have been consumed (this can easily be checked with a pipette). Overfeeding should be avoided since wasted feed increases production costs.

The behaviour of the fry may also be used as an indication for the quantity of feed to be administered. Hungry fry swim vigorously in the water column, whereas well-fed fry gather in clusters on the bottom of the tank and have a considerably swollen belly. The stomach contents

of the fry can easily be monitored since their ventral sides are transparent. Thus, fry fed on Artimia nauplii or de-capsulated Artemia eggs have a distinct orange belly after feeding. Once the fry shows the satisfactory behaviour, feeding can be stopped and the water supply must be resumed.

The advanced fry are transferred to nursery troughs. Transferring of advanced fry is a delicate procedure and must be done by carefully siphoning fry into a bucket. The content of this bucket is then gently released in the nursing device.

Each nursing tank, filled with about 160–200 litres of water may be stocked with 10,000 fry, (50 to 65 fry per litre). The water supply must be adjusted once a day according to the dissolved oxygen content of the out-flowing water. Compared to larvae and early fry advanced fry are less vulnerable to dissolved oxygen since their gills as well as their accessory air breathing organ have developed. The recommended dissolved oxygen level for advanced fry nursing is 3 mg/l. The water flow rate is regulated by the water temperature and the quantity of feed given per day

After 5 to 8 weeks, the advanced fry will have a weight of about 1g. At this size, they can be harvested and transferred to grow-out or fattening ponds. A survival of about 70 to 80% can be obtained under optimum husbandry management.

Safety in the Hatchery

Factors Leading to Dead Eggs and Disease

Strip-spawning can often result in egg masses with a large number of unfertilized or dead eggs. In the hatchery, over-handling, overcrowding, and adverse environmental factors, such high temperatures and poor water quality, also result in egg stress and death.

Unfertilized and dead eggs are the primary target of disease causing pathogens and provide a starting point for diseases to spread.

Even in the most sanitary of hatcheries, pathogens are present. Once a disease outbreak has begun, it can quickly get out of hand. Prevention should be the first goal of a good hatchery disease management plan.

Dead eggs

Dead eggs need to be managed to prevent massive disease outbreaks. Live eggs should appear transparent and progress from a pale yellow color to an orange–red color. Dead eggs are often difficult to observe during the first 1-2 days after spawning (release of eggs). By the third day,

dead eggs typically appear opaque and colorless. Some dead eggs will also be enlarged. When dead eggs are observed, they can be manually removed to prevent infection. When removing dead eggs, care must be taken not to damage good eggs.

Overcrowding

Many factors affect the maximum loading rate a hatchery can sustain. Generally, two large egg masses (approx. 1 kg each) or three small egg masses (approx. 0.5 kg each) can be incubated in a single hatching trough 20 cm (8 in) wide x 41 cm (16 in) long x 10 cm (4 in) deep). Egg masses that overlap substantially are subject to poor water circulation, reduced egg survival, and the direct transfer of diseases between egg masses.

Temperature

Temperature is an important environmental factor affecting fry development, hatch rates, and disease susceptibility. The optimal temperature range for incubating catfish eggs is between 26°C – 28°C (78°F - 82°F). At temperatures above and below this range, egg death and prevalence of disease increases, reducing hatch rates.

Water hardness

Water hardness (water that cannot form lather with soap or water with less calcium) plays an important role in catfish fry development. Low calcium levels in hatchery water can increase egg death and reduce hatch rates. Hatch rates from eggs incubated in water with less than 10 ppm calcium-hardness during the first 24 hours after spawning are reduced by as much as 70%. Low calcium-hardness during later stages of development can cause up to a 25% reduction in hatch rates. For this reason, it is important to maintain adequate water hardness in the hatchery. It is recommended that a minimum calcium-hardness of 20 ppm be maintained, especially during the first 24 hours after spawning.

Disease Causing Organisms

Bacterial and fungal infections are the primary threats when incubating catfish eggs. Generally, bacterial infections occur when hatchery water temperatures are above 28°C (82°F) and when egg masses are overcrowded. Bacterial egg rot appears as a milky-white patch in the egg mass.

