

Indian Spiny Loach Seed Production and Rearing Techniques

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Abstract

Indian spiny loach has a greater market demand in Indian local market due to its delicious and nutritious meat. This demand is met only through wild collection of this fish from natural resources. Wild collection coupled with burgeoning anthropogenic threats to natural ecosystems, especially aquatic ecosystems, significantly threatening the biodiversity of this fish in wild conditions which is placing an immense pressure on the captive breeding and seed production of this species. Moreover, there is a huge demand for this species among the farmers for practicing commercial fish farming. Keeping this in mind, Tamil Nadu Dr. J. Jayalalithaa Fisheries University has initiated its natural and induced breeding at Kanyakumari-Parakkai Centre for sustainable aquaculture. The present article covers the preliminary studies carried out at this centre and the experiments have shown positive results for both natural and induced breeding which can be well explored for standardizing the breeding and seed protocol for Indian spiny loach.

Keywords: Broodstock development, Captive breeding, Loach fish, Seed production

Introduction

Lepidocephalichthys thermalis (Valenciennes, 1846) is an Indigenous fish which is popularly called as "Ayirai Meen" in Tamil Nadu and commonly known as "Indian Spiny Loach" in India. It belongs to the family of Cobitidae and it is delicious as well as nutritious edible freshwater fish (Keskar *et al.*, 2017; Manoharan *et al.*, 2019). Moreover, it has greater consumer preference in different parts of the country, such as Karnataka, Kerala, Maharashtra, West Bengal and Tamil Nadu. In Tamil Nadu, it is highly preferred by people in the Madurai, Theni, Tenkasi, Thirunelveli and Southern districts due to their nutraceutical potential with good taste and flavor. Loach is stuffed with abundant source of calcium, irons and other nutrients. Mostly, loaches, especially in live condition, are considered as high-priced food fishes and marketed with a market price of Rs. 1,500.00-2,000.00 kg⁻¹. It is widespread in peninsular India and Sri Lanka (Shaji *et al.*, 2000). India is endowed with rich biodiversity of fish and other aquatic fauna many of which have the potential for aquaculture but due to anthropogenic activity their

biodiversity and existence are significantly threatened. And many of these species are pushed into vulnerable conditions. In this order, Indian spiny loach has also categorized under least concern (LC) categories as per IUCN.

Loach inhabits ponds, lake, streams and adjacent creeks of paddy fields. Presently, loaches are coming mainly from the capture fishery resources, which are placing a heavy pressure of natural stock depletion. Loach can be grown in small size pond, as they grow smaller in size, with less water quantity of water compared with other inland aquaculture species, due to their easy adaptability and facultative air-breathing behaviors. The non-availability of culture technology, seed production techniques and suitable feed are some of the major impediment for its production. In this connection, the Kanyakumari-Parakkai Centre for sustainable aquaculture, a wing of Tamil Nadu Dr. J. Jayalalithaa Fisheries University, has made effort and developed a natural and artificial induced breeding techniques from preliminary studies. This result could help to meet-out the seed demand and also encourage the farmers to involve in the culture of Indian spiny loach.

Article History

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Captive Brood Stock Development & Management

In a year, it spawns twice during their prolonged spawning activity and they mostly breed between June to August and October to December. The matured brood-stock or juveniles collected from wild conditions such as canals or riverine areas and easily acclimatized to captive conditions (Figure 1). In the case of juvenile fish, water with neutral pH condition (7.0-7.5) and temperature manipulations (from 26 °C to 22 °C) could be used for faster maturation. On the other hand, brooders require good quality of water, mild aeration and diet to attain faster maturity. Cement tank or FRP tank provided with 3-5 cm height of fined sand bottom will yield better results. Brood fish can be stocked with the density of 150-200 Nos. m⁻² (tank). Feed them with sinking crumble feed twice in a day, containing protein of 30-35% @ ad-libitum of the biomass for two months of brood stock development. On fortnight basis, 20% of water exchange is required to maintain good water quality. For natural breeding male and female should be maintained in separate tanks. In general, brooders with more than one year group are highly preferred for artificial induced breeding.

