

Reproductive Behaviour of Ornamental Angel Fish, *Pterophyllum Altum* (Pellegrin, 1903) Under Aquarium Condition

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Abstract

An Angel fish species, *Pterophyllum altum* (Pellegrin, 1903) was studied on the aspect of reproductive biology in relation to clutch size, growth rate of larvae and juveniles, parental care in aquaria. Temperature and pH of tank water were recorded daily and correlated with reproduction. Both sexes were observed to be aggressive with parental care, especially during breeding time. Throughout the life span, females bred for seven to nine times. Under the temperature of 28C° hatching was observed between (2-3) days after being laid. Newly hatched larvae attached to substratum and do not swim for (3-4) days. Sexually matured at the age of five months and pair formation was observed in six-month olds.

Key words; Angel fish; reproduction.

Introduction

Among ornamental fish, Angel fishes of *Pterophyllum* species are popular and commonly known. They have a unique position in the fish keeping world and are called the "King of the aquarium," or "Angel fish" and they are extremely beautiful animals with highly varied finned and color schemes (Wakes, 1991). *Pterophyllum* is derived from a Greek word (Greek *pteron* "wing + *phullon*") meaning "winged leaf." They are more disc-like structure and have two fanned fins. Depending on the variety, they may differ in shape (Walker, 1974; Loiselle, 1985). The genus *Pterophyllum* comprises three species, all of which are native to South America. *Pterophyllum altum* (Pellegrin, 1903) is native to the upper Orinoco River basin and the upper Rio Negro drainage in South America. *P.altum* is more disease resistant than the other species. The breeding of this species and the behaviour of the ornamental fish in captivity was possible since native aquarists have been successful in breeding various varieties of Angel fish with different color and different shape. This fish was first introduced to Myanmar in 1960 (Roy Mya Thein,).

The present work was conducted to investigate the reproductive behavior of angel fish in aquarium.

Materials and Methods

Study site and Study period

Commercial ornamental fish breeding farm Yangon. Study period lasted from April 2004 to April 2006.

Preparation of tanks

Glass aquaria of (45cm×60cm×45cm) and (30cm×45cm×30cm) were used in this experiment. Glass aquaria were cleaned thoroughly and filled with water for two days in order to remove toxic substances if present. Then, replaced with clean water and aquaria were placed to obtain proper sunlight and proper aeration.

Rearing of breeders

Into each (45cm×60cm×45cm) tank, 8-10 two-month old breeder fishes were introduced carefully by acclimatizing the water from aquarium and that from fish container. Breeder fishes were fed with of *Tubifex* at the rate of two per cent of body weight daily at 9:00 and 16:00 hrs. The mature males and females were allowed to pair naturally. Every three days half of the water of the aquarium was siphoned out and refilled with fresh water. Every aquarium was cleaned once a week.

Breeding

When breeders were at about six months old, a pair of fish was chosen from the group and kept in a breeding tank measured (30cm×45cm×30cm). Feeding was conducted as above. A piece of rectangular flat stone (10cm × 20cm) was leaned against one of the walls of the aquarium to facilitate as egg laying substrate. Half of the water was replaced daily.

After the eggs were laid, aeration was softly done by aquarium air pump (AC- 220-240 V 50 Hz). Then, 0.003 g of methylene blue was put into the aquarium as fungicide. One third of water was exchanged daily and debris removed during this procedure. The fry were removed from the breeding tank to the rearing tank no later than two weeks after spawning

Collection of data

Breeding frequency, resting period between breeding, incubation period and free-swimming period of fry were recorded. The numbers of the

eggs were counted by plotting cm^2 on the surface of the slate. The eggs in a cm^2 plot were counted and multiplied by the numbers plots to obtain total numbers of egg (Table1 and 2). The hatchability and survival rate were calculated as a percentage according to the clutch size of egg.

