

Breeding of Three Spotted Gourami (*Trichopodus trichopterus*) – A Hardy Ornamental Species of Aquarium

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Abstract

The three-spot gourami is a hardy and common ornamental fish of the family Osphronemidae, named for two body spots and a dark eye. It shows unique breeding behavior with strong parental care. Males build bubble nests, followed by courtship and spawning. After spawning, the female is removed due to male aggression, while the male guards the eggs until hatching (26–36 hours). Larvae are reared under controlled conditions and initially fed infusoria and egg custard. Its labyrinth organ allows survival in poor water conditions, and strong parental care with easy larval rearing makes it suitable for sustainable ornamental fish culture.

Keywords: Three-spot gourami, Bubble nest formation, Parental care behaviour, Labyrinth organ and Larval rearing.

Introduction

Ornamental fish vibrant in colours with a peaceful nature. Aquarium enthusiasts and hobbyists are drawn to the fascinating colours and graceful movements of ornamental fish. They are often known as “living jewels” due to their brilliant colours (Nematollahi *et al.*, 2016). Aquarium keeping has become a passion and gain popularity over the world wide (Pargunan and Alagappan, 2020). Aquarium is a good way to lessen mental stress (Gee *et al.*, 2019) and helps to connect to the nature by observing their graceful and joyful movements of the fishes. The ornamental fisheries market is a multi-billion-dollar market encompassing participation from over 125 countries worldwide (Raja *et al.*, 2019). As per the Marine Products Export Development Authority (MPEDA), India exported 244 metric tonnes of ornamental fish worth ₹28 crore in the financial year 2023–24. The US is the largest importer of ornamental, while Thailand, Indonesia and Japan are the largest exporter. India possesses huge potential in the ornamental fish industry due to the favourable climate, rich diversity and cheap labour

(Panchani. 2020). It is considered as the sleeping giant in the ornamental fish industry, greater awareness and adequate information among the aquaculturists can flourish this sector (Jena *et al.*, 2019).

Gouramis are a diverse group of fishes and about 133 species are presently known, placed in 4 sub-families and 15 genera (Jena *et al.*, 2019). The three-spot gourami belongs to the order Anabantiformes and family Osphronemidae (Froese and Pauly, 2014). It is a bubble nest-builder (Cole *et al.* 2000) and they are adapted to the confined aquaria. The distinctive characteristics of order Anabantiformes is the presence of labyrinth organ (Adamek-Urbańska *et al.*, 2021). The labyrinth organ enables them to extract oxygen directly from the air which helps Anabantoideis to survive even in the harsh environmental condition where dissolved oxygen level is low (Tate *et al.*, 2017). The three-spot gourami is a preferred species among aquarists because of its hardy nature and flambyant colours. This fish needs little care and survives even with minimal management practices.

Distribution and habitat

Three-spot gourami is native to the south-east asian countries. The species is distributed in Asia, primarily within the Mekong River basin, including Laos, Yunnan (China), Thailand, Cambodia, and Viet Nam, as well as other parts of Southeast Asia (Kottelet, 1998). It is not a native species of India but introduced through ornamental trade.

Three spot gourami is predominantly found in the lentic and slow flowing lotic waterbodies such as swamps, lakes, streams, pond, wetlands, paddy fields (Maddern, 2022). These are predatory in nature mostly fed on zooplankton, insect larvae and small fishes.

Identification and morphology

It is having (total) 6-8 dorsal spines, (total) 7-10 dorsal soft rays; 9-12 anal spines; 30-38 anal soft rays. The dorsal fin is having 8-9 branched rays and the anal is having 30-38 anal fin rays. (Froese and Pauly, 2014). Irregular dark marks are present on the shoulder and yellowish in the opercles and thorax region. Median fins and pectoral fins are brown in colour while pelvic fin is yellowish in colour. They are having numerous narrow oblique bars on the body. The mouth size is very small, lower jaw is prominent and upper jaw is vertical and slightly protectile. The lateral line is curved and irregular.

A black spot is located at the middle of the lateral side, while another is found at the base of the caudal fin. The eye forms the third spot, so they are called three-spot gourami. They are also having two long filaments which is tectile, can sense and gather information from the environment (Low and Lim, 2012). These elongated filaments are the modification of pelvic fin. The average TL of three-spot gourami is approximately 10 cm but it can grow up to 15 cm

SL male/unsexed (Froese and Pauly, 2014).

