Captive production of Gangetic mystus (*Mystus cavasius*): A guide for farmers

S.K. Sahoo, S.N. Sahoo, B. Mishra and S.S. Giri

ICAR-Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar-751002, Odisha, India

Gravid females ready for breeding operation.

Aquaculture in Asia began long ago as a small part of farming. Over time, it grew into a commercial industry, thanks to research on many types of fish. Today, Asian aquaculture contributes significantly to global fish production—both in quantity and value. It supports food security, helps rural communities earn a living, and boosts the economy. Governments in many countries are now encouraging more fish farming. With new technology and more fish species being added, the industry is likely to keep growing.

One focus area is farming small indigenous species (SIS) in South Asia. Researchers are working to promote these species and show farmers how to raise them. One such fish is *Mystus cavasius*, a freshwater catfish. It is popular in South Asia because of its taste and nutritional value. This species has strong market demand and is a good choice for freshwater aquaculture. Captive breeding and seed production techniques can help farmers raise it commercially. This article provides guidance to overcome the challenges of seed production.

Brief biology

M. cavasius is found in many parts of Southeast Asia. It is a common food fish in the Indian subcontinent. It lives in freshwater and can also be found in tidal rivers and lakes. Other habitats include ponds, tanks, ditches, flooded areas, and paddy fields.

The fish is silver-white or grey-white. It has a long, flat body and a cone-shaped head. It has four pairs of barbels (whisker-like organs). In adults, the maxillary barbels stretch past the base of the tail fin. The mouth has small teeth in a crescent-shaped band. The tail fin is deeply forked, and the dorsal spine is weak. There is a large section of adipose tissue (a soft fleshy area) after the dorsal fin, ending before the tail fin.

This catfish is omnivorous. It eats many types of food, such as phytoplankton, zooplankton, roundworms, insects and their larvae, and plant materials. Its diet is mainly plant-based.

The fish grows evenly in size. In its first year, it usually reaches 8–10 cm. In the wild, it can grow up to 20–25 cm. Female fish are more common than males. It breeds during the monsoon season, usually after the first rains in July or August. It matures at around one year of age, when it is over 10 cm long. This fish lays many eggs—a 50-gram fish can produce 13,000 to 15,000 eggs.

Broodstock management

M. cavasius brood fish (brooders) are raised in small ponds or cement tanks. The ideal stocking density is 3 to 4 fish per square metre. Earthen ponds are better because they provide natural food along with artificial feed. If using cement tanks, add a 2–3 cm layer of soil at the bottom. This prevents injury to the underside of the fish when they rub against the tank floor.

Brooders are fed twice a day with a fish meal-based diet that contains 30–35% protein. The amount of feed should be 2–3% of the fish's body weight.

Good water quality is important. Maintain the following levels:

- pH: 7.8–8.5
- Dissolved oxygen (DO): 5–6 mg/L
- Total hardness: 80–180 mg/L
- Total alkalinity: 80–180 mg/L

If rearing in tanks, change the water regularly. Also, apply manure to ponds or tanks as needed to encourage natural food production and maintain water quality.

Brooder selection

M. cavasius reaches sexual maturity in its first year and breeds during the monsoon season, from June to August. Females weighing 50–80 grams are ideal for captive breeding. Smaller females can also carry eggs during the monsoon.

Mature males and females can be identified by their secondary sexual features. During the breeding season, males have a long genital papilla, while females have a swollen belly.

Induced breeding

Synthetic hormones like Ovatide, WOVA-FH, Gonopro, or Spawnpro are commonly used to breed *M. cavasius* in captivity. Female brooders are injected with 1.0–1.5 ml of hormone per kilogram of body weight. After the injection, the females are usually ready for egg collection (stripping) in 10–12 hours. The timing may vary depending on the condition of the fish and its response to the hormone.

The stripped eggs are collected in a tray for fertilisation. These eggs are small (0.4–0.6 mm), round, and pale yellow or white in colour. A female weighing 40–80 grams can produce 10,000–22,000 eggs.

Identification of male and female broodstock.

Testes location and morphology.

