
Culture of Sand Goby (*Oxyeleotris marmoratus*, Bleeker) Fed with Live and Frozen Fairy Shrimp (*Streptocephalus sirindhornae*)

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Suksomnit, A. and Pholwieng, N. (2017). Culture of sand goby (*Oxyeleotris marmoratus*, Bleeker) fed with live and frozen fairy shrimp (*Streptocephalus sirindhornae*). International Journal of Agricultural Technology 13(4):493-499.

Abstract This study aimed to analyze the effect of live and frozen ¹fairy shrimp (*Streptocephalus sirindhornae*) for the growth performance of sand goby (*Oxyeleotris marmoratus*). The experiment was designed in Completely Randomized Design. The fingerlings of sand goby were fed with live artemia, live and frozen fairy shrimp of 1.5 centimeters in length which contained in a 95 cm plastic basin. Each basin carried 20 liters of water with 25 sand goby per basin. The experiment animals were fed twice daily in the morning and afternoon for 8 weeks. The average initial weights and length of fingerlings were 0.63±0.00, 0.60±0.02, 0.63±0.03 g and 3.12±0.02, 3.11±0.02, 3.11±0.02 cm., respectively. The results showed that fingerling fed with live fairy shrimp gave significantly better growth than fed with artemia and frozen fairy shrimp (p<0.05). The final weights were 5.32±0.16, 2.57±0.25 and 2.54±0.22g, respectively. Meanwhile, the final lengths were 6.20±0.09, 4.90±0.14 and 4.88±0.13 cm, respectively. The daily weight gains were 0.085±0.00, 0.035±0.00 and 0.026±0.02 g/day respectively; specific growth rate of 3.89±0.08, 2.51±0.12 and 2.48±0.14 % per day, respectively. Survival rates were 99.00±2.00, 91.00±11.49 and 73.00±8.87 %, respectively. It is indicated that sand goby fed with live fairy shrimp yielded better growth performance.

Keywords: *Oxyeleotris marmoratus*, *Streptocephalus sirindhornae*, live and frozen fairy shrimp, artemia, culture

Introduction

The sand goby, marble goby or marbled sleeper goby are common names of carnivorous fish, *Oxyeleotris marmoratus* which is a member of the family Eleotridae. This species is commonly found in freshwater and brackish water bodies throughout Indo-China (Sompong, 1980). In natural condition, sand goby is found in river swam reservoirs and canals along the Mekong and Chao Phraya Basins Malay Peninsula Indochina Philippines and Indonesia. (Kottelat *et al.*, 1993; Luong, *et al.*, 2005). It is the largest and the most expensive freshwater gobioid fish in Southeast Asian region (Tanaka and Senoo, 2009). The production of *O. marmoratus* is very low as

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0.1% from the total of aquaculture production in these regions (FAO, 2006). Sand goby fry raised in earthen ponds had shown a low survival rate (25 -50 %) (Tawee *et al.*, 1986; Anusorn and Sujitra, 1989). It is preferable that survival rate of fry can be improved by providing suitable natural foods at the right time and with appropriate husbandry (Bundit, 2007).

Fairy shrimps are small freshwater animal. They have only been reported from Thailand over the past 10 years. *Streptocephalus sirindhornae* was described from a temporary pond since 2000. *S. sirindhornae* is the widely distributed species across Thailand. They have been recorded in 38 provinces from all region of country (Sanoamuang *et al.*, 2000). Fairy shrimps have great potential as live food organism for a variety of aquatic animals. Both larvae and adult fairy shrimp (live or even frozen) can be fed as commercial aquaculture species for catfish and shrimp and other aquarium species such as flower horn (Boonmak *et al.*, 2007). The biochemical composition of adult *S. sirindhornae* revealed that the fairy shrimp on its dry weight basis has 74.41% protein (Dararat, 2011). It has also been shown that fairy shrimps contain high levels of many essential amino acid which are important for the growth performance of fresh and brackish water fish and other crustaceans. Through enrichment and bio-encapsulation, fairy shrimp can be an ideal candidate for the provision of valuable nutrients to young larvae of commercial aquaculture species (Munuswamy, 2005).

