SUSTAINABLE SEED PRODUCTION TECHNOLOGY OF THE BRACKISHWATER CATFISH, *MYSTUS GULIO*

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Fig 1. The long whiskers catfish, Mystus gulio

Introduction

The long whiskers catfish, *Mystus gulio* (Hamilton, 1822), belonging to the family Bagridae, is a euryhaline fish, that is commonly called as "nona tengra" in Bengali (Fig 1.) *M. gulio* is a commercially important estuarine catfish of Sunderban delta of Bangladesh and India. It also has a decent market value in the states of Andhra Pradesh and Odisha. It is a small indigenous fish species (SIS), having high nutritional value. The domestic market price of *M. gulio* ranges from Rs. 200 – 700/Kg. Its important attributes such as high nutritional value, consumer demand, high market price, hardy nature and faster growth make this species a desirable candidate species for aquaculture in Southeast Asia. Due to its euryhaline nature, this fish can be bred and farmed both in freshwater as well as brackishwater environments. In addition to being suitable for co-culture along with other brackishwater fishes in the paddy fields and bheris of the Sunderban, *Mystus gulio* can also be farmed at high densities in cage and Recirculatory Aquaculture System (RAS). Expansion of farming of this species is hindered mainly because of the unavailability of hatchery produced seeds in sufficient quantities for farming. It was in these circumstances that the Kakdwip Research Centre of ICAR - Central Institute of Brackishwater Aquaculture, West Bengal, India developed and popularized a cost effective, farmer-friendly seed production and farming technology of *M. gulio*.

Fig 2. Broodstock of Mystus gulio

Hatchery Seed Production

Broodstock development

Earthen pond (500 - 1000 m^2), net cages (3x2x1m) or circular tanks (10000 L) are ideal for holding and developing broodstock of Mystus gulio (Fig. 2). This fish attains sexual maturity at the average weight and length of 56g and 6.5cm respectively in 6 months of culture in brackishwater ponds. However, the ideal size of male and female brooders required is 50 - 60g and 60 - 120g, respectively. Therefore, juveniles or adult fish having the size of more than 50g are used for broodstock development. To develop the potential broodstock, adult fish collected from wild or farm has to be reared for 3 - 4 months in a broodstock pond, prior to breeding season (April - August). These fish have to be fed (@ 5% of body weight) twice daily with supplementary broodstock feed (developed by CIBA). One month before the onset of spawning season, the broodstock are fed with chicken liver once daily to satiation.

Male

Female

Reservoir tank

Water from the broodstock pond/canal is pumped to a reservoir tank (10000 L) and sanitized with bleaching powder (200 Kg/ha or 20 ppm). After de-chlorination, water is pumped from the reservoir tank to an overhead tank (OHT, 1000 L). During breeding, water from the OHT is supplied continuously to the breeding unit and a constant water flow is maintained.

Breeding unit

As *M. gulio* attains sexual maturity at relatively smaller sizes, they can be easily bred in smaller breeding pools. The ideal size of circular breeding tank is 1000 L, where three to four set of females can easily be bred. Therefore, to produce large numbers of seed, we may require several numbers of breeding tanks. The breeding pools must have the provision of continuous water flow from the OHT through PVC pipes or be connected to a recirculation system. In each breeding tub, around ten numbers of egg collectors are kept submerged with the help of weights (stone) fixed at one end. The egg collectors are made up of a bunch of nylon fibers, and each bunch consists of around 500 - 600 strips of 15 cm long nylon fiber.

Incubation cum hatching unit

Each breeding pool required two number of Incubation

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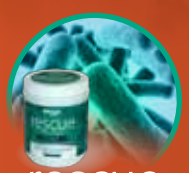

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Fig 3. Egg collector with sticky eggs of Mystus gulio

tanks. Ideal size of incubation cum hatching tank is around 500 L, preferably circular in shape. These tanks must also have the provision of continuous water flow and aeration.

Larval rearing unit

Each breeding unit, should also be supported by one rectangular tank (1000 L capacity) having a height of 0.5 - 0.75m for larval rearing. Larval rearing is carried out for a period of 30 days post hatching (dph).

Induced breeding protocol

Maturity assessment

Sexual dimorphism is distinct and prominent in *M. gulio*. A muscular papilla with reddish-pink tip is present in males whereas, it is absent in females. During the spawning season, mature *M. gulio* are collected from the broodstock ponds. An ovarian biopsy of the female is performed to assess maturity. However, without ovarian biopsy, maturity can be judged through morphological observation of vent; a swollen belly and swollen reddish vent indicates maturity. Mature males can be identified by the presence of elongated papillae with a pinkish tip. Generally, females and males in the size range of 60 - 120 g and 25 - 75 g, respectively, are selected for breeding. The operational sex ratio of males to females is 2:1.

