



Short Communication

Feeding behavior of giant gourami, *Osphronemus gouramy* (Lacepede) larvae

Thumronk Amornsakun^{1*}, Surasak Kullai², and Anuar Hassan³

¹ *Fisheries Technology Program, Department of Technology and Industries, Faculty of Science and Technology, Prince of Songkla University, Pattani Campus, Mueang, Pattani, 94000 Thailand.*

² *Pattani Inland Fisheries Research and Development Center, Yarang, Pattani, 94160 Thailand.*

³ *Faculty of Fisheries and Aqua-Industry, Universiti Malaysia Terengganu, Mengabang Telipot, Kuala Terengganu, Terengganu, 20130 Malaysia.*

Received 7 August 2013; Accepted 28 January 2014

Abstract

Feeding experiments were carried out in 15-liter glass aquaria with 10 liters of water containing 1000 larvae aged 1.5 days post-hatching (before mouth opening) in three replicates. It was found that the feeding scheme of larval giant gourami aged 5-17 days (TL 8.36-13.40 mm) consumed *Moina*. The larvae aged 14-17 days (TL 12.40-13.40 mm) consumed both *Moina* and artificial pellet. Larvae aged more than 18-days (TL 13.60 mm) consumed only artificial pellet.

Daily food uptake by the larvae and juvenile were determined in a 15-liter aquaria (water volume 10 liters) containing 500 larvae. The larvae were fed with *Moina* at density of 10 ind/ml. Aquaria without larvae were also set for a control of natural fluctuation in food density. The amount of food intake was calculated based on changes of food density in the aquarium with and without fish larvae. It was found the average uptake of *Moina* in digestive tract per day of larvae aged 5, 8, 11, 14 and 17 days old were 38, 52, 182, 205 and 266 individual/larva, respectively at density of 1.27, 1.73, 6.07, 6.83, and 8.87 individual/ml, respectively.

Keywords: feeding scheme, daily food uptake, larviculture, giant gourami, *Osphronemus gouramy*

1. Introduction

The growth and survival rate of larval and juvenile fish are determined by various environmental factors, food supply etc. Mass mortality of larval and juvenile fish might occur if the food supply is inadequate (Houde, 1978). The food supply during larval stage is an important factor to achieve high growth and survival rates. The sequence of food in early larval stages differs among species. Freshwater fish are generally given rotifer, *Artemia* or *Moina*, as an

initial food. At a later stage the larvae or juveniles are fed minced fish, shellfish and shrimp or an artificial pellet (Hecht and Appelbaum, 1987; Hogendoorn, 1980). It is obvious that fish of different species require different feeding techniques. Commercial scale propagation of giant gourami in hatcheries is yet to be standardized. Larval feeding activity may be considered as the most important aspect and a critical factor in larval production of this fish in hatcheries. Few reports, on feeding of giant gourami feeding have been published so far. The feed and feeding scheme in the giant gourami larvae fed with *Moina* have not been established.

The purpose of this study was to investigate feeding scheme and daily food uptake in order to indicate the suitable time for feeding, and suitable food for larval and juvenile giant gourami.

* Corresponding author.

Email address: thumronk@bunga.pn.psu.ac.th, thumronk.a@gmail.com

2. Materials and Methods

2.1 Feed and feeding scheme experiment

The feed and feeding scheme experiments in the culture of larvae were conducted in 500 liter rearing tanks (water volume 300 liters) containing 500 5-day old larvae. *Moina* were given to 5 to 20-day old larvae twice a day at the density of 5-10 individual/ml. Artificial pellet were given to 10 to 20-day old larvae, *Moina* and artificial pellet were given together to 10 to 29-day old larvae (Tarnchanukit *et al.*, 1982; Kungvankij *et al.*, 1986; Eda *et al.*, 1993). Samples of 20 larvae were randomly collected every day about 1 hour after feeding, then preserved in 5% buffered formalin solution. Stomach content of preserved giant gourami larvae was later determined. Observations of the size of mouth opening were measured at each stage.