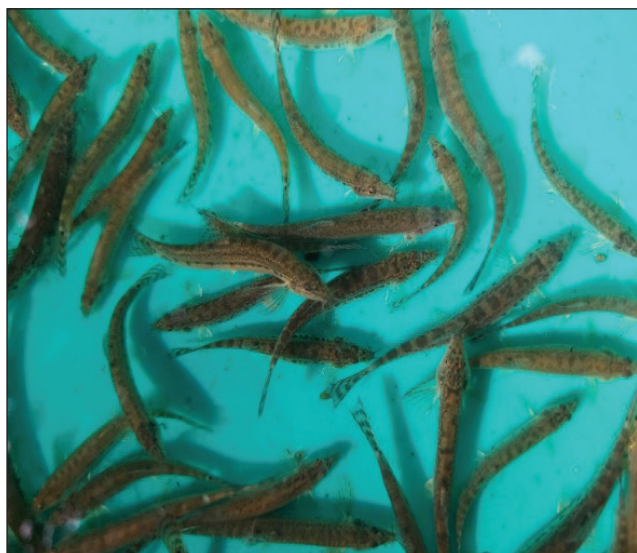


Figure 1: Wild collected loach fish kept for maturation in captive conditions

Selection Criteria for Male and Female Fish

Male and female can be easily distinguished by the abdomen which is prominent in female than male (Figure 2). Male are smaller in size, slender, more pigmented as compared to females. Females are bigger in size, bulged abdomen, with no modification in the 7th and 8th rays of pectoral fin and pale whitish in colour; whereas in male, 7th and 8th pectoral fin has thin layer (ossified fin rays) with milky whitish. Loach attains sexual maturity at the size of 4.5 cm, 1.24 g (male); 4.5 cm, 1.38 g (female) and minimum size at first maturity is 3.3-3.5 cm, observed spawning type is asynchronous; fecundity ranges between 2000-5000 Nos. The ripened ovary average size is 600-768 μ (Kumari and Nair, 1979). The sex ratio of male:female is 1:1 for better breeding performance.

Breeding of Loach Fish

Natural Induced Breeding

After selection of matured male and female fish (one pair),

the fish were stocked in 30 L capacity of rectangular tubs with 10 cm of water depth. Provide 1 or 2 cm layer of sand substrate on bottom of the tub. Maintain the water quality parameters such as water temperature (26-27), pH (6.9-7.5), hardness (60-150 ppm), alkalinity (60-190 ppm) and dissolved oxygen (>5 ppm) for better breeding performance. Feed the brooders with supplementary feed with vitamin and mineral mixture (feed- ad-libitum). Ensure mild aeration or water flow for better breeding performance. Also, avoid frequent disturbance around the breeding units. Between 21-26 days, fish breeds naturally. The larvae can be seen after 72 hrs only. It shows concealing behavior and swim around the bottom.



Figure 2: Brooder identification in loach fish

Artificial Induced Breeding

For any fish artificial induced breeding, a successful protocol needs to be developed for proper handling of fish during the breeding process. In loach fish, the following steps have been practices such as selection, weighing and anesthetizing - injection - recovery.

Anesthesia Preparation

- Add 1 drop of clove oil in 1000 ml of water at a temperature of 26-27 °C and leave the solution as such for 1 hr to get complete dissolution of clove oil (while adding drop, syringe can be used for avoiding of more drops) (Figure 3).
- Then allow the fish to swim in the solution. Carefully observe the fish behaviour until gasping stops and operculum movement became very slow. During this stage, the fish have to be removed and used for injection.
- At this stage, the fish is ready for injection as it does not react for handling or jolt while injecting.
- Place the fish into the sponge and while keeping, the abdomen position of fish should be in top. Prior to this stage, the sponge has to be soaked in water to maintain a wet condition during the injection.



Figure 3: Preparation of clove oil solution for anesthetize the fish

Injection

- The injection is given in the abdominal cavity posterior to the pelvic grille. First, insert the needle into the middle between the pelvic fin and slowly release the inducing agent into the fish body (Figure 4).
- For male below, the dorsal (intra-muscular injection) is suitable and inject gently.
- After injection, transfer the injected fish to normal water for recovery. If recovery is slow, swirl the water towards the gill.

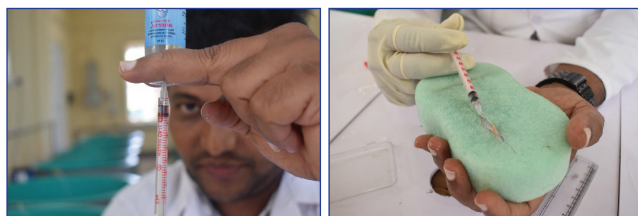


Figure 4: Inducing the loach fish through hormonal injection

Spawning Tank

In the tanks, rear the aquatic plants for hiding and to maintain the water temperature 26 °C or below. In general, loaches prefer some substratum for laying the eggs. Additionally, the egg needs to be collected after fertilization; therefore, a suitable substratum such as sand, gravels and plants, needs to be provided (Figure 5).