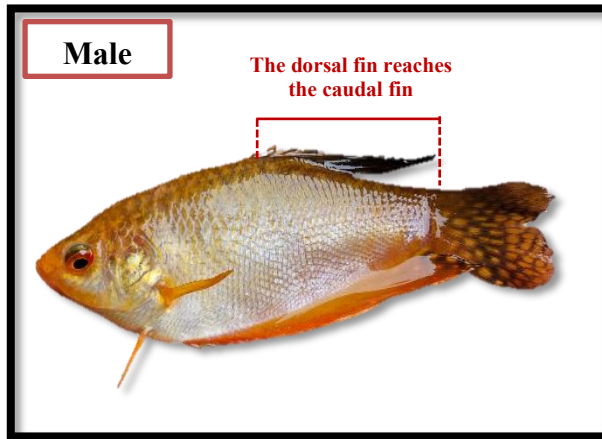


Fig-3: The Male chases the female

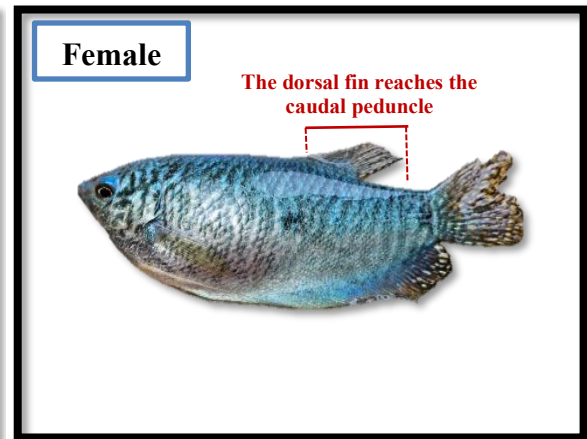


Fig.2: Female (*Trichopodus trichopterus*)

Reproductive biology and Sexual dimorphism

The three-spot gourami can attain sexual maturity at the age of 12-14 weeks and 7cm TL (McKinnon and Liley, 1987). Environmental cues significantly influence sexual maturation and the breeding process. Conducive environmental conditions such as temperature and length of photoperiod play paramount role in reproduction. The fecundity of the three-spot gourami (*Trichopodus trichopterus*) depends upon the size of the females, for smaller female fecundity is about 300-400.

They do not exhibit significant sexual dimorphism; however, males and females can be distinguished upon close scrutiny. Many anabantoids exhibit sexual dimorphism either in the form of colourations / variations in the fin. Finnage dimorphism is used to distinguish male and female in the three-spot gourami. The male's dorsal fin is characteristically longer and can easily reaches the caudal fin (Fig. 1), when it is in relaxed state (Cole *et al.*, 2000). The females are having shorter dorsal fin and can sometimes reaches to caudal peduncle (Fig. 2). Moreover, females have a much-rounded belly and the males possess a slim body.

Broodstock management and water quality parameters

The broodstock management of three spot gourami plays an important role in the whole breeding process therefore at least 2 months of broodstock management is typically required therefore the broods are fed properly twice daily with combination of live feed such as tubifex and other zooplankton and high-quality supplemental feed in order to fulfil all the requirement for gonadal development, after 1-2 month the brood was selected and a 30 gallon tank is prepared with enough hide out, plants and fine plant leaf's (Fig-3) in order to comfort the breeding process and to reduce aggression. The brood should be healthy and disease-free which ensures better breeding and reproductive success. Total 3-4 pair of male (Fig-4) and female

(Fig-5) are released into the prepared tank, the water quality has to be maintained in order to create a stress-free environment, which has to be maintained by regular siphoning and tank cleaning. These measures ensure the broodstock remain healthy and in optimal condition for reproduction.



Fig. 3: Breeding set up



Fig. 4: Mature Male
(*Trichopodus trichopterus*)



Fig. 5: Mature Female
(*Trichopodus trichopterus*)

Courtship, Breeding and Spawning

The brooders are kept in a stress-free environment by water with a pH of 6 to 7.5 and a temperature range of 26 to 29°. Once the brooders are released into tank within few days the male exhibits aggressive and a complex behaviour associated with defending reproductive territories. The tank contains aquatic vegetation and substratum which serve as hiding spots and provide tank support to the nest. The male and female began exploring the tank together. After 5 days, the male three-spot gourami gulp air and produce mucus-coated bubbles to build a bubble nest. Some of the bubbles adhere to the floating and emergent plants, while others are released and adhere together to create an aggregate on the water's surface. Following the completion of the bubble nest, the male chases the female (Fig. 6), encircling female with his body and exerting pressure on her abdomen to release the eggs, and the male then fertilizes. As the fertilized eggs are lighter and naturally floats toward the nest, the male retrieves the fertilized eggs back into the nest if some have fallen down. During each mating event, the female releases eggs in successive batches, which are simultaneously fertilized by the male. This cycle continues until the female has completely released all eggs.



Fig. 6: Chasing of male

Parental care and larval rearing

After spawning, the male exhibits a higher level of aggression towards conspecifics; therefore, the female is removed from the tank to prevent unwanted damage such as fin nip and injury. Hatching takes place within 24- 36 hour followed by male parental care which ceases when all the fish larvae started swimming independently. The newly hatched larvae fed on their yolk sac for nourishment during the first three days, after which supplementary feed was provided. Fish larvae are provided with live feed immediately after the absorption of the yolk sac, and proper aeration ensures higher survival and growth rates. Further, the larvae are transferred to larger tanks for rearing, where they are initially provided with infusoria or egg custard (Fig-7), followed by Artemia as they grow. Aeration plays a crucial role in the larval rearing, as the larval stage is the most delicate stage; maximum mortality occurs at the early stage of their life.



Fig. 7: 5-day old Fry's

Conclusion

The ornamental fish industry is a multi-billion-dollar global market, and India has vast untapped potential but remains a “sleeping giant” due to limited awareness among aquaculturists. The three-spot gourami is a promising ornamental species because of its hardiness, attractive coloration, tolerance to low dissolved oxygen, and ease of breeding. Unique traits such as bubble-nest construction, male parental care, and territorial behavior make it biologically interesting. With proper management, male aggression is controllable and larval survival is high. Selective breeding for reduced aggression, adaptability, and faster growth, along with better market access and awareness, can significantly boost domestic and global ornamental fish trade.

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