Water parameters

Daily, at 13:00 hr pH was recorded with pH-EC-TDS METER and water temperature was recorded by a thermometer.

Feeding to fry fish

Young free swimming fry were fed *ad libitum* with freshly hatched brine shrimps (*Artemia nauplii*) when the fish started swimming for two weeks.

Results

Behaviour of breeders

Female and male of *P. altum* sexually matured at the age of six months and naturally paired in captivity. At that time, the male used to define his territory at a corner of tank and protects it against invasion of other fish. Large males typically have a more rounded lateral profile of head than do females.

At the time of spawning, the genital papilla of the female usually appears as a larger and more blunt outgrowth, while that of male was more slender and pointed. The vent of the female is swollen due to developing ovaries during the breeding time. The colour of both male and female was more distinct. Besides, their fins were spreading like fans. But their colour became normal after spawning.

During breeding, less feeding rate was observed. The feeding rate of male was higher than female. The egg lying females almost stop feeding or feed less for three or four days, then, feeding rate increased again.

Parental care

Angel fish are monogamous with parental care and substrate spawners. They spawn freely under aquarium conditions. Their parental care was observed to last from the period of laying eggs to the mature enough to defend for them.

Female *P.altum* usually lays their eggs on any vertical surface that had been nipped clean. That was done two to three days before egg laying, using their mouth to bite and scrub the surface of the slate. After then, the female passed over the site and deposited eggs which adhered to the surface. The male was found to pass alternately as if it was releasing spermatozoa in order to fertilize the laid eggs. Once the eggs are laid, both parents took turns in fanning the eggs with pectoral fins. Sometimes an adult removes damaged eggs with pectoral fins and sometime eats it. Eggs that were scattered at the bottom of the tank were found to be unfertilized.

If disturbed, the male or female would eat their eggs or fry. Parental care persisted up to four weeks in captivity. Two weeks after post spawning, most pairs were observed to spawn again.

Breeding was found to be temporarily halted where breeding pairs were transferred or introduced into a new tank. When the view on the wall of the aquarium was changed (i.e. paper or picture), they were observed to stay away from that strange new view. Spawning was also disturbed by frequent appearance of movement outside the aquarium.

Pterophyllum altum

Throughout the life span, a pair of *P.altum* usually breed for average of seven times however some breed for ten times (Table 2).

Resting period

Resting period between two successive breeding was observed to vary in the breeding pairs of *P.altum*. Most pair rested for (15-50) days before breeding again

(Table 1 and 2).

Clutch size

The clutch size differed in different breeding pairs. In most pairs, the mean and the range were examined to be 560 (200-1000) eggs (Table 1 and 2).

Incubation period

Good temperature of 28 to 30°C incubation period lasted for 72 hours. Longer incubation periods were observed under very high water temperature of more than 30°C or low water temperature of less than 20°C.

Hatching rate and survival rate

Good aeration and temperature within 28°C to 30°C, was optimum for high hatchability. The survival rate depended highly on aeration. With fully aerated condition, under the temperature of 28°C, survival rate was 50%.

Eggs and larval development

Eggs

Eggs usually were small, round and translucent in the beginning. Damaged eggs turned white and were devoured by the parents.

Eggs hatched within 72 to 96 hours according to the temperature of the tank. The larvae with yolk sac were observed to be hanging from the slate and shifted by either of the parent from one place to another on the vertical plate. Sometimes they were moved to the floor of the aquarium. The mouth was not formed. No fin was differentiated. The larvae did not swim freely; they swing their tail rapidly while still attached to the substrate.

