

FEEDING FREQUENCY AND FOOD UTILIZATION IN THE FRY OF ESTUARINE MULLET *LIZA PARSIA*

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ABSTRACT

The mullet (*Liza parsia*) fry were offered food at different frequencies and their growth, food consumption, and gross conversion efficiency were studied. Food consumption was affected by the feeding schedules adopted and multiple feeding per day provided better growth and food conversion. Thrice a day feeding is advocated.

INTRODUCTION

THE INTERACTION between economic considerations and technical possibilities in the production and application of feeds during fry production underscores the importance of adopting the right zoo-techniques. The level of food ration to be offered per day, the appropriate number of feedings, etc. depend on the eating behaviour of a particular fish. Food should be provided at predetermined schedules to derive the maximum benefit of supplementary feeding in aquaculture. Frequent feeding has been shown to enhance growth considerably (Kono and Nose, 1971; Andrews and Page, 1975; Grayton and Beamish, 1977; Ohua and Teng, 1978). The present investigation aims at determining the frequency which produces the maximum growth with efficient food conversion in the fry of *Liza parsia*.

MATERIAL AND METHODS

The experimental fish were collected from the Fisheries Station of Kerala Agricultural

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University at Cochin. They were acclimatized to the laboratory conditions for two weeks during which they were adapted to a semi-moist artificial diet. Uniform sized animals (0.640 ± 0.008 g) were selected for the different treatments. Ten animals were maintained in each circular plastic aquaria in over 30 l of well aerated brackishwater of salinity 15 ± 1 ppt for a duration of five weeks. Fresh brackishwater was replaced every alternate day. Water temperature ