

Investigation of the growth rate of *Cichlasoma* sp. (Gunther, 1867) rearing with different diets in aquaria

Aye Aye Than¹, Nwe Nwe Aung², Khin Maw Maw Myint³

Abstract

The present study was conducted to compare the effect of the two types of food on the growth of Flowerhorn fish. The study period lasted from May 2017 to April 2018. The experiment was conducted in four glass aquaria to study the growth performance and feed conversion ratio (FCR) of *Cichlasoma* sp. (Gunther, 1867) (hybrid flower horn) fed on fresh food (shrimp) and dried food (Humpy head). Two replicates for each ingredient were followed. The feed was supplied at the rate of 4% of net body weight of fingerlings twice a day. The flower horn fingerlings fed with fresh food gained the highest body weight (101.25 ± 26.57 g), followed by dried food (50.75 ± 2.9 g). The total length attained by fish was 15.25 ± 1.84 cm on fresh food and 12.25 ± 1.19 cm on dried food. The overall mean value of FCR was lower (better) in fresh food (1.00 ± 0.40), than that of dried food (2.01 ± 0.78). Fresh food (shrimp) was better for the growth of the fish and dried food (Humpy head) was less the effect on the fish growth. Thus, The fresh food, on the basis of growth performance and better FCR, should be added to feed in the rearing of flower horn.

Key words: Growth performance, Feed Conversion Ratio (FCR),

Introduction

People culture aquarium fishes for recreation and economy. Fish undoubtedly have a soothing and therapeutic effect upon the human psyche. Keeping aquarium fish as a hobby gives a peaceful effect for the people. Watching fish swimming in an aquarium is extremely calming and peaceful, especially after a stressful day (Goodwin, 2001).

The success of commercial aquarium operations depends on a variety of factors relating to the fields of biology, engineering and economics. One key biological component is the availability of suitable diets that are efficiently digested and provide the required nutrients for optimum growth (Mokolensang *et al.*, 2003).

¹ Dr., Lecturer, Department of Zoology, East Yangon University

² Dr., Lecturer, Department of Zoology, East Yangon University

³ Dr., Lecturer, Department of Zoology, East Yangon University

Flowerhorn is one of the most popular and expensive fish available today. Flowerhorn cichlids are ornamental aquarium fish noted for their vivid colors and the distinctively shaped heads for which they are named. Their head protuberance is formally termed a "nuchal hump." Another interesting feature of the Flowerhorn is the black horizontal markings or known as just 'flowers'. Some of these markings resemble Chinese characters and this fetches a high price for the owner. First developed in Malaysia and Taiwan, they are now kept by fish hobbyists worldwide. Flowerhorn fish is a hybrid artificially bred (Anonymous, 2017).

Fishes have various diets according to their feeding habits. Correct and suitable amount of diet produces healthy, colorful and disease-resistant fish. Healthy fish are more colorful than unhealthy one. The intensity of coloration greatly depends on the diet of the fish (Mokolensang *et al.*, 2003).

The growth and feed conversion ratio (FCR) of a fish is remarkable tool to compute the acceptability of artificial feed. The proper information of FCR on locally available ingredients will provide the basis to develop acceptable feed, though the task of preparing acceptable and suitable artificial feed for fish is complicating due to its feeding preference (Jhingran, 1991). This paper describes growth rate and feeds conversion ratio of available feed ingredients for hybrid flowerhorn.

The present study works are conducted with the following objectives;

- to study the growth rate of flowerhorn associated with two different diets
- to determine the different mean weight, mean length, rate of maturation in two different diets
- to formulate cheap diet using locally available as feed for aquarium fish

Material and methods

Study site and study period

The study site is in the Laboratory of Zoology Department, East Yangon University. Study period lasted from May 2017 to April 2018.

