AGRIALLIS
Science for Agriculture and Allied Sector: A Monthly Magazine
Volume 6, Issue 5
www.agriallis.com

Article Id
AL04339

FISH SEED TRANSPORTATION AND COLLECTION TECHNIQUES IN INDIA

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Fish seed is obtained from hatcheries by forced breeding, or from natural resources. It is extremely difficult to transport spawn, fry, and fingerlings from distant or far-off seed production sources to an aquaculture farm. Because fish seed is so delicate, it must be handled carefully during the collecting, conditioning, packing, shipping, and stocking processes. Fish culture has gained prominence recently because to the emphasis on fish culture, which replaced the catch fishery as the primary source of fish. The primary determinant of aquaculture success is the quality of fish seed, which is also the most significant limitation. To achieve this, appropriate understanding of fish seed and brood fish transportation is needed. Fish transport technology has advanced from the use of basic earthen pots to the use of polythene bags, high oxygen pressure, and poisons and anesthetics. If the skin and gills are kept wet at low temperatures, fish can be transported under anesthesia without even needing water.

Fish seed is transported in earthen pots from seed collection centers to spawn markets and nurseries for stocking, either as head loads or on slings. This is an age-old practice. During transit, these conventional techniques frequently result in high fatality rates. With a better understanding of the fundamental physiological needs of fish across all age groups and the reasons for fish death during transportation, advancements have recently been achieved in live fish transport procedures.

Fish Seed Resources and Its Collection

i. Riverine Collection of Seed

Major carp spawn is still mostly collected from rivers; in 1964–1965, this source accounted for 91.67% of the total spawn produced. Riverine collection is heavily dependent

on a number of biological and climatic conditions and has clear limitations beyond a certain degree of exploitation. When the mature fish ascend the flooded rivers and breed upon finding suitable ecological, meteorological, and climatological conditions, the seed of major carps, namely Catla (*Catla catla*), Rohu (*Labeo rohita*), and Mrigal (*Cirrhinus mrigala*), as well as of certain medium carps, is collected during the monsoon months.

In the state of Andhra Pradesh, fish seed is collected by both forced breeding using pituitary hormones and riverine collecting. Only the spawn and fingerlings of big carps may be collected from riverine sources for seed. They are gathered from the main tributaries of the Godavari, Krishna, Manjra, and Musi river systems. The natural fish seed resources of Assam are found in the River Brahmaputra and her tributaries; nevertheless, the quality of seed found in these rivers is said to be quite low. When it comes to natural spawn resources, Bihar is the most significant State in the nation. Nearly all of the fish spawn in the state comes from the riverine resources found in the tributaries of the Baghmati, Gandak, Kosi and Bihar rivers. Based on popular belief, the Ganga spawn generally comprises 75% major carps, of which mrigal form 50% and Catla and Rohu 25% each.

The Yamuna River's predominant carp fingerlings are the only source of fish seed produced in Delhi. In the district of Belgaum, the Dudhganga river is the only location where riverine spawn is collected in Mysore State. In contrast, two to four locations on the same river are used for the collection of fry and fingerlings obtained from natural sources. On the Mahanadi, Brahmani, and Subarnrekha rivers, there are fifteen primary locations where spawn and fry are collected from natural resources. Fingerlings of large carps were gathered in Karaikal and Yanam rivers and streams in Pondicherry. Among all the various techniques, riverine collection is already producing the highest amount of fish seed 32.89 lakhs of spawn and 23.04 lakhs of fry in 1964-1965 having been initiated for the first time in Punjab in 1963. In 1964-1965, Rajasthan collected 20.41 lakhs of fingerlings of major carps from rivers, but it was unable to gather spawn and fry from riverine sources. There are riverine collecting

centres on the Channel, Banas, Dai, Ghambhir, Gomti, Tabra, Ruparail, Parbati, and their tributaries across the whole state.

The primary method of obtaining carp spawn in Uttar Pradesh is by riverine collecting. On the rivers Betwa, Chandmovinala, Ganga, Ghagra, Gomti, Huiden, Isun, Krishna, Ramganga, Rapti, Sahnadi, Sai, Sarda, Sarjoo, Son, and Yamuna, around 150 sites are used to collect spawn, while eight locations are used to collect fry on the rivers Ghagra, Ganga, Sarju, and Son 821.Between 1964 and 1965, 5.12 lakh fry and 66 lakh spawn were gathered from riverine sources. The State's collection of riverine spawn in 1991-1992 totals 65.73 lakhs. Spawning areas are gathered in West Bengal at several locations along the Ganga, Padma, Bhagirathi, and Damodar rivers. 11,583 lakhs of spawn are thought to be produced annually in the State from riverine sources.