Hormone and dose

A single intramuscular injection of either human chorionic gonadotropin (HCG), luteinizing releasing hormone (LhRHa) or a commercial hormone at a dose of 10 IU/g, 5 µg/g and 20 µl/g body weight of the female, respectively, induces the fish to spawn. Males are injected simultaneously with half the dose administered to females. After hormone administration, one set (one female and two males) is released into a breeding pool.

Egg incubation cum hatching

The latency period between injection and spawning ranges from 8 - 10 h, depending on the stage of maturation and water temperature. Fertilised eggs are

round, demersal, and sticky, and demand the provision of an egg collector (Fig 3). Fertilized eggs get attached to egg collectors, which are transferred carefully into the incubation cum hatching pool. Round the clock aeration and water flow is a must. Incubation period of *M. gulio* ranges from 16 - 18 hours.

Larval rearing

To avoid mortality and stress, the newly hatched larvae are gently transferred to larval rearing units at a density of 25 numbers/L. The newly hatched larvae start feeding two days after hatching just before the complete exhaustion of yolk sac. Larvae are a kind of mixed feeders. They are fed from the second day onwards with freshly hatched Artemia nauplii at a density of 3,000 nauplii per litre, four times per day. Artemia nauplii feeding continues till the seventh day. Thereafter, larvae are fed with both larval feed (500µ) as well as Artemia nauplii. At 30 - 35 days post hatching, larvae attain a size of 35 - 48 mm. During larval rearing, few shooters are seen during the first seven days of rearing. These shooters are cannibalistic and therefore must be manually removed, especially during the first seven days of larval rearing to improve the survival rate.

Nursery rearing

Nursery rearing is essential to produce stockable sized seed for grow-out farming. The larval nursery phase is carried out either in net cage hapas, tanks or small ponds. Nursery rearing in hapa is easy to monitor and economical (Fig. 4). To carry out the nursery rearing, seven to ten days old larvae (0.01- 0.02 g) are stocked in net cage hapa (2x1x1) at an ideal density of 500

Fig 4. Hapa of 2x1x1 m3 size used for nursery rearing of Mystus gulio

Larval rearing tanks

Fig 6. Mystus gulio fingerlings at the end of the nursery rearing phase

Fig 5. Mystus gulio fry

numbers/hapa. Larvae are fed four times a day with larval feed at the rate of 10% of total biomass. After 60 days of rearing, the larvae attain a size of 1.30 - 1.50g at an average survival of 45% (Fig 5). Harvested fingerlings of *M. gulio* is shown in Fig 6.

Value chain of M. gulio seed production technology

Seed production technology has been refined and popularized among the farmers of West Bengal and Andhra Pradesh through hands-on training, demonstrations and technology transfer. While over a hundred farmers benefitted through the hands-on training programme conducted at the Kakdwip Research Centre of CIBA, seed production technology was demonstrated among farmers of Sunderban area of India. Technology was also provided to SC beneficiaries as an alternate livelihood option.

A Memorandum of Understanding (MOU) was signed with the Department of Fisheries, Krishna District, Machilipatnam, Andhra Pradesh, for the transfer of seed production technology of *M. gulio* (Fig 7). Under technical guidance of CIBA, first batch of hatchery bred seeds of *M. gulio* was produced during July, 2021. After rearing the seeds in a nursery for a period of 35 days, the fingerlings were distributed to the farmers on 25th August, 2021 by the hon'ble MLA, Shri. Simhadri Ramesh Babu (Cost of technology transfer was Rs. 200000/-). Presently, hatchery and farming technology of M. gulio is being demonstrated among beneficiaries of the Schedule Caste (SC) community in West Bengal (Fig 8).

Fig 7. Demonstration of M. gulio seed production to Department of Fisheries, Govt. of AP

Fig 8. Sampling of M. gulio being done by thebeneficiaries from the SC community in West Bengal

Economic viability of Mystus gulio seed production

The estimated total cost of production for one lakh seed of Mystus gulio is Rs. 50,000/-, with gross return of Rs. 60,000/- and net return of Rs. 10,000. The Benefit Cost Ratio (BCR) for one lakh seed production is 1: 1.2. Therefore, in a short period of 3 months, total cost of production of 1 lakh seed could be recovered with a net benefit of Rs. 10,000. The returns would be much higher if the production is scaled up.

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