

Effect of Feeding Frequency on Fecundity In Angel Fish (*Pterophyllum scalare*)

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Abstract: The freshwater angelfish (*Pterophyllum scalare*) is South American cichlid became very popular among aquarists. In order to examine the effect of feeding frequency on fecundity angel fish, an experiment for 8 months in center of ornamental fish reproduction and breeding (Mazandaran-Behshahr) was conducted. The five treatments (one time a day, two times a day, three times a day, four times a day and five times a day) were used in this experiment. There were no significant differences in fish fecundity between 2, 3, 4 and 5 feeding frequencies but there was significant difference between these treatments with 1 treatment fish in 1 treatment did not reach maturity and did not spawn.

Key words: *Pterophyllum scalare* • Feeding Frequency • Fecundity

INTRODUCTION

Ornamental fish farming is an important primary industry [1]. Ornamental fishes are often referred as living jewels due to their color, shape and behavior [2]. They are peaceful, generally tiny, attractively colored and could be accommodated in confined spaces [2]. Angel fish is one of the most popular freshwater fish species in the aquarium trade industry [3]. Due to its body coloration, shape and economical value the angel fish represents one of the most important ornamental cichlid species [4]. Angelfish are endemic to the Amazon basin. In nature, they are found in soft, acid water that is very warm most of the year, usually around 26°C. Their natural environment is one of slow moving water that has many hiding places such as roots and tall plants. Angelfish usually pair up and start showing spawning behavior between the ages of 8 and 12 months [5]. When a pair is beginning to form, the two fish may take part in short jaw locking "battles." The pair will choose a spawning site and begin cleaning it with their teeth. The male's ovipositor is smaller and more pointed in shape than that of the female. Two or three days after the cleaning commences, spawning begins [5]. The female lays rows of eggs on the spawning site and the male follows behind

her, fertilizing them. When spawning is complete, there will usually be several hundred eggs there and there may be as many as 1,200 if the pair is mature and in good condition. Any eggs which are infertile will turn white over the first day or two [5].

Good nutrition in animal production stem is essential to economically produce a healthy, high quality product [6]. Since the feed cost accounts approximately 40-60% of the operating costs in intensive culture systems, the economic viability of the culture operation depends on the feed and feeding frequency [7]. It means that nutritionally well-balanced diets and their adequate feeding are the main requirements for successful culture operations [8]. The growth of fish at all stages is largely governed by the kind of food, ration, feeding frequency, food intake and its ability to absorb the nutrients. Among these, feeding frequency is an important aspect for the survival and growth of fish at the early stage [9]. Therefore, feed quality and feeding strategy are of great importance in fish nutrition science [10]. One problem confronting by fish culturists is to obtain a balance between rapid fish growth and optimum use of the supplied feed. Among these, feeding frequency is an important factor for the survival and growth of fish at the early stage [11]. The optimal frequency for feeding

ornamental fish species has yet to be clearly defined and this has led to uncertainty in the feeding routines used by many aquarists. Both over- and underfeeding can be detrimental to the health of the fish and may cause a marked deterioration in water quality, reduced weight, poor food utilization and increased susceptibility to infection [12]. Consequently, specific growth rates and the efficiency of feed conversion can be directly related to feed ration and frequency. Therefore, it is important to be able to predict the most favorable feeding frequency relative to the species and size of fish. Although it is often postulated that feeding ornamental fish little and often throughout the day will result in more efficient feed utilization, research has not yet been conducted to validate this hypothesis. Published literature on frequency of feeding ornamental fish is limited when compared with that available from cultured fish species. Data from aquaculture research is commonly extrapolated and applied to ornamental species, which often proves to be unsatisfactory because of the differences in fish species and variation in diet formulations. In addition, the majority of research has focused on feeding fish to satiation, measuring the food intake and linking this to growth performance and utilization [13]. Many authors studied the effect of feeding frequency on food intake and growth in edible fishes but little attention has been paid to the impact of feeding frequency on growth and reproductive performance in ornamental fishes [14].