Selection and maintenance of the rearing tanks

One month old flower horns are used for the experiment. The fishes were collected from the breeding pond of Lucky pet aquarium shop. The

experiment was done in four glass aquaria. The working dimension of each aquarium was 90 x 30 x 30 cm³. Flowerhorn needs plenty of open swimming space. As tank make recommended to keep them with fish of similar size and similar behavior. Each aquarium was filled with water up to level of 25 cm which was maintained throughout the experimental period.

Each aquarium was stocked with two fingerlings. Glass aquaria which have been cleaned with salt for nearly two days were used to avoid the presence of toxic substances. The aquaria were placed to obtain sunlight. Every three days, three quarters of water of the aquarium was siphoned out and refilled with tap water. Aquariums were covered with plastic mosquito-net lids to prevent unnecessary disturbance and escape of fishes. Cleaning of four aquariums was done on a weekly basis.

Recording of water parameters

The water temperature of rearing media was monitored twice a day with the use of common thermometer. Like most tropical fish, flower horn thrives in temperature between 20 - 30°C. The range of water temperature was supplied between 28 - 31°C during study period by using heater.

Water quality in terms of pH was analyzed once a week using color matching method. The pH scales ranges from 6.5 - 7.7 in order to maintain stable water conditions. Dissolved oxygen and pH of water in each aquarium was monitored by changing water daily and by using air pump.

Filtration System

A good filtration system is extremely important in an artificial aquatic environment. The best of the fish (coloration, nuchal hump and overall health), incorporates an efficient filtration system. Due to its eating habit (messy eater that produces a lot of waste) frequent water changes and powerful filtration system is essential. Aeration was done throughout the research period by using aerators.

Preparation of food

Two types of food designated as A and B were used in this experiment. Food type A was fresh food (shrimp) prepared by meat grinder. The food type B was dried food (Humpy Head). The proximate composition of ingredients in two food types is shown in Table 1.

Table 1 The composition of food ingredients

Ingredients	Crude protein (%)	Crude fat (%)	Crude moisture (%)	Crude ash (%)
Food (A) Fresh food (Shrimp)	20.28	0.5	77.6	0.5
Food (B) Dried food (Humpy Head)	43	1.5	6.3	12.5

Table 2 Water parameters

Parameter	Unit	Tube well	Standard EPA value
pH		7.3	6.5 - 9
Total Alkalinity	mg/L	98	100-250
Total Hardness	mg/L	38	40 - 150
Dissolved Oxygen	mg/L	4.5	>5

Source for standard values; from U.S Environmental Protection Agency (EPA) Quality Criteria for water (1998)

Feeding

Fresh food (shrimp) was given to the fish of aquarium (1 and 2) and dried food (Humpy Head) with to the aquarium (3 and 4) respectively. The diet was fed twice daily (morning and evening) in two equal portions.

Data recording

The morphometric characteristics i.e. body weight and total lengths were recorded to observe their growth performance. Total length and body weight of two flower horns of each tank were measured to the nearest centimeter and gram. Measurements were taken monthly by using a scaled ruler and a weighting balance. The mean standard length and weight were calculated. Changes of fish weight in each tank were recorded at seven days' intervals.

Analytical procedure

The composition of protein, fat, moisture and ash in each food type were examined at Analytical Laboratory Section, Department of Fisheries. Water quality was assessed in the Laboratory of Freshwater Aquaculture Research Unit, Department of Fisheries.

The data on body weight, total length and feed conversion ratio were subjected to statistical analysis (Version 23) using analysis of variance technique. In order to compare the effect of different feed on fish growth, the following equation was applied.

$$\text{Food conversion ratio FCR} = P / (W_k - W_p)$$

Where P = Amount of food offered (g)

W_k = Final weight of fish in a tank (g)

W_p = Initial weight of fish in a tank (g) (Sadowski *et al.*, 1998)

$$\text{Specific growth rate SGR} = (W_f - W_i) / T \times 100$$

W_f = mean final weight

W_i = mean initial weight

T = total experiment days (Vasagam *et al.*, 2007)