ii. Collection of Eggs

Eggs are collected from their real nesting grounds using rectangular pieces of mosquito netting that vary in size. The eggs are carefully removed from shallower areas. They are caught with a conical bag net in swiftly moving waters.

iii. Collection of Spawn

Shooting nets are a specially designed tool used to capture carp spawn, which emerges from the eggs in 18 to 24 hours and measures 5-7 mm in length. In every state, there are variations in the shooting net's dimensions, form, composition, and construction. Approximately 24 feet long and with a mouth diameter of around 18 feet, the largest ones are constructed from conical-shaped mosquito netting material that is open at both ends. During the process, the cane or bamboo ring on the cod end, which has a diameter of around 9" to

12", provides stability. Segment able, two-foot-by-one-foot Gamcha composed of delicate muslin fabric is fastened to the cod end by means of the operation. Detachable piece, 2 ft. x 1 ft., the Gamcha made out of fine muslin cloth, is attached to the cod end during the operation to serve as a receptacle.

iv. Collection of Fry and Fingerlings

Along with spawn, the rivers are also used to gather fingerlings and fries. In certain states, such as Punjab and Madhya Pradesh, fingerlings are also collected from rice fields (Andhra and Tamil Nadu) or from below irrigation or pick-up weirs. Drag nets with tiny mesh used for fry collecting are used to gather the fry and fingerlings. In addition, as the fingerlings jump over to pass the irrigation barriers, cast nets—traps made of fine muslin cloth collect them. The Godavari, Krishna, and Cauvery rivers are utilised to harvest fry and fingerlings using basket traps.

v. Bundh Breeding

Merely found in the States of Madhya Pradesh and West Bengal, bundh-breeding was responsible for 5.38% of the nation's total fish seed output. Although there are reports of wet bundhs in some areas of Andhra Pradesh, Uttar Pradesh, and Bihar where large carp spawning is said to occur, the relevant State Governments are allegedly unaware of the extent of these bundhs' existence.

vi. Dry-Bundhs

According to local terminology, a dry bundh is a shallow depression with three sides protected by an earthen wall called a bundh that collects and holds rainwater from the catchment region during the monsoon season. These impoundments are referred to as "dry bundhs" since they stay mostly dry throughout the year. A major factor in the distribution and location of dry-bundhs is the land's topography. The undulating terrain in the West Bengal districts of Midnapore and Bankura, which offers a sizable catchment area, facilitates rapid filling of the bundhs even with brief rains, and facilitates rapid and easy drainage due to gravity, has been particularly conducive to the construction of numerous such bundhs in the private sector. Dry bundhs in Madhya Pradesh are mostly found in the Nowgang area of the Chhatrapur district, where the soil type and land topography are nearly identical to those found in the two West Bengal districts.

vii. Wet-bundh Breeding

Located in the middle of a low-lying area and surrounded on three sides by high embankments, a wet form of bundh is a sort of small or big perennial pond or tank that can range in size from a few acres to over a square mile. A quarter of the majority of these bundhs usually dry up and are cultivated in the summer, while the centre portion, which is deeper than the surrounding region, is constantly partially submerged in water and is home to adult fish. Fish reproduce in the shallower waters during the monsoon season when water from the upland areas rushes towards the central region in the form of streamlets. The fish lay their eggs in mud or cloth hatching pits.

Transportation of Fish Seed

Fish seed transportation under anesthesia and in polythene bags with high oxygen pressure is a common practice nowadays. When transporting fish seeds, a key worry is high mortality. The following factors contribute to fish mortality during transportation:

i. fish respiration, which depletes dissolved oxygen in ambient water
ii. accumulation of free carbon dioxide from respiration and ammonia as an excretory end product
iii. sudden temperature fluctuations
iv. handling-related hyperactivity and stress
v. physical harm from handling before and during transport
vi. diseases.

