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Breeding and Rearing of Angel Fish (*Pterophyllum scalare*) for Mass Scale Production under Captivity

Suraj Biswas*, Shriparna Saxena, B.K. Mahapatra and Deepak Kher
Department of Aquaculture,
Sanjeev Agrawal Global Education University, Bhopal (Madhya Pradesh), India.

(Corresponding author: Suraj Biswas)*
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ABSTRACT: The cultivation of Angel Fish (*Pterophyllum scalare*) in captivity has garnered significant interest due to its aesthetic appeal and commercial viability. This abstract explores the intricacies of breeding and rearing these majestic creatures on a mass scale under controlled conditions. Key aspects of successful mass-scale production include understanding the natural habitat and behavior of Angel Fish, creating optimal environmental conditions within captivity, implementing efficient breeding techniques, and ensuring proper nutrition and health management throughout the rearing process. By mimicking the natural habitat of Angel Fish in captivity, including providing suitable water parameters such as pH, temperature, and water quality, breeders can encourage spawning behavior and increase reproductive success. Various breeding techniques such as pair formation, induced spawning through hormonal manipulation, and selective breeding can be employed to enhance productivity and genetic diversity. Moreover, meticulous attention to nutrition is paramount for the growth and development of Angel Fish fry. Offering a balanced diet rich in protein, vitamins, and minerals, along with regular feeding schedules, promotes healthy growth and reduces mortality rates. Furthermore, effective disease prevention strategies, such as quarantine protocols and routine health monitoring, are essential to mitigate the risk of infections and ensure the overall well-being of the fish population.

Keywords: Angel Fish, Growth performance, Larval rearing, Feeding, Bio-floc.

INTRODUCTION

Angel (*Pterophyllum scalare)* is very beautiful aquarium fish belongs of family Ciclidae. It is also known as the king of aquarium.

It is peaceful and non-destructive fish grown up to a length of 15 cm. the dorsal and anal fins are extremely long. The demand for angelfish in the aquarium trade remains high due to their graceful swimming patterns and distinctive appearance. The pelvic fins are extended into long thread like feelers. It is a soft and somewhat acidic water having Ph 6.8 – 6.9 and temperature 25 degree to 27 degree Celsius. Optimal commercial production is the lack of knowledge on proper diets for the different life stages, in captivity the common live larval food used for graving of most ornamental fish is limited to macro zooplankton such as moina, daphnia, artemia, nauplii. Although it is known that the angel fish accepts artificial diets. Ornamental fish farming is a high-income generating activity (Mahapatra, 1999). It has also great export potential (Anon., 1995). *Pterphyllum scalare* is without question the most popular and generally more available member of the entire family cichladae. This species is notoriously difficult to sex the physical difference which can be used to distinguish the sexes are often only visible during spawning. Male angel fish for visible expect during mating periods. Usually, the male chooses their mate and sometimes the female chooses their mate (Cacho *et al.,* 2007). Males of the species may also exhibit more aggression or territorial behavior. The couple in majority is furiously involved with offspring, mainly during the starting phase of breeding (Cacho *et al.,* 1999). Angel fish tend to breed in pairs but since they are so difficult , it is best to start with a group of 8 juveniles and to wait for there to pair off naturally as they mature to speed up the whole process we have to purchase a ready to breed pair from the pet market .All kind of Pterophyllum species originate from the basin like Amazon basin, Orinoco basin and other rivers like Giana Shield in tropical South America.In nature, there are only three kind of species of Angelfish *Pterophyllum altum, P. dumerili* and *P. scatare* (Anon., 1991). Naturally developed angel fish is a technique of camouflage.

MATERIAL AND METHODS

The experiment was conducted at Fish-breeding Training Centre, Garia, Kolkata. The duration of the experiment was from September 2023 to March 2024. A total number of 12 pairs of brooders with an average weight of 10 g, ranging from 8 g to 13 g, and an average length of 9 cm, ranging from 6 cm to 11 cm Gallif street on 15 October 2023, which is situated at

North 24 Pargana, West Bengal. After collecting the fishes were packed in the oxygenated packet with methylene blue and the packets were arranged in a thermocol box for further transportation. Then the fishes were safely transferred to Fish-breeding Training Centre, Panchpota, Garia, Kolkata-700152.