Results

Systematic position

According to Petrovicky` (1989), the systematic position of the studied fish species was

- Phylum - Chordata
- Class - Actinopterygii
- Order - Perciformes
- Family - Cichlidae
- Genus - *Cichlasoma* sp. (Gunther, 1867)
- Common name - Flower horn, Flowerhorn cichlid
- Local name - Sartan Nga

Morphological characters

Generally, the males are larger than the females. Males have the kok, or the nuchal hump, on their foreheads. Males also usually have brighter and more vivid colors. For most breeds, the females have black dots on their dorsal fins, whereas males usually have longer anal and dorsal fins. Females tend to have an orange belly, especially when ready to breed.

The mouth of the male is thicker and more pronounced than the female's. Females reach sexual maturity at 8 - 10 cm, males at 12 - 14 cm (Plate 1).

Feeding behavior

Flowerhorn fish are very good appetite. These hybrids were taken fresh food (Shrimp) and dried food pellets. It is observed that, the studied fish preferred the fresh food. Dried foods were also taken.

Breeding behavior

Male and female flowerhorn kept in the same tank may attack each other. If the breeding pair attacks each other, they should be separated immediately (using tank dividers) to avoid unwanted injuries or fatality. The male and female fish were safely introduced to each other. The goal of the pairing process was to sexually stimulate both fish while maintaining a balance of dominance in the tank. The male and female were wiggle and their coloration intensifies. This is a sign that they are sexually excited. Put an upside-down ceramic flowerpot in the breeding tank for female to lay eggs. The couples were alternately peck and rub their bellies on the pot. The female was laid egg on the pot, the male was alternately wiggle on the pot to spray its milt. This process continues for a few hours. The parents removed, some fishes have the habit of eating the eggs. The eggs were hatch in 2-3 days. Strong parental care was shown towards the eggs and the fry (Plate 1).

Maturation period and number of spawning

Maturation period and number of hatching of the studied fishes were also recorded. The number of spawn were found to be high in the control 720 eggs fed with fresh food (shrimp) during five months and thirteen days and the lowest 440 eggs fed with dried food (Humpy head) during the six months and twenty- one days. This observation indicated that the spawning time of fish which fed with fresh food was earlier and the number of eggs was high.

Cost of food

Cost of each type of food was recorded in this study. The cost of fresh food (shrimp) was 33.34 kyats and dried food (Humpy head) was 66.34 kyats per day. Fresh food was cheaper than dried food and easily available in local.



A. Male in aquarium (1)



B. Female in aquarium (1)



C. Male in breeding time



D. Quitting oviduct of female in breeding time



E. Paring behaviour



F. Spawning behaviour



G. 20 days old fried



H. One month old fried

Plate 1 Breeding behaviour and fingerlings of flowerhorn

Table 3 Monthly variation of mean body weight of flowerhorn fish fed with two different feed types

No. Months	Fresh food (Shrimp)	Dried food (Humpy head)	Correlation Coefficient(r)	P value
0	0.77±0.16	0.69±0.12	0.92	0.07
1	4.7±0.24	4.6±0.23	0.98	0.02
2	14.0±1.41	12.25±2.63	0.44	0.55
3	21.5±4.35	19.25±2.98	0.88	0.11
4	42.0±5.41	25.5±4.93	0.07	0.92
5	60.0±8.16	40.0±1.63	1.0	0.00**
6	80.0±14.71	44.5±4.20	0.26	0.73
7	101.25±26.57	50.75±2.93	-0.03	0.96

**** Correlation is significant at the 0.01 level (T Test)**

Table 4 Monthly variation of mean body length of flowerhorn fish fed with two different feed types