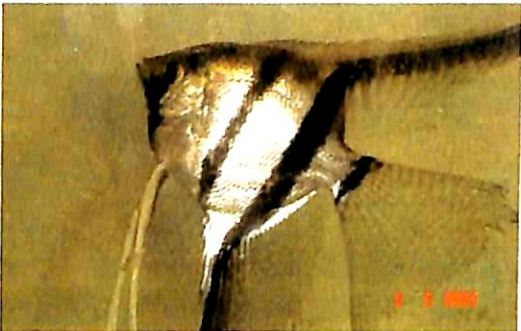
Larvae started swimming freely on about the seventh day of development. The pair gulped their young in their mouth and blew out a corner of the tank. They took a rest after the young had been still when darkness fell. This behaviour was observed till the second day of free swimming period. The oval shaped swim bladder was visible; made of thin transparent membranes. Parents frequently moved their young from place to place.

Larval behaviour

Newly hatched larvae attached to the substrate with the help of the cement produced from their heads and wriggled their tails for 72 hours. After that, they detached and started swimming as fry. Free-swimming was observed first in the stronger and bigger fry followed by smaller ones. Under too high temperature of more than 31°C and lower than 27°C, the young were observed to be crawling at the bottom of the aquarium.

Plate . Reproduction of angel fish

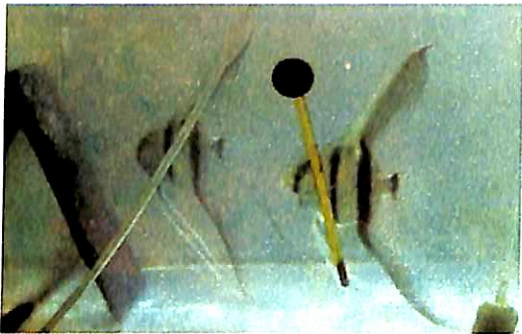
- A. *Pterophyllum altum*
- B. Laying the eggs of *P. altum*
- C. The eggs on the flat stone



A



B



C
Plate

Table 2. Breeding performance of *P. altum* pair II, April 2005 to April 2006

No of breeding	Breeding time	Mean Temperature (C°)	Resting period (days)	Clutch size of egg	Incubation period (hours)	Hatchability %	Survival rate %	Free-swimming period (hours)
I	Aug./05	31	-	300	96	66	13	96
II	May./05	30	23	500	72	40	13	96
III	Jun./05	28	30	1000	72	30	50	72
IV	Jun./05	28	16	800	72	50	25	72
V	Aug./05	28	35	700	72	63	40	72
VI	Sept./05	28	39	500	72	40	40	72
VII	Sept./05	28	17	300	96	66	25	96
VIII	Oct./05	30	27	300	72	66	10	72
IX	Nov./05	28	14	200	-	-	-	-
X	Dec./05	27	22	500	72	60	33	72
	Mean	28.6	22.3	560	69.6	48.1	30.5	70
	Range	27-31	14-39	200-1000	72-96	30-66	10-50	72-96

Discussion

The Angel fish was monogamous with biparental care and substrate is a spawner as stated by Jennifer and Wilkison (1995). Moreover, they were strong territory providers and aggressive during spawning season. It was also stated that the sex can be easily determined by the genital papillae. Similar behaviours were also recorded in the present study: Females could be distinguished from males by the swollen vent.

Swann (1994) stated that *P.altum* spawns rarely in aquarium conditions. In the present study, *P.altum* bred successfully in aquarium. The females usually bred for 7-9 times, then died. Number of eggs in clutch varied in all breeding pairs due to food and the nature of the fish. Difference in resting period may depend on temperature as well as other environmental conditions. Similarly, various incubation periods may be due to aeration, temperature and water quality. Aeration was done from the egg laying to the young about two week old. It was recorded that the optimum pH ranged from 6.8 to 7 in rainy season and from 7 to 7.2 in summer for breeding. The pH and temperature were not differed during at the study period.

Free-swimming period also needs appropriate temperature and good aeration. Sometimes longer free-swimming may be due to the water quality (Barker, 2000). So that, one third of water should be exchanged regularly during spawning season. Moreover, it is necessary for the young to have sufficient oxygen and suitable size (45cm×60cm×45cm) of the tank.

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