This patch of bacteria will contain dead and deteriorating eggs, and is often seen on the underside and in the middle of the egg mass. Anytime milky-white patches are observed on the egg mass, care should be taken in the removal of the bad spot and surrounding dead eggs.

Fungus is more prevalent at lower temperatures, usually 26°C (78°F) and below and rapidly attacks infertile and dead eggs. Fungal infections are easy to spot, appearing as white or brown cotton-like growths made of many small filaments. If left untreated, these filaments can invade and kill adjacent healthy eggs, expanding to cover the entire egg mass and potentially every egg mass in the hatching trough. Mechanical removal of dead and infected eggs can be time consuming, but is beneficial. Chemical control of fungal infections is quite effective.

Bio-security measures in the hatchery

Bio-security is the protection of agricultural animals from any type of infectious agent -- viral, bacterial, fungal, or parasitic. People can spread diseases as they move within a facility and from one facility to another.

Below are some important bio-security precautions that need to be put in place in the hatchery during production:

- Stock only with certified, disease-free brood stock from a reputable supplier
- Use a pathogen free water supply (e.g. spring, borehole).
- Each fish holding facility should have an independent water supply
- Mortality and infected fish should be removed daily and disposed properly
- Disinfection facilities (e.g sprays, footbaths) and clear notices requiring all visitors to disinfect boots /shoes before entering.
- Disinfect all tanks, hatching trough, incubators and all materials used after hatching.

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Revision Questions

1 Why is breeding of fingerlings difficult?
2 What are the steps in artificial propagation of catfish?
3 What is a hatchery?
4 What are the factors necessary for successful hatching?
5 What are the materials needed in a hatchery?
6 What is brood-stock?
7 How would you distinguish between male and female brood-stock?
8 What is the length of nursery period?
9 What are the methods used in inducing brood-stock?
10 What is the common hormone used in inducing brood-stock?
11 How long does the injected brood-stock need to be isolated?
12 About how many male with well-developed testes will fertilize eggs from 8-10 average sized female catfish?
13 What stripping in catfish hatching?
14 What is the other name for milt?
15 How long does fertilization take place?
16 Why is it necessary to stir during mixing of eggs and milt within the period of fertilization?
17 What is the best time to feed the fry in the incubator?
18 What method should be used in feeding?
19 What determines the quantity of feed to use?
20 What are the reasons for dead eggs?
21 What are the basic bio-security precautions in the hatchery?

ABOUT IITA YOUTH AGRIPRENEURS (IYA)

The IITA Youth Agripreneurs (IYA) is a group of 35 members made up of 16 males and 19 females from various disciplines such as History, Computer Science, Quantity Surveying, Statistics, Biochemistry, Mass Media, Economics, Soil Science, Agronomy, and Crop Breeding. The group began with reorientation to prompt a change in mindset about agriculture in the youth. Despite limited knowledge of agriculture and agribusiness at the commencement of the program, the youths were able to gather great understanding and knowledge of "agripreneurship" through training both on and off the field.

IYA uses science-driven improvements in agriculture to make a distinctive contribution to solutions of the challenges faced in agriculture and agribusiness and also offer consultancy services on best bet agronomic practices of the following crops: Cassava stem multiplication, cassava root production, Maize and soybean seed production, plantain and banana sucker multiplication, vegetable production, fishery and livestock (production of fingerlings to table size) and also into the value addition of some of this crops. Entrepreneurship skill set is also not left out such as: ICT in agribusiness, marketing, record keeping, M&E, business development, etc.

The goal of IYA is engaging youths in productive market-oriented agriculture, agribusiness and service provision. IYA directly engages youth to use linkages along the value chains from production to processing, marketing, and ultimately to industrial and domestic consumption.

IYA's initial focus was production and distribution of quality seeds and has expanded to value addition leading to production of cassava bread, soymilk, and tidbit snacks, service delivery in capacity building and consultancies. The group also diversified into vegetable production, catfish farming and pig raising for low fat pork.

Currently the IYA concept is expanded to more countries and new groups have been established in DR Congo, Kenya, Tanzania, Uganda and Zambia