MATERIAL AND METHODS

Experimental studies were carried out at center of ornamental fish reproduction and breeding (Mazandaran- Behshahr) for 8 months. Angel fishes were obtained from a hatchery in Tehran and transported to the center of ornamental fish breeding and reproduction in aerated bags. Fish were acclimatized to laboratory conditions for two weeks in 72 L aquaria and fed two meals a day. After this period 60 fishes were distributed into five aquaria (measuring 60 × 40 × 30 cm). Trial conditions included twelve fish per aquaria and five feeding frequencies. Fish were kept under natural photoperiod of approximately 12/12 h light/dark cycle and fed a commercial feed (Coppens, Holland) once (at 10.00 h), twice (08.30 and 14.30 h), thrice (08.30, 12.30 and 16.30 h), four times (08.30, 11.30, 14.30 and 17.30 h) and five times (08.30, 11.00, 13.30, 16.00 and 18.30 h) daily respectively, to 3- 5% body weight for 8 weeks. Food composition used for juveniles listed in Table 1.

Table 1: Food composition used for juvenile

Food composition	
Protein	40-43
Water	8-10
Fat	9-11
Carbohydrates	8-12
Vitamin supplement	2
Minerals	10
Mineral supplement	2

Table 2: Angel fish fecundity in different treatment

	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Fecundity	608±73 ^a	610±88 ^a	485±21 ^a	592±146 ^a

- Data are represented as mean ± SD -Fish in treatment 1 did not spawn.

Fish aquaria were cleaned by siphoning out residual feed and fecal matter, water in the aquaria were changed thrice weekly. During the experiment, water temperature was within 26 – 29°C. Ammonia content in the water and pH was measured for each treatment (Table 2). After the fish were mating, each pair was transferred to a separate aquarium. A tile or stone in each aquarium was placed in italics. During spawning, the fish are laying eggs on the tile. After spawning, the tiles containing eggs removed from the aquarium to avoid being eaten eggs by breeders. Tiles containing eggs were transferred to another aquarium then Methylene blue was added to the aquarium to prevent light from entering. Each aquarium was aerated by a stone aerator. Then the number of eggs laid by breeders in each treatment was counted using a magnifying glass. Some water parameters such as ammonia, pH were measured. The data collected was performed by One-Way-ANOVA with Duncan test using SPSS 16.

RESULTS

The results indicate that treatments 2, 3, 4 and 5 did not differ significantly (P<0.05) but they had significant difference with treatment 1 (P<0.05). So, feeding times of 2, 3, 4 and 5 times a day are not influence fish spawning period (Table 3).

There was no significant difference in ammonia content in treatment 2 and 4 but there was significant difference between these treatments with treatment 1, 3 and 5 (p <0.05). There was no significant difference in pH value in treatment 3 and 5 and also treatment 2 and 4 but there was significant difference between these treatments with treatment 1 (P<0.05).

Table 3: Water quality parameters of angel fish during the experiment

	26-28°C				
Temperature	-----				
Treatment	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Ammonia	0.67±.026 ^a	0.26±.020 ^b	0.33±0.30 ^c	0.22±030 ^b	0.14±025 ^d
pH	7.14±.020 ^a	7.37±.025 ^c	7.23±0.30 ^b	7.37±.026 ^c	7.24±.020 ^b

DISCUSSION

Many experiments were carried out on the effects of feeding frequency on growth and sexual maturation. The aim of this experiment was to investigate the effect of feeding frequency on fecundity in angel fish. Effects of feeding frequency on growth of fish reveal different results for different species [15]. In an experiment conducted on fighting fish (*Betta splendens*) Effect of feeding frequency on growth and fecundity of the fish were examined. The experiment showed that the fish were feeding two times a day had most fecundity than the other treatment (one time a day and three time a day) [14]. In this experiment, the frequency of feeding 2,3, 4 and 5 times a day on angel fish fecundity has not been effective and feeding once a day, probably due to increase the amount of ammonia and water quality change the fish did not reach maturity and did not spawning.

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