It is necessary to train fry and older fish in order to lower mortality during lengthy transit. Fish seed and brood fish are often starved for a while before being transferred to the transport carrier. This is commonly done in a peaceful area of the fish pond or in reasonably quiet water in a canal or river using a cloth 'hapa' or other containers. Fish that have been conditioned have a number of benefits, including: diminished blood pH and increased blood lactate levels; fish recover from the handling effects of capture; gut evacuation occurs; and the medium is not further contaminated by faeces during the transport period.

i. Packing and Transport

There are two distinct categories of transport carriers

a) open systems, which consist of open carriers with or without artificial aeration,

oxygenation, or water circulation.

b) closed systems, which include oxygen-filled sealed airtight carriers.

ii. Open System

The most basic kind of transport carrier is an earthen vessel, like the traditional "hundi" that is used in Bengal, India. Today, indestructible aluminium jars are taking the place of earthen hundis, however earthen hundies have the benefit of using evaporative cooling to keep the water inside cold. Two varieties of clay jars are used in Bengal: the smaller, with a diameter of 20 cm and a capacity of 23 liters, is carried as a head load or on a bamboo sling; the bigger, with a diameter of 23 cm and a capacity of 32 liters, is used for train transportation. The water in the clay pots comes from the same source as the fry. In the smaller vessel, around 50,000 carp spawn are discharged, and in the bigger, about 75,000. During traditional transportation in India, the water surface of the transport vessel is covered with around 60 g of finely ground red dirt, and the vessels are frequently shaking. Move. Red soil is added, which coagulates the suspended organic matter and reduces the pollution zone and extent. Using a rough cotton rope, the bottom sediments are occasionally removed during transportation. Depending on need, the water is also partially replenished. Transport is permitted by the of fry upto a duration of 30 hours.

Only their unbreak ability makes the upgraded metal containers superior to the clay ones. The metal containers that are utilized are circular, wide-mouthed jars that can have lids that are perforated and pushed in. The bigger kind has dimensions of 53 cm in diameter at the base, 20 cm at the mouth, and 38 cm high. Any modification of this magnitude ought to operate just as well. The metal containers are covered with hardwood boards to avoid denting and, more importantly, to provide insulation; frequently, the vessel is crated and kept damp during the voyage. Although there may be a greater exchange of breathing gases between the air and the water if there is some air space left above the water in the container, other professionals believe that the fish carried may suffer harm if there is frequent splashing of water during travel. This fact is the source of the splash-less fish carriers used for fries. There have also been larger containers used that are affixed to cars. Some of them have a semi-rotatory pump installed, which shoots water over the tank's water surface through a delivery tube that has two rows of holes spaced 45 degrees apart. Fish fry have been carried 500 km in such semi-insulated motor

trucks with less than 5% mortality. There are a few other variations of open cargo carriers installed on automobiles that are equally popular.

Even while open packing systems are less expensive, they are becoming less popular for the transportation of fish seed since they require constant attention to detail and regular water replenishment during lengthy trips. Carrying larger fingerlings and adults in compact packing containers is obviously neither cost-effective or desirable. For this reason, truck-mounted open tanks that feature water circulation and mechanical aeration (like the one described) have been used with success.

Effective open containers, some with traditional designs, have been devised in China and Southeast Asia for the transportation of adult and fingerling fish. In Indonesia, 10,000 5 cm-sized fry may be kept in watertight, tar-coated, plaited bamboo baskets. For every 250 g of mature fish weight, it is believed that one liter of water is needed; oval barrels with a 150-liter capacity are used in Indonesia to carry fish. It is said that baskets and tubs, some as big as two meters high and around two meters in diameter, are used in China. The water is constantly stirred, and occasionally, filthy water is emptied out. Fry are fed after being freed in a net that is fastened in a pond during overnight stops. On trips lasting around a week, a 60% survival rate is deemed satisfactory. Large live-fish boats with unique designs that have holds split into many compartments with openings and other mechanisms to enable constant input and outflow of fresh water from the exterior are also in use. A loading capacity of 10 million fries is available for some of these vessels.

iii. Closed System

In this technique, the air space above the water's surface is filled with either compressed air or pure oxygen delivered into airtight, sealed containers. This is now a widely acknowledged practice worldwide, having gained popularity for many years in

Western nations. For this, plastic bags, rubber, and sealed metal containers have been employed. Transporting 100–200 fingerlings measuring 7–10 earn, or 30–40 fingerlings measuring 13–20 cm, may be done in a 12-hour trip using a 45 x 35 x 35 em metal container with U'110 airtight apertures, one for oxygen and another for water. Transporting 1000 fry measuring between one and two centimeters in length over a 20-hour period is done at CIFRI, Barrack pore, using eighteen-liter tins with airtight screw-capped lids for filling and tubes for giving out water and sucking in oxygen. Transporting fish fingerlings and fry is now a common usage for polythene bags of different sizes (74 cm x 46 cm or 65 x 45 cm - thickness 0.0625 inch). Here's how it works: first, the bag is placed inside a hard box, such as a tin, that holds 18 to 20 liters. It is then filled with water to a third of its capacity, or 6-7 liters, along with the necessary amount of seed. Finally, the bag is inflated with oxygen under high pressure using a cylinder. upto2/3of the bag. The bag's top 10 to 15 cm are bent, twisted, and tightly sealed with a string. When carp hatchlings, ranging in quantity from 20,000 to 40,000, 300 to 600 fry (30 to 40 mm), and 40 to 70 fingerlings per bag are packed and transported in this way, the reported mortality varies from 0% to 5%.