2.2 Daily food uptake experiment

To determine the daily food uptake by the larvae, 15-liter aquaria (water volume 10 liters) containing 500 larvae were maintained. The larvae were fed with *Moina* at density of 10 individual/ml. Aquaria without larvae were also set for a control of natural fluctuation in food density (Hassan, 1990). The amount of food intake was calculated based on changes of food density in the aquarium with and without fish larvae. At 2 hour intervals 5 water drops were counted for the density of *Moina*. Known numbers of food were added

when the density became low. The procedure was carried out at 5, 8, 11, 14 and 17 days old in triplicate.

3. Results

It was found that the larvae aged 5-17 day larvae (TL 8.36-13.40 mm) consumed only *Moina*. The average density of *Moina* in digestive tract of larvae at 1 hr after feeding at 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17 days old were 7.20, 12.50, 23.0, 28.60, 32.10, 40.10, 40.50, 51.50, 52.40, 48.80, 26.30, 14.60 and 4.50 individual/larva, respectively. The larvae aged 14-17 day larvae (TL 12.40-13.40 mm) consumed both *Moina* and artificial pellet. Larvae aged more than 18-day larvae (TL 13.60 mm) consumed only artificial pellets (Table 1 and Figure 1).

The average daily uptake of *Moina* in digestive tract per day of larvae aged 5, 8, 11, 14 and 17 days old were 38, 52, 182, 205 and 266 individual/larva, respectively, and the *Moina* densities were 1.27, 1.73, 6.07, 6.83, and 8.87 individual/ml, respectively (Figure 2).

4. Discussion

Giant gourami larvae aged 5-17 days (TL 8.36-13.40 mm) consumed only *Moina*. The food supply during larval stage is potentially important factor to achieve high survival and growth rates. Mass mortality of larval and juvenile fish might occur if the food supply is inadequate (Houde, 1978). Different species require different sequential food during the

Table 1. Amount of food uptake in a day of giant gourami in each stage

Larval age (day)	Total length (mm)	Number of <i>Moina</i> /larva (ind.)
	Mean \pm SD (Min-Max)	
1	5.14 \pm 0.29 (4.75-5.50)	0
2	6.90 \pm 0.32 (5.40-7.20)	0
3	7.80 \pm 0.23 (7.25-8.40)	0
4	7.64 \pm 0.25 (7.25-8.40)	0
5	8.36 \pm 0.25 (7.60-8.50)	7.20 \pm 2.10 (5-9)
6	9.11 \pm 0.18 (8.40-9.30)	12.50 \pm 5.50 (8-26)
7	9.23 \pm 0.62 (8.20-9.50)	23.0 \pm 5.90 (16-40)
8	9.47 \pm 0.59 (8.10-9.83)	28.60 \pm 6.10 (20-39)
9	9.64 \pm 0.32 (8.50-10.20)	32.10 \pm 11.80 (22-56)
10	10.43 \pm 0.41 (10.33-11.20)	40.10 \pm 10.30 (21-55)
11	11.90 \pm 0.34 (10.80-13.20)	40.50 \pm 8.60 (28-64)
12	12.24 \pm 0.54 (11.13-12.60)	51.50 \pm 8.90 (37-65)
13	12.28 \pm 0.62 (11.40-14.30)	52.40 \pm 10.70 (32-70)
14	12.40 \pm 0.72 (11.30-14.10)	48.80 \pm 6.20 (32-65)
15	13.24 \pm 0.96 (12.50-16.20)	26.30 \pm 4.70 (15-48)
16	13.30 \pm 0.70 (12.60-16.40)	14.60 \pm 2.30 (5-20)
17	13.40 \pm 0.49 (13.10-15.80)	4.50 \pm 2.50 (2-9)
18	13.60 \pm 0.35 (13.10-16.60)	0
19	13.92 \pm 0.24 (13.20-16.80)	0