After procuring fishes were disinfected by giving bath treatment with 5 ppm $KMnO_4$ until fishes show the symptoms of stress. After discarding dead and weak fishes the bath-treated fishes were transferred to 4 glass tanks of 300-litre capacity with continuous aeration. Fishes were acclimated for 14 days in laboratory conditions before starting the experiment. After the procurement brooders were separated into male and female where male were 6 pieces and female were 6 pieces. The breeding of Angel*was* done in a small, improvised glass breeding chamber (3'×1.5'×1.5') in which brooder were placed inside the brood cage. And used an artificial shower. During breeding the sticky eggs were automatically separated through the water flow or by doing hand Jobs. The study is done using improvised tanks. It is placed inside the hatchery. PVC pipe for flowing water are provided since the experimental eggs required continuous flow of water. Continuous aeration was also provided in the improvised tanks to sustain the supply of dissolved oxygen.

Fig. 1. Location of the study site.

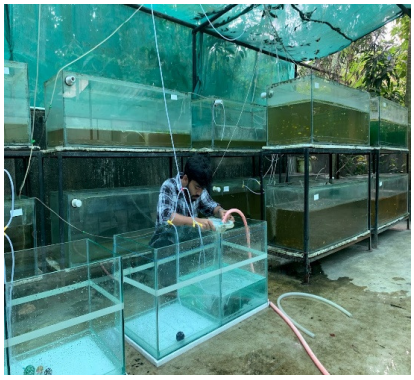

Fig. 2. Settling the tanks.

Materials needed in induced spawning. The materials that were used in the study are: improvised tanks, PVC pipes, slate, Amazon plants or a band of acrylic of about 2 inches wide. Washing materials used in the study were washed to ensure that free from contaminants. Detergent powder was used in washing. Each material is rinsed thoroughly using running tap water from faucet. Materials were dried under sunlight.

For the larval rearing of, *Pterophyllum scalare* we have used a Hatching tank of size (4×1.5×1ft) glass tank for stocking Hatchling to spawn and used a Nursery tank of size (4×1.5×1ft) glass tanks at stocking of spawn to fry. Then we used a glass tank of size (4×1.5×1ft) as a rearing tank for stocking fry to advance fry. After that, we transfer it to bio floc tank with another diameter tank (4"x2"x1" ft) for rearing advanced fry to early fingerling. For bio floc tank preparation we used two separate glass tank with the diameter of 4" x 2"x1" and the water capacity of 250 lit .We added 240lit tap water then added 50gm raw salt and 1ml of methylene blue for disinfection , kept this whole thing for a day . After 24 hrs we added advanced fry of Angelfish into two bio floc tanks (240 lit). After 30 hrs we prepare the FCO solution. For FCO solution we used a 10 lit bucket, poured it with 2 lit tap water then added 1 to 2 gm probiotics (Upper100) and then added solid base molasses (50 gm to 60 gm). Mix it with hand properly and kept it for 1 day with the aeration for fermentation. Then the presence of flocs was determined using a calibrated Imhoff cone. The Imhoff cone should be filled with 1 litre of water collected from the aeration point of the culture tank and kept on a suitable stand for 30 minutes to settle. Water exchange was done when needed. Physico-chemical properties of water was monitored standard methods (APHA, 1985). The volume is then measured from the marking of the Imhoff cone. After 24 hours of complete breeding, when the yolk sac becomes absorbed, we start feeding boiled egg yolk in a 1/4 proportion and observe maximum feed consumption. And used to feed 4 times a day at 6:00 AM, 10:00 AM, 2:00 PM, 6 PM. On day 3 we used to boiled egg yolk both for 4 times. After day 3 we used to feed only green water and infusoria from days 4-8 for 3 times a day. After that used to feed infusoria and dry tubifex from days 9-15 for 2 times a day, next, we used only dry tubifex from days 16-20 for 2 times a day. And after day 20 we used to feed dry tubifex and mosquito larvae from days 21-40 for rearing fry to advance fry 2 times a day. After that, we feed only artificial feed for rearing advanced fry to early fingerlings from days 41-90 for 2 times a day.