No. of Months	Fresh food (Shrimp)	Dried food (Humpy head)	Correlation Coefficient(r)	P value
0	3.25±0.33	3.07±0.34	0.81	0.18
1	3.75±0.28	3.70±0.24	0.23	0.76
2	8.87±0.85	8.05±1.25	0.67	0.32
3	9.62±1.10	9.12±1.31	0.84	0.15
4	11.62±1.37	10.12±2.01	0.50	0.49
5	12.75±1.32	10.62±1.79	0.26	0.73
6	14.25±1.25	11.32±1.24	0.99	0.00**
7	15.25±1.84	12.25±1.19	0.75	0.24

**** Correlation is significant at the 0.01 level (T Test)**

Table 5 Monthly variations of mean FCR values of flowerhorn fish fed with two different feed types

No. of Months	Fresh food (Shrimp)	Dried food (Humpy head)
1	0.92	0.92
2	0.97	0.94
3	1.90	2.05
4	0.70	2.30
5	0.80	2.40
6	0.85	2.65
7	0.90	2.85
Mean	1.00±0.40	2.01±0.78

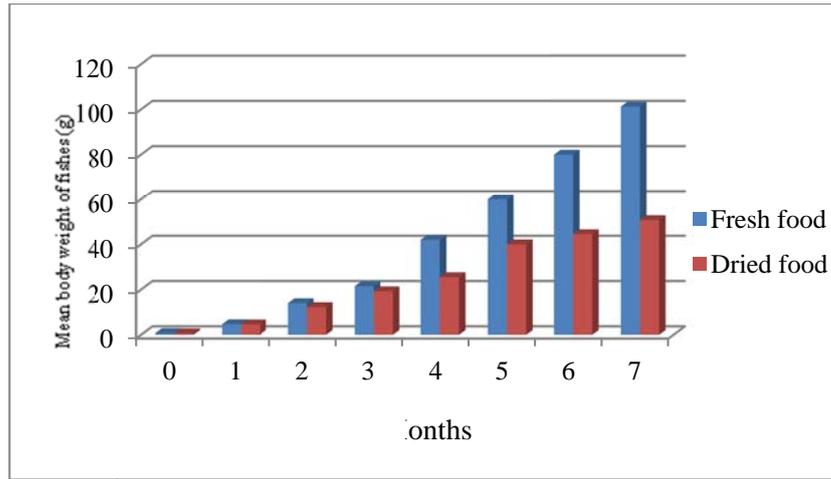


Fig.1 Mean body weight of fish fed with two different types of food

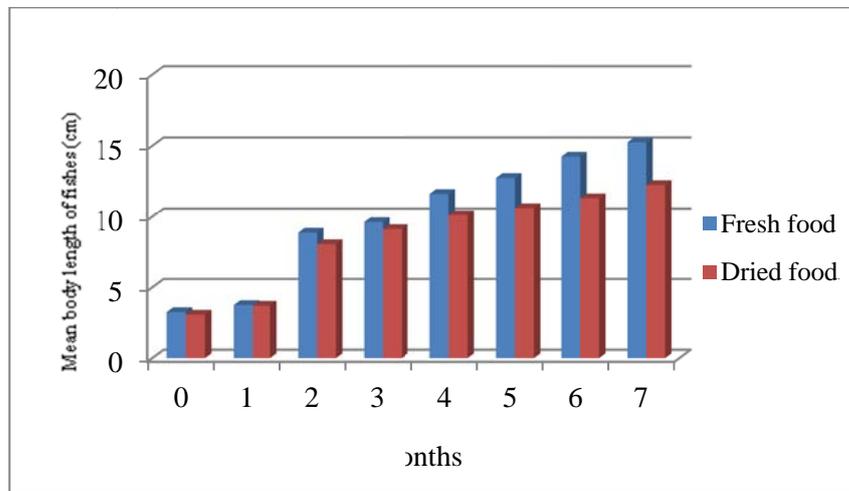


Fig. 2 Mean body length of fish fed with two different types of food

Growth rate

At the beginning of the experiment, the body weights of fry were nearly the same (0.77 ± 0.16 g) for fresh food and (0.69 ± 0.12 g) for dried food. The body weight and size of the fish increased gradually throughout the study period. The final body weight of flower horn fed with fresh food (101.25 ± 26.57 g) was higher than the fish which was fed with dried food (50.75 ± 2.93 g). The statistical analysis revealed that the effect of two different feeds on body weight of fish during seven months study period was significant ($P < 0.05$) (Fig.1, Table 3). At the beginning of the experiment, the body lengths of fry were nearly the same (3.25 ± 0.33 cm) for fresh food and (3.07 ± 0.34 cm) for dried food. At the end of experiment, the maximum total length of fish fed with fresh food was (15.25 ± 1.84 cm) and fish fed with dried food was (12.25 ± 1.19 cm). The overall mean total length of fish fed with fresh food was significantly higher than that of dried food (Fig.2, Table 4).

The overall mean FCR value of flowerhorn fed with dried food (2.01 ± 0.78) was higher than that of fresh food (1.00 ± 0.40) (Table 5). Mean body weight and mean body length of the studied fish species by feeding two different type of food were recorded. The higher growth rate was found in fish fed with fresh food.

Discussion

In the present study, the hybrid flowerhorn gained higher body weight and maximum total length on fresh food, followed by dried food. The growth pattern of fingerlings also remained highest for fresh food. Lim *et al* (2003) stated that the efficiency in the production of fish larvae, fry and fingerlings are related with the accessibility to fresh food for feeding purpose. Shrimp meal is a source of pigments that enhances the desirable color in the tissues of fish and showing a better growth performance, survival and stress resistance as well as a low cost and better hygienic procedure.