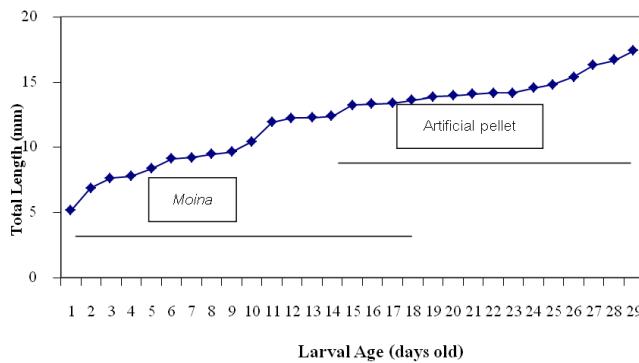


Figure 1. Mean total length of larval giant gourami according to age and feeding scheme

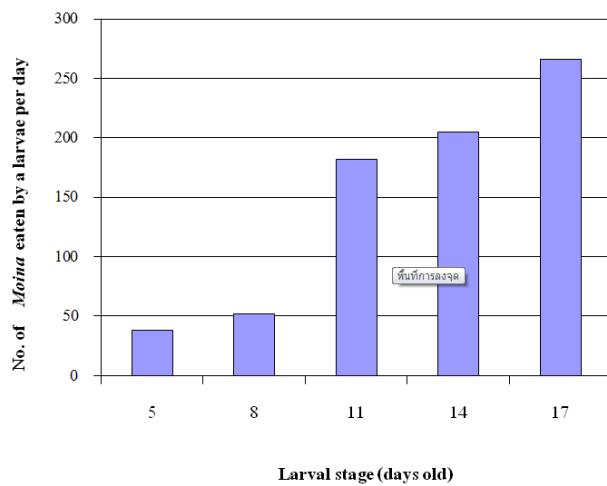


Figure 2. Number of food eaten per day by of larval giant gourami

early life stages. Watanabe *et al.* (1983) described the food regimes used most extensively in the larvae of various fish production in Japan. In newly hatched fish greater than 2.3 mm body length, rotifers were exclusively given as an initial feed, when fish reached 7 mm or more, marine copepods such as *Tigriopus*, *Acartia*, *Oithona* and *Paracalanus* were given. Brine shrimp, *Artemia salina*, were frequently used for the larvae of many species during shortages of marine copepods. Larvae larger than 10 to 11 mm were fed minced fish, shellfish and shrimp or an artificial diet. Tsukashima and Kitajima (1981) reported the rearing of larval and juvenile filefish, *Stephanolepis cirrifer*, up to the stage of young fish. They were fed rotifer, *Tigriopus japonicus*, *Artemia* and subsequently fish meat. The giant gourami of 5-17 day larvae (TL 8.36-13.40 mm) were fed *Moina* at the start of feeding. Giant gourami more than 18 days old (TL 13.60 mm) consumed only artificial pellet. At this age the young giant gourami is classified as juvenile, while its food particle size and character are in transformation. The juvenile stage of giant gourami developed to consume *Moina* and slowly than

green catfish. Larval green catfish aged 2-10 days were fed with *Moina* only and the feed completely changed to artificial pellet when they were 16 days old (Amornsakun *et al.*, 1998). The mean numbers of *Moina* eaten in a day by 5, 8, 11, 14 and 17 days old giant gourami were 38, 52, 182, 205 and 266 individual/larva, respectively, and the *Moina* densities were 1.27, 1.73, 6.07, 6.83, and 8.87 individual/ml, respectively at water temperature ranging between 28 and 30.5°C. *Moina* were eaten by fish larvae in the range of 1.27-8.87 individual larvae⁻¹ day⁻¹. The numbers of prey consumed were less than for other fishes. Amornsakun *et al.* (1998) reported that *Moina* were eaten by fish larvae of green catfish in a range of 61.56-421.74 individual larvae⁻¹ day⁻¹. Tawaratmanikul *et al.* (1988) reported that the studies on numbers of *Moina* taken in a day by giant catfish (*Pangasianodon gigas*) larvae for the 2-3 day, 5-6 day and 8-9 day old larvae were 64, 396 and 341 individual, respectively. It is very important to determine the suitable amount of food consumed by a larva per day at each stage of its sequential growth. Suitably estimating the amount food needed for a certain number of cultured larvae or juveniles will ensure better growth and survival as well as avoid unnecessary food wastage.