Types of feeds used: Boiled egg yolk- the egg was boiled, and then the yolk was used to make the yolk emulsion with water, which was used for feeding purposes. Infusoria culture - Infusoria was cultured using banana peelings and filtered water in a 30-liter water drum, covered with cloth from above to prevent flies and mosquitoes but allow air passage. Regular harvesting was done to get a regular supply of infusoria and drops of milk were added regularly. Dry tubifex- Soak the tubifex in water for 15 minutes before feeding. Then, properly paste it with water and then used to feed. Mosquito larvae culture– For mosquito larvae culture milk solution was added with tap water in a fibre tank of approx. 200 Lt. capacity and left undisturbed. Medium mash-sized net used as cover to avoid the accumulation of unwanted leaves and dirt.

After 2-3 days mosquito larvae were ready for feeding. Artificial feed – used to feed 0.8 mm size feed which contained 36% protein and 6% fat.

Growth performance: We measured the growth performance of Angel in different stages by using different types of feed and sampling the growth for 80 days to assess the final body weight and length of the fish. The weight was taken in an electronic balance. The growth performance was assessed using the following formula.

Fig. 3. Adding the tubifex worms.

Fig. 4. Injecting Hatch-me.

Fig 5. Intramuscular hormonal injection.

RESULT AND DISCUSSION

The spawning success of Angel fish was found after seven trials with different hormonal doses. Spawning success of 100% was observed in Trial 1, Trial 2, Trial 3, and Trial 4. Trial 5, Trial 6, Trial 7. The fertilization % of Angel fish after a successful spawning in Trial 1, Trial 2, Trial 3, Trial 4, Trial 5, Trial 6 are 43%, 74%, 81%, 91%, 84 %, 62%. Highest fertilization % of 921% was observed in Trial 4.The hatching % of Angel fish found in Trial 1, Trial 2, Trial 3, Trial 4, Trial 5, Trial 6 are 43%, 74%, 81%, 91%, 84 %, 62%. Highest fertilization % of 91% was observed in Trial 4.

Table 1: Data on induced spawning of (*Pterophyllum scalare*).

Sr. No.			T1	T2	T3	T3	T4	T6
1.	Total body weight of brooders	Male & Female	11g 9g	12g 10g	11g 10g	12g 11g	13g 12g	12g 11g
2.	Doses of Injection (ml/kg)	Male & Female	0.15 0.55	0.16 0.50	0.17 0.45	0.17 0.35	0.18 0.30	0.16 0.25
	Spawning (Hr)		10 hrs	8.2 hrs	6.9 hrs	6.3 hrs	7.4 hrs	8.7 hrs
3.	Fertilization (%)		43%	74%	81%	91%	84%	62%
4.	Hatching time (hrs)		46 to 56	39 to 46	36 to 40	35 to38	38 to 41	45 to 52
5.	Water Temp	AT Avg(28)	26	28	26	28	29	28
6.	Dissolved Oxygen	Avg D.O. (6.5)	6.1	6.8	7.1	6.5	6.9	7.2

Abbreviations: AT-Air temperature; T- Trial, M- Male, hrs.- Hour, AT- Air temperature, WT- Water temperature; DO- Dissolved oxygen.

Table 2: Details of feeding in different stages of larval rearing of *Pterophyllum scalare*.

Sr. No.	Stage	Age	Feed types	Remarks
1.	Fertilized eggs	0 hr.	-	No feed
2.	Hatchling	36-48 hrs	-	No feed
3.	Spawns	49-52 hrs	Boiled egg yolk	5 times per day
4.	Spawn to fry	4DPH	Boiled egg yolk, Green Water.	5 times per day
		4-9DPH	Green water, Infusoria.	3 times per day
		9-14 DPH	Infusoria, dry tubifex	2 times per day
		14 - 20DPH	Dry tubifex	2 times per day
5.	Fry to advanced fry	23- 50 DPH	Dry tubifex, Mosquito larvae.	2 times per day
6.	Advanced fry to fingerlings	50- 80 DPH	Artificial fish feed	2 times per day

Abbreviations: DPH- Day Post Hatch

Fig. 6. Male Angel fish weight.