Food conversion ratio (FCR) is calculated as the weight of the feed fed to the fish divided by the weight of fish growth. As far as the value of FCR is concerned, the better (lower) feed conversion ratio was observed for fresh food (Shrimp) (1.00 ± 0.40), followed by dried food (Humpy head) (2.01 ± 0.78). Ali and Salim (2004) noted higher FCR value for rice polish (5.27), followed by fish meal (3.026) and sunflower meal (3.021). The FCR

value of sunflower was comparatively higher than the value of present results. This indicated that fresh food (shrimp) is more acceptable fish feed for flowerhorn. The value of FCR and SGR showed good condition in fresh food than in dried food.

Fresh food prepared by low cost and must contain balanced amounts of nutrients essential in the development of nuchal humps. The commercial pellets like Humpy Head, which are expensive but still contain nutrients essential for the body coloration. Extruded feeds are more expensive due to the higher manufacturing costs. The biggest advantage of fresh food would be that they somehow rejuvenate the appetite of these fishes. Assumed that the fresh food was attracted the fish than that of dried food. The advantages of the fresh food (Shrimp) may be easy to purchase in local market and the attraction of smell to fish and cheap cost.

Harpaz *et al.*, (2005) suggested that aquarium fishes with commercial interest in order to fulfill their optimum nutritional requirements promote optimal growth, reduce the cost. The traditional parameters used in aquaria to evaluate diet formulation such growth performance and reproduction. Based on the results of the present study, the importance of the fresh food as a source of protein, it was concluded that fresh food should be fed in the rearing of hybrid fingerlings of flowerhorn fish species.

Conclusion

The present study provides valuable information concerning the effect of food on the growth of Flowerhorn fish. In conclusion, since the ornamental fish, *Cichlasoma* sp. (Flowerhorn) is more prefer fresh food than the dried food. So it is carnivorous fish. The experiment revealed that diet of fresh food (shrimp) gave the best growth and survival rate. Thus the commercial feed for *Cichlasoma* sp. should be prepared with animal by-products for low-cost production. The finding of this study could be provided effective information for hobbyists and aquarium fishery biologists. Fishkeeping hobbyists need to understand the feeding of fish to increase growth rate, promote health and facilitate reproduction.

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