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Research Article

STUDY OF REARING AND BREEDING OF ANGLE FISH (*PTEROPHYLLUM SCALARE*) IN GLASS AQUARIUM

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ABSTRACT
The present study deals with the culture and breeding of ornamental fish in small space and an additional income generating programme especially for women. The study was conducted for a period of 16 months from June, 2010 to September, 2011. The culture and breeding of Angle fish (*Pterophyllum scalare*)was done in glass aquaria of size 30" x 12" x 15" and 48"x 12"x 18"and cement tank of size 40" x 24" x 22" with a regular monitoring of water quality parameters. Water exchange was also done when needed. The various water parameters such as temperature, pH, CO_2 content, dissolved oxygen, and alkalinity was determined daily during breeding period. The breeding of Angel was successfully done in glass aquaria in September, 2010 and Augst, 2011. In two seasons the average no. of eggs per female produced was 180 and 290 respectively. Although the no. of eggs produced was less. The reason for this is probably small size of brooder, small space for rearing of brooders, a short period of rearing of brooders in natural environment.

***Key Words**: Breeding and Rearing, Pterophyllum scalare*

INTRODUCTION
Angel (*Pterophyllum scalare*) is very beautiful aquarium fish belongs to family cichlidae. It is also known as the king of the aquarium. It is a peaceful and non- destructive fish, grows up to a length of 15 cm. The dorsal and anal fins are extremely long. The pelvic fins are extended into long threadlike feelers. It is a native of South America. Angel is an omnivorous fish but prefer frequent change of diet. Angels requires fairly soft and somewhat acidic water having pH 6.8-6.9 and temperature 25-27^{0}c In the present study an attempt was mad to develop a body of knowledge regarding commercial breeding and rearing of the ornamental fishes under local hardy environmental conditions.

MATERIALS AND METHODS
The present study was conducted at department of Zoology Govt. Girls (P.G.) College, Sri Ganganagar Rajasthan. The climatic condition of Sri Ganganagar varies widely with temperature reaching 0^{0}C in winter and 50^{0}C in summer, with almost nil to scanty rains. The study period extended from June, 2010 to September, 2011. Initially, Angel fishes were transported from Delhi. About 20-30 fishes were packed in polythene bag and placed in cartoons and transported to Sri Ganganagar by bus. After 12 hrs of journey fishes were acclimatized for 30 to 45 minute and unpacked and released in cement tanks. Fishes were reared in glass aquarium of size 48" x 12" x 18" and 30" x 12" x 15" and cement tank of size 48" x 24" x 30". According to age and size fishes were fed with farax, readymade food, live food (earthworms, Daphnia) and prepared food. A regular monitoring of water quality parameters were done in all aquaria and cement tank and water exchange was also done when needed. In culture the storage, chlorine free tap water was used. The various parameters of water such as temperature, pH, CO_2 content, DO and alkalinity were determined daily during breeding period. The different water parameters were determined following the methods of APHA (1998) and Trivedi and Goel (1984).

Breeding In Angel (*Pterophyllum scalare*)
Selection of good brood fishes is a prerequisite for easy breeding. Angel matures at the age of 12 months. Female Angel has the longer space between pelvic and anal fin and also this space is less curved. The first

strip passing through the eye is straight in the males but curved in the females. During breeding period, in females, the abdomen is slightly swollen and the vent is larger than the males. The female's breeding tube (ovipositor) is larger and rounded than male's which is slender and more pointed.

Breeding was conducted in glass aquaria of size 30" x 12" x 15" which was provided with a gravel substratum as the eggs of Angel are sticky in nature. Aquarium and gravel were cleaned with potassium permanganate. Rearing was done in glass aquarium of size 48"x 12"x 18". Fishes were fed with daphnia, earthworm and prepared food. A regular monitoring of water quality parameters was done in all the aquarium and water exchange was done when needed. Selected three pairs of brooder (1 male : 1 female) were kept in breeding aquarium in August, 2010 and September,2011. There is no need of aquarium plants in the breeding tank as the Angel preferred filter tube and slanting slates kept in the aquarium. The breeding pair exhibits courtship behavior. Just before actual spawning, pairs of Angel select their spawning site and clean thoroughly with their mouth. The females made test runs with her body over the spot. Her tube rubs gently against it. Then female passed over the surface and her ovipositor released sticky eggs in rows, which adhered to the surface. The male follows close behind the same path. The male also released his invisible milt with his tube, over the just laid eggs and fertilized them. The total process continued for about half an hour until several hundred eggs were deposited and fertilized. Detail of spawning showing in table 2. After fertilization, both the parents showed parental care together or alternately. Both fishes take turn to fan the eggs with their pectoral fins. The fanning is to create a good water circulation around the eggs so that the eggs get good oxygenated water and also prevent fungus growing over the eggs. This nonstop fanning continues until the eggs hatch out. Hatching of eggs in Angel took place after 48-50 hours. After 90 hours, the yolk sac of larvae was absorbed and from 7^{th}day onward they become free swimming. These free swimming larvae were fed with daphnia, crushed earthworm and prepared food. After 10 days young ones were separated from their parents and transferred in a separate aquarium.After about 20 days of rearing the young ones were transferred to cement tank.