Giant closed-system carrier tanks have been constructed for the transportation of bigger fish (giant fingerlings, brooders). As said, the fish would not suffer many injuries from the water's reduced splashing in the tank. A simpler version by Fry used a rubber tube (cycle tyre) that could be inflated on top to fill the smaller galvanised splash-less carriage. To regulate the temperature, add room and ice cubes to the carrier's top.

Additionally, a standby oxygen cylinder is carried. As previously mentioned, the interior of the tank is coated with foam rubber, or U-foam, to avoid physical harm to living fish. Fish weighing 60 kg and 90,000 fingerlings have both been safely transported in this splash less tank, with a maximum weight capacity of 250 kg per fish.


iv. Application of Additives During Transport

a. Use of Chemical Either as antiseptics and antibiotics, or as sedatives and tranquillizers, drugs and chemicals are employed. Several employees have provided a general list of fish anesthetics. Common applications for sedatives include:

i. Decreased metabolic rates, namely oxygen uptake and ammonia and carbon dioxide excretion.
ii. Improving fish handling convenience
iii. Diminishing fish excitability and harm.

Fish can be permanently lost if a little dosage increase or extended exposure time is taken when using sedatives and other medications, thus caution must be used in their usage.

Table 1: Dosages of drugs used in transport of live fish (Jhingran, 1975)

S. No	Chemical	Recommended Dose	Author- remarks
01	Tricaine methane sulphonate (Ms 222 Sandoz)	50 ppm	Inwaterfor *Cirrhinus reba* and *Barbus mahicola* (Sreeniv asan, 1962)
02	Novocaine	50 mg/kg fish	Injected Rohu & Mrigal brooders (1–3 kg weight)
		30 mg/kg fish	Injected catla (2–3 kg weight) (Kewalramani and Gogate, 1968)
03	Barbital sodium	50 mg/kg fish	Injected carp brooders - to bring partial loss of equilibrium for transport

ii.**Use of antiseptics and antibiotics**

Methylene blue	**2 ppm**
Acriflavin	10 ppm
Chloromycetin	8–10 ppm
Copper sulphate	0.5 ppm
Sodium chloride	3%
Potassium Permanganate	3 ppm

A prophylactic bath of fry and fingerlings in the above mentioned chemicals is recommended while handling the fish prior to transport, for prevention and spread of diseases - pathogens and parasites.

iii. Factors Which Determine Successful Transport of Fish Seed

i. Total biomass of fish to be transported.

ii. The rate of utilization of oxygen.

iii. Initial oxygen content of water carried.

iv.The rate of entry of oxygen into the system.

v.The rate of accumulation of harmful excretory wastes, especially CO_2 and NH_3 and capacity of the system to trap/remove these

iv. Precautions During Transportation of Fish Seed

i) Healthy and uniform seed should be collected.
ii) Counting should be proper to avoid over stocking in transport bags.
iii) iii.Optimal density for longer duration and higher density for shorter duration of transport may be followed.
iv) iv.Seed should be conditioned properly.
v) v.Adequate precautions should be taken to control temperature of water medium, which the seed is packed.
vi) vi.Polythene bags with fused bottom should only be used.
vii) vii.Generally, 6 liters of fresh and filtered water and 4 liters of oxygen should be avoided for each bag.
viii) After packing the bags should be checked for any leak of oxygen by putting the bag in water.
ix) ix.The fastest mean of transport such as air may be engaged for long distance travel to ensure greater survival.

Conclusion

Creating fish that satisfy market demand as well as personal requirements is the ultimate objective of the fish farmer. A farmer may choose for desired traits like quick growth and disease resistance, among other things, using artificial Production. When fry or juveniles are placed in an environment designed to promote optimal and quick growth, the process of producing marketable fish starts. This allows for the quickest possible harvest. To achieve his desired level of output, the fish farmer must acquire a sufficient quantity of juvenile fish. Wild capture is one way to obtain these fish. An additional key concern is the delivery of fish seed. According to the suggestion, the seed may be transferred from a short

distance to a very long distance by using the right approaches while using various additives and conditioning methods.

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