Sperm must be prepared before stripping the female. Male brooders are dissected to remove the testes, which appear like a lump of muscle with thread-like structures. The testes are located just before the anal opening and below the digestive tract. Once removed, the testes are crushed and mixed with normal saline to create a sperm solution. This is gently mixed with the eggs in the tray for a few seconds to allow fertilisation. One male provides enough sperm to fertilise eggs from two females of the same weight.

The fertilised eggs are sticky when in contact with water. They should be incubated immediately to prevent clumping, which reduces hatching success. A glass jar or flow-through hatchery system is used for incubation. In jar hatcheries,

ropes are hung inside to let eggs stick to them. Alternatively, eggs can be spread in shallow tubs or tanks with a flow-through water system.

Natural spawning method

M. cavasius can also spawn naturally after hormone injection. In this method, the male is not sacrificed, and there is no need to wait 10–12 hours for stripping.

Use a round or rectangular tank of at least 1 square metre. The tank should have a wall outlet and hold water at a height of about 30 cm or slightly less. Injected male and female brooders are released into the tank in a 1:1 ratio (same weight). Keep a continuous water shower running in the tank.

Fertilisation of stripped eggs with sperm suspension.

Fertilised egg incubation for hatching.

Feeding the larvae with compound feed.

Within 12 hours, the female releases eggs, which stick to the tank bottom. After spawning, collect and return the spent brooders to the brood tank. Replace the water in the spawning tank and continue showering. By the next morning, hatchlings can be seen on the tank walls. These are collected using a siphon and transferred for larval rearing.

Primary rearing (larvae to fry)

The newly hatched larvae of *M. cavasius* are very small and transparent. They measure about 3 mm in length. The yolk sac, which provides early nutrition, is oval-shaped and about 0.7–0.9 mm in size. The yolk sac is fully absorbed within 60 hours after hatching. After this, the larvae need external feeding and further care.

Some farmers release yolk-free larvae directly into nursery ponds, often along with carp larvae, due to limited space. However, this leads to high mortality and low survival rates.

To improve survival, it is important to rear the larvae indoors for a few days before transferring them to fingerling tanks or ponds. This early indoor care helps reduce mortality during their most vulnerable stage.

There are three key areas to focus on during larval rearing:

- Good husbandry practices
- Proper water management
- Appropriate food and feeding methods

These factors must be managed carefully to increase the survival rate of the larvae.

Husbandry practice

To ensure survival, tiny *M. cavasius* larvae should be raised in tanks. Once the yolk sac is absorbed, the larvae begin swimming short distances and tend to stay near the bottom and walls of the tank.

It is best to keep the rearing density low—about 5 larvae per litre of water. At this density, the larvae grow well, reaching 22–25 mg in three weeks, with a survival rate of 75–80%.

If too many larvae are kept together, growth and survival rates drop sharply. Some farmers believe high-density rearing will give them more fry, but this often causes crowding stress and poor water conditions, leading to high mortality. For the best results, larvae should be raised in stress-free conditions with proper care.

Water quality management

Because *M. cavasius* larvae are small and fragile, they need clean and stable water to survive. The water in their rearing tanks should be renewed twice a day, with 50–60% of the water replaced each time. Use aerators to maintain good oxygen levels. Gentle water flow or mild recirculation systems can also help, but strong currents should be avoided as they can stress the larvae.

Keep the water depth at around 15–20 cm. In high-density tanks, waste and uneaten food can quickly degrade water quality. These wastes release harmful substances like:

- Free ammonia (NH_3) – toxic even at low levels, damaging the gills
- Ionised ammonia (NH^{4+})
- Hydrogen sulphide (H_2S)
- Carbon dioxide (CO_2)

Levels that may not affect larvae are:

- CO_2: up to 15 ppm
- NH_3: up to 0.05 ppm
- NH^{4+}: up to 0.25 ppm

Even at these levels, long exposure can reduce survival and growth. Regular cleaning and careful water management are essential to keep the larvae healthy.

A haul of fingerlings.

Fish infected by red patch disease.

Dropsy in M. cavasius.

Larval feed management

The yolk sac of *M. cavasius* larvae is absorbed within 72 hours after hatching. After that, the larvae need external feeding. Live feed is the best option during this early stage.