In view of the foregoing studies on the culture and used fairy shrimp as live and frozen food for sand goby was recorded. This study specifically aimed to compare the growth performance of sand goby (*O. marmoratus*) fed with live artemia, and live and frozen fairy shrimp. In particular, the study probed the length, weight, specific growth rate, and survival rate of sand goby fingerlings fed by live artemia, and live and frozen fairy shrimp.

Materials and methods

This experiment aimed to compare the growth performance of sand goby fingerlings fed with live artemia, 1.5 centimeters in length of live and frozen fairy shrimp. These fingerlings were contained in a 95 cm plastic basin. The experiment started by rearing a body length of 3 cm- sand goby up to 8 weeks. During this period, experiment was done by feeding the sand goby fingerling with earlier cultured fairy shrimp from the Department of Fisheries, Suphunburi College of Agriculture and Technology, and artemia from the market. The experiment was performed in Completely Randomized Design (CRD) with 4 replications and treatments were as follows sand goby fed with live artemia, live fairy shrimp and frozen fairy shrimp. The experiment set-up was done in a 95 cm plastic basin, and punted 1 air stone and 10 p.m. Each basin contained 20 liters of water with 25 sand goby per basin.

Feeding procedure

The experiment was conducted for 8 weeks to determine the influence of live artemia, live fairy shrimp and frozen feed given *ad-libitum* on sand goby's growth performance. Specifically, the length, weight, specific growth rate, and survival rate were recorded. Feeding was done twice a day and the water was changed daily in the morning.

Monitoring growth performance

Initial and final weights of sand goby were measured before and after the experiment in a period using a weighing scale, while the initial and final lengths were measured by using a ruler.

Water quality

Water quality was monitored regularly. Specifically, monitoring of dissolved oxygen, temperature, pH, and ammonia were done between 06.00-07.00 am. The water quality parameter was monitored once a week until the end of the study period.

Statistical analysis

Experiment was conducted in Completely Randomized Design (CRD). Analysis of variance was employed to determine significant differences among the treatment effects, while Duncan's Multiple Range Test (DMRT) was employed to determine specific mean differences. Statistical significance was compared at the 5 % probability level.

Results

Growth performance of sand goby fingerling

The principal purpose in conducting this experiment in plastic basin for a total of 8 weeks was to give the researcher the opportunity to observe the feeding behavior of fairy shrimp for their growth performance and survival. Result showed that the values for final length (6.20 ± 0.02 cm), weight (5.32 ± 0.16 g), daily weight gain (0.085 ± 0.00 g/day), specific growth rate ($0.085 \pm 0.00\%$ /day) and survival rate ($99.00 \pm 2.00\%$) for sand goby fed with live fairy shrimp were higher than those of sand goby fed with live artemia and frozen fairy shrimp as shown in Table 1. Sand goby fed with live fairy shrimp had the highest mean length followed by the sand goby fed with frozen fairy shrimp, and sand goby fed with live artemia with mean measurements of 6.20 ± 0.09 , 4.90 ± 0.14 and 4.88 ± 0.13

cm, respectively. ($p < 0.05$). The highest final weight of sand goby was obtained by sand goby fed with live fairy shrimp followed by the sand goby fed with frozen fairy shrimp and sand goby fed with live artemia with mean measurements of 5.32 ± 0.16 , 2.57 ± 0.25 and 2.54 ± 0.22 g, respectively ($p < 0.05$).