Figure 5: Preparation of spawning tank for loach fish breeding

Stages of Embryonic Development

The loach fish fertilized eggs are in spherical shape. The recorded size of fertilized egg was 687.37 μm and they are demersal type. Gastrula stage was observed at the time of 4:30 hrs after completion from the zygote stage. The pre-larvae stages were observed on 96th hours (embryo with yolk sac). Therefore, the incubation periods can be considered between 24 to 48 hrs. However, further studies are needed for its confirmation. After 120 hrs, post-larvae stage with pectoral fin, eye, organ, pigmentation and formation of blotches on body were noticed (Figure 6) (Chaudhari *et al.*, 2022).

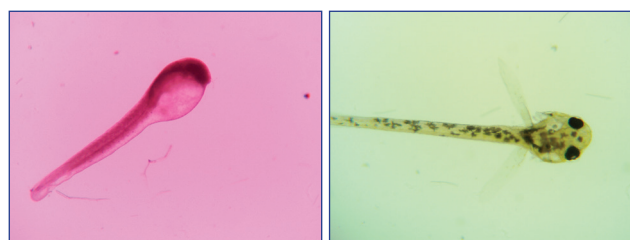
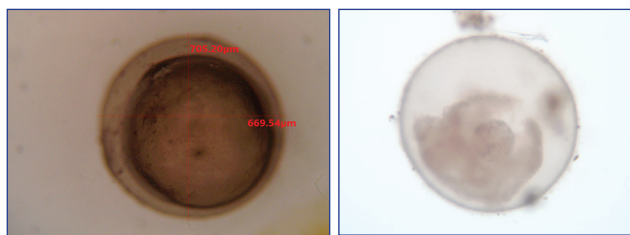


Figure 6: Embryonic developmental stages observed in the loach fish during captive breeding

Seed Transportation

- Prior to packing and transportation, feeding of fry will be stopped for 24 hours.
- Conditioning of seed or fasting of 24 hrs is done to reduce the mortality rate during transportation.
- Seeds should not be handled roughly with bare hands.
- Late evening is the best time for transportation (cool hours). Use cool and clean water for packing the seed.
- When transporting the seeds, avoid direct sunlight falling over the polythen bags.
- Loach seed with a size of 2-3 cm can be transported (1200-1500 pieces bag⁻¹) in plastic bags with 6-6.3 L of water and 14 L of oxygen for more than 12 hrs (Figure 7).



Figure 7: Loach seed packing for transportation



Figure 8: Larval food used for rearing of loach fish fry

Rearing of Early-Fry

The early-fry are stocked in specially prepared outdoor fiberglass tanks. These rearing tanks are equipped with a

Table 1: Recommended water quality parameters for rearing of loach fish

Water quality parameters	Optimum range
Water temperature (°C)	24-28
Dissolved oxygen (ppm)	> 4
pH	7.0-7.5
Alkalinity (ppm)	64-120
Hardness (ppm)	60-125
Ammonia (ppm)	< 0.05

2-3 cm thick layer of fine sand on the bottom. Water depth is maintained at 25 cm. Rice bran with GNOC or copepod larvae can be given ad libitum level as larval food (Figure 8). They reach a size of around 4 cm and it can be used as a stocking material for grow-out rearing. The following water quality conditions (Table 1) can be maintained at larval rearing systems for better production.

Conclusion

Being an indigenous ornament and food fish, Indian spiny loach has a greater market demand in Indian local market. However, the demand is met only through wild collection of this fish from natural resources. Wild collection coupled with burgeoning anthropogenic threats to natural ecosystems, especially aquatic ecosystems, significantly threatening the biodiversity of this fish in wild conditions, which is placing an immense pressure on the captive breeding and seed production of this species. Additionally, there is a huge demand among the fish farmers for this species to carry out commercial farming practices. Therefore, it is the right time to explore the breeding and seed production of *Lepidocephalichthys thermalis* under captive conditions.

Our preliminary studies also have shown positive results for both natural and induced breeding which can be well explored for standardizing the breeding and seed protocol for Indian spiny loach.

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