It was conclude that the feeding scheme of larval giant gourami aged 5-17 days (TL 8.36-13.40 mm) should include *Moina*. The larvae aged 14-17 days (TL 12.40-13.40 mm) consumed both *Moina* and artificial pellet. Larvae aged 18-days (TL 13.60 mm) consumed only artificial pellet. The average uptake of *Moina* in digestive tract per day of larvae aged 5, 8, 11, 14 and 17 days were 38, 52, 182, 205 and 266 individual/larva, respectively and the densities of 1.27, 1.73, 6.07, 6.83, and 8.87 individual/ml, respectively at water temperature ranging between 28 and 30.5°C.

Acknowledgements

I am grateful to the National Research Council of Thailand (TEC 49045) for financial support of the field work. I also thank Miss Netpat Hengseng and Mr. Pakorn Tipmonta for assistance in research.

References

- Amornsakun, T., Hassan, A., Ambak, A. and Chiayvareesaja, S. 1998. The culture of green catfish, *Mystus nemurus* (Cuv. & Val.) I : Feed and feeding scheme of larvae and juveniles. Songklanakarin Journal of Science and Technology. 20(3), 373-378.
- Eda, H., Darwisito, S., Fujiwara, T. and Takita, T. 1993. Rearing of larval and juvenile dragonets, *Repomucenus* spp. Suisanzoshoku. 41(4), 553-558.
- Hassan, A. 1990. Study on the Life History and Aquaculture of the Mullet, *Liza haematocheila* Distribute in the Ariake Sound. Ph.D. Thesis, Graduate School of Marine Science and Engineering, Nagasaki University. 199 p.

Hecht, T. and Appelbaum, S. 1987. Notes on the growth of Israeli sharptooth catfish, *Clarias gariepinus* during the primary nursing phase. *Aquaculture*. 63, 195-204.

Hogendoorn, H. 1980. Controlled propagation of the African catfish, *Clarias lazera* (C & V): III feeding and growth of fry. *Aquaculture*. 21, 233-241.

Houde, E. D. 1978. Critical food concentrations for larvae of three species of subtropical marine fishes. *Bulletin Marine Science*. 28(3), 395-411.

Kungvankij, P., Pudadera, B. J. Jr., Tiro, L. B. Jr. and Potestas, I. O. 1986. Biology and Culture of Seabass, *Lates calcarifer*. Thailand: Network of Aquaculture Centre in Asia, 69 p.

Tarnchalanukit, W., Chuapoeuk, W., Suraniranat, P. and Na Nakorn, U. 1982. *Pla Duk Dan Culture*. Thailand: Faculty of Fisheries, Kasetsart University. 58 p. (in Thai)

Tawaratmanikul, P., Viputanimat, T., Mewan, A. and Pokasap, K. 1988. Study on the Suitable *Moina* Density in Nursing the Giant Catfish, *Pangasianodon gigas*. Technical Paper No. 6/1988, Thailand: Pathumthani Freshwater Fisheries Station, Inland Fisheries Division, Department of Fisheries, Ministry of Agriculture and Co-operatives, 6 p. (in Thai with English abstract)

Watanabe, T., Kitajima, C. and Fujita, S. 1983. Nutritional values of live organisms used in Japan for mass propagation of fish: Review. *Aquaculture*. 34, 115-143.