The highest daily weight gain of sand goby was obtained by sand goby fed with live fairy shrimp followed by the sand goby fed with frozen fairy shrimp and sand goby fed with live artemia with mean measurements of 0.085 ± 0.00 , 0.035 ± 0.00 and 0.026 ± 0.02 g/day respectively ($p < 0.05$). The highest specific growth rate of sand goby was obtained by sand goby fed with live fairy shrimp followed by the sand goby fed with frozen fairy shrimp and sand goby fed with live artemia with mean measurements of 3.89 ± 0.08 , 2.51 ± 0.12 and 0.248 ± 0.14 % respectively ($p < 0.05$). The highest survival rate of sand goby was obtained by sand goby fed with live fairy shrimp followed by the sand goby fed with live artemia and sand goby fed with frozen fairy shrimp with mean measurements of 99.00 ± 2.00 , 91.00 ± 11.49 and 73.00 ± 8.87 % respectively ($p < 0.05$).

Table 1. Growth performance of sand goby fed with different types of feeds reared in plastic basin for 8 weeks

	Treatment		
	Live artemia	Live fairy shrimp	Frozen fairy shrimp
Initial length (cm)	3.12 ± 0.03^a	3.11 ± 0.03^a	3.11 ± 0.02^a
Final length (cm)	4.88 ± 0.13^b	6.20 ± 0.09^a	4.90 ± 0.14^b
Initial weight (g)	0.63 ± 0.01^a	0.60 ± 0.02^a	0.63 ± 0.03^a
Final weight (g)	2.54 ± 0.22^b	5.32 ± 0.16^a	2.57 ± 0.25^b
Daily weight gain (g/day)	0.026 ± 0.02^b	0.085 ± 0.00^a	0.035 ± 0.00^b
Specific growth rate (%)	2.48 ± 0.14^b	3.89 ± 0.08^a	2.51 ± 0.12^b
Percent survival	91.00 ± 11.49^a	99.00 ± 2.00^a	73.00 ± 8.87^b

The water quality for this experiment revealed that all the recorded levels of the various water quality parameter such as temperature (24-27.10°C), dissolved oxygen (5-7 ml/l) pH (7.80-8.50 ml/l) and ammonia (0.21-0.42ml/l) were within the tolerable limits for sand goby.

Discussion

The diet preference of sand goby as a carnivorous organism may support the reason why the live artemia group yielded the lowest growth performance in all parameters. The characteristic of sand goby as carnivorous organism enable them to benefit from live fairy shrimp than from live artemia. More so live artemia contained lower protein contain of 56.4% protein (Tunsutapanich, 1982) while live fairy shrimp on the hand,

has 74.41% protein, particularly essential amino acids which are need for growth and reproduction. The highest amino acid content was recorded in *S. sirindhornae* (784.92 mg g⁻¹) (Dararat, 2011).

It is evident that using live fairy shrimp for better fish survival rate is more effective than that of live artemia and frozen fairy shrimp in *O. marmoratus* fingerling. This phenomenon is perhaps due to the active movement of live fairy shrimp and artemia (Darwis, *et al.*, 2008). Low survival rate of fingerling fed frozen fairy shrimp may be due to more frequent cannibalism. Best on visual observation, the fingerling attacked occasionally the other fish which would be finally killed. The cannibalism occurred when the fingerling were not attractive to consume the fed. Cannibalistic behavior is recognize as common in *O. marmoratus* since larval stage and continued until the fingerling stage (Anusorn and Sujitta, 1989 and Darwis, *et al.*, 2008).



Figure 1. Sand goby fed with live artemia



Figure 2. Sand goby fed with live fairy shrimp



Figure 3. Sand goby fed with frozen fairy shrimp

Acknowledgement

I would like to acknowledge Department of Fisheries, Suphanburi College of Agriculture and Technology to support all facilities and equipment, and office of Vocational Education Commission for funding this project. A deep appreciation is extended to the Pathumthani Inland Fisheries Research and Development Center, Pathumthani, Thailand. The author's gratitude is as well given to Mr. Kriengkrai Sahassanonta and Miss Jirapa Phosri for providing useful information about marble goby culture.

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(Received: 18 May 2017, accepted: 30 June 2017)