Fig. 7. Female Angel fish weight.

Larval growth performance and survivability of Angel fish for 80 days and used to feed different foods in different life stages. A significant difference was between the treatments in terms of length gain, weight gain, and survival rate. We have the length gain of larvae from spawn to early fingerling. The length gain was achieved in nursery tank 0.5-0.7 cm where we used to feed boiled egg yolk & infusoria; length gain in Rearing tank 0.9-1.5 cm (fry to advance fry) by used only dry tubifex and mosquito larvae; and in Rearing tank-1,2,3 4.5-5cm (advance fry to fingerling) where we used to feed only 0.8mm size artificial fish feed. We observed the weight gain of larvae from fry to early fingerling. The weight gain in normal rearing tank-1 rearing tank-2 and rearing tank-3 are.

Table 3: Relation between spawning response time with doses of Hatch-me.

Doses of Hatch-me	Average response time	Characters
0.55	0	— Highly stressed — Settled down to the bottom — Slow movement of fins. — No breeding was found. — Within few hours males separated from females. — Male cannot fertilize the eggs.
0.5	10	— Abnormal behaviour was observed — Come to the bottom, tilting, slow movement of fins, and stressed. — Low fertilization rate was very less (%)
0.45	8.2	— Abnormal behavior was found. — Come to corner of the aquarium. — Dorsal and anal fin closed. — Slow movement of female. — When female introduced to the breeding tank male comes to the female, pushing them but — no response from female. — Lower fertilization rate (%)
0.4	6.90	— Moderate fertilization. — Large no of eggs are released within few seconds.
0.35	6.32	— High fertilization rate (%) — High fecundity — Complete spawning
0.3	7.4	— Fertilization rate reduced
0.25	8.7	— Low fertilization rate (%), less fecundity

CONCLUSIONS

This study describe about the breeding and rearing the Angel fish under the controlled situation with improvised technic along with Bio-floc technology for rearing. These kind of breeding environment offers a rewarding and potentially profitable opportunity for aquarium enthusiasts. This researched has explored various aspects of breeding angelfish in the home environment and examined its commercialization potential. The hormonal intervention also helps to increase the breeding percentages and response time is going down for that, by carefully managing water quality, temperature, and providing suitable breeding fry. From the results, it is evident that induced breeding with Hatch me 0.45ml/kg body weight for female and 0.17ml/kg body weight for male and after successful spawning we used to rear the larvae in a bio floc system and get beautiful colour enhance and growth rate than natural raring tank.

FUTURE SCOPE

The research provide the guidance for ornamental fish breeding studies exploring various hormonal interventions by providing practical guidance in these breeding and rearing portion of aquaculture. Furthermore, it furnishes essential information about the, larval phase rearing and maintenance, serving as a foundational resource for aqua culturists aiming to optimize rearing practices and maximize yield.

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Conflict of Interest. None.

REFERENCES

Anon (1991). The complete aquarium encyclopedia of tropical freshwater fish. Elsevier Publishing Projects, S. A. Lausanne.

Anon (1995). Handbook on aquafarming MPEDA, Cochin.

APHA (1985). Standard methods for the examination of water and wastewater. American Public Health Association, Washington.

Cacho, M. D. S. R., Yamamoto, M. E., & Chellappa, S. (1999). Comportamento reprodutivo do acará bandeira, *Pterophyllum scalare* Cuvier & Valenciennes (*Osteichthyes*, *Cichlidae*). *Revista Brasileira de Zoologia*, *16*(1) 653-664.

Cacho, M. S. R. F., Yamamoto, M. E., & Chellappa, S. (2007). Mating system of the amazonian cichlid angel fish, Pterophyllum scalare. *Brazilian Journal of Biology*, *67*(1), 161-165.

Mahapatra, B. K. (1999). Ornamental fish culture. Fresh water Fisheries Research station, Kulia, Directorate of Fisheries, Government of West Bengal, Publication No. 10.

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