Common live feeds include:

- Mixed zooplankton (like copepods, *Daphnia*, *Moina*)
- *Artemia* nauplii
- Chopped *Tubifex* worms

Before feeding mixed zooplankton, sieve it once or twice to remove larger plankton. Large copepods or *Daphnia* can injure the delicate larvae, reducing survival rates.

Artemia nauplii are rich in protein and support better growth than plankton. *Tubifex* worms can be chopped for easier consumption until the larvae are 7–8 days old. After 8–10 days, chopping is no longer needed.

From the 15th day, gradually replace live feed with a formulated feed containing:

- 35% crude protein
- 8% crude fat

Feed the larvae two or three times a day. Feed as much as they can eat (ad libitum), adjusting based on how much they consume. Remove uneaten feed and faeces daily, and refresh the water to maintain good quality and prevent disease.

Harvest of marketable fish.

After three weeks of indoor rearing, the fry can be moved to nursery ponds or cement tanks for further growth. At this stage, larvae usually reach 30 mg in weight, with a survival rate of 60–70%.

Fingerling production

Fry that are 2–3 weeks old are usually moved to cement tanks or nursery ponds for fingerling production. Farmers often use small, plankton-rich ponds of 50–100 square metres. These ponds provide both natural food and additional compound feed, helping to grow a good number of fingerlings.

However, natural ponds can have problems with predators like birds or aquatic animals. To improve survival, cement tanks can be used as a controlled alternative.

In soil-based tanks, it's helpful to create shelters before stocking the fry. Maintain a water depth of 30–50 cm. These shelters give the fish a place to hide and make them feel safe. They also make feeding easier, as the fish tend to stay near the shelter. This setup can improve survival rates.

Feed the fingerlings with a formulated diet that has:

- 30% crude protein
- 6% crude fat

Feed them 5–6% of their body weight daily. Adjust the feed amount based on how much the fish are eating and seasonal changes in appetite.

If you notice fish coming to the surface early in the morning, this could mean low oxygen levels. This is often caused by filamentous algae or waste buildup at the tank bottom. In such cases, remove the algae with a net and clean the tank bottom. Also, replace some of the water to improve quality.

In 2–3 months, the fingerlings usually grow to 3–4 grams, making them ready for stocking into grow-out ponds.

Grow-out culture

For grow-out farming of *M. cavasius*, small perennial earthen ponds are recommended. These ponds can be easily drained, which is helpful because fully harvesting this catfish with nets is difficult. Cement tanks can also be used, but growth rates are lower compared to earthen ponds.

Although this species is mainly fed with compound feed, the pond should be manured (like in carp culture) to promote natural food. Because *M. cavasius* grows slowly, it is best to stock fingerlings of at least 4–5 grams at a low density—only 2–3 fish per square metre. The fish use natural food well, which supports their growth and survival.

Ideal water quality for grow-out ponds includes:

- pH: 6–8
- Alkalinity: less than 140 ppm
- Dissolved oxygen: above 5 ppm

- Ammonia: less than 0.05 ppm

Feed should contain 30–32% protein to support good body growth. This catfish accepts both floating and sinking feeds. Because of its slow growth, expected production is below 1 tonne per hectare per year. In that time, fish typically reach 30–40 grams. This size has high market demand in the Indian subcontinent.

Health management

Disease is rarely seen in the larval or fry stage. However, illness can appear during the winter or when the season shifts from winter to summer, especially in fingerling tanks and grow-out ponds.

Common issues include:

- Fin rot.
- Skin ulcers.
- Red patches near the tail or body.

Affected fish swim slowly and eat less. To manage outbreaks:

- Replace the water frequently at the first sign of disease.
- Use CIFAX (developed by ICAR-CIFA) to treat tanks or ponds.
- Remove and isolate sick fish to prevent the spread.

Another occasional issue is dropsy, seen in tanks with high organic waste or debris. Affected fish develop swollen bellies, stop swimming normally, and usually die within a few days. These fish should be removed from the tank immediately.

Overall, good environmental management is essential to prevent disease and ensure healthy fish throughout the culture period, and will increase the probability of successful culture.