RESULTS AND DISCUSSION

The rearing and breeding detail of Angel are presented in table2. Angel is a most popular fresh water fish species in aquarium trade industry. Table no.1 gives the water quality of the rearing water. It would be seen from this table that the water quality remained more or less the same throughout the culture and breeding period. All the parameters were within the range acceptable for fish. The water temperature in the present study ranged between 24^0 to28^0c.Although the recommended pH range for fresh water fish falls between 6.8 and 7.2(Cooper, 2004). In present study Angel was successfully reared in pH ranges between6.8 to7.1.

The quality and quantity of feed are important factors affecting growth and reproduction in fishes (Degani and Yehuda, 1996, James and Sampath, 2002). The short reproductive cycle of aquarium fishes might result in continuous oogenesis in adult female, and hence availability of right type of diet is very important. In the present investigation foods offered were mixed food which contains natural planktons, earthworms, farax and prepared food (soybean flour+ Wheat flour+ mustered oil+ egg+ germinated gram+ salt+ calcium and mineral powder). Nandeesh *et al.,* (1994) reported that mixed feeding schedules were superior to the high protein of a single diet because nitrogen retention was high in fish fed with mixed schedules. Farex was given as it is known to be the best food for the aquarium fishes because of its high digestibility and the resultant low metabolic wastes. In present study, the breeding of Angel was successfully done. Although the no. of eggs produced was less. The reason for this is probably small size of brooder, small space, a short period of rearing of brooders in natural environment and immaturity of brooders. The small size of brooder was used due to the availability of small space. A large, active fish cannot be expected to spawn in a small space. (Mercy Anna, 2009). As the larger fish (length & weight) has drastically more fecundity then the smaller size. (Solomon, *et al.*, 2011). A general ratio of one male to one female (1:1) was maintained.

The breeding detail of Angel is shown in table 2. Breeding was conducted in the glass aquarium in two seasons, first in September, 2010 and second in August, 2011. Three pairs of brooders were used for breeding in each season. The total number of eggs laid was 540 (average 180 eggs per female) in September, 2010 and 870 (average 290 eggs per female) in August, 2011. After fertilization, both the parents showed parental care together. Both fishes take turn to fan the eggs with their pectoral fins. Hatching was took place in 48-50 hours. After a period of one month of rearing about 150 and 220 young ones survived in September, 2010 and August, 2011 respectively.

By maintaining the temperature, the ornamental fish can be bred and reared in the local area as an indoor aquabusiness. Less space requirement and less investment with high cost benefit ratio are the main advantages (Table-3). It can be treated as a small scale bio industry especially for women as an additional income generating programme, similar obervations have been made by *Ghosh et al.*, 2000. In rural areas and small towns a small open space of the houses may be converted into a small ornamental indoor fish culture unit and can generate additional income source from this trade especially by women.

Table 1: Physico-Chemical Parameters of Water During Culture and Breeding of Angel Fish

S.No.	Parameters	Culture	Breeding
1	Water Temperature(0c)	24-28	25-27
2	Alkalinity (mg/l)	5.2-6.7	5.5-7.4
3	DO (mg/l)	7.1-7.4	7.1-7.6
4	CO_2 (mg/l)	3.3	2.9
5	pH	6.8-7.1	6.7-7.0

Table 2: Breeding Details of Angel Fish (September, 2010 & August, 2011)

S. No.	Particulars	Angel Breeding In Sept. 2010	Angel Breeding In August 2011
1	Age of fish at spawning	11-12 months	22-23 months
2	Water temperature	25-27^{0}c	26-27^{0}c
3	Water pH	6.7-6.9	6.8-7.0
4	Male : Female ratio	1 : 1	1 : 1
5	No. of pairs of brooder selected	3 pairs	3 pairs
6	No. of eggs laid	540	870
7	Fertilization percent	90-95%	90-95%
8	Hatching period	48-56 hrs	48-56 hrs
9	Hatching percentage	60%	50%
10	Average no. of fry survived after thirty days of rearing	150	220

Table 3: Economics of Angel Fish Rearing (For 1000 Fry Rearing)

S.No.	Particulars	Rate(Rs.)	Total Value
	CAPITAL COST		
1	3 Aquarium(48" x 12" x 18")	1500/-pc	4500/-
2	2 Cement Tank(48" x 24" x 30")	1000/-pc	2000/-
3	5 Air Pumps	200/-pc	1000/-
4	5 Water Heater	200/-pc	1000/-
	CULTURE COST		
4	Cost of brooders (100 nos.)	20/-pc	2000/-
5	Cost of feed for 60 days	20/-per day	1200/-
6	Miscellaneous expenditure		1000/-
	SALE		
7	After 15 days of rearing(200 pieces)	5/-pc	1000/-
8	After 30 days of rearing(200 pieces)	7/-pc	1400/-
9	After 60 days of rearing(600 pieces)	10/-pc	12000/-
10	Profit in two months culture period		14400/-
11	Annual profit (3 crops)		43200/-
12	Annual net profit (after deducting capital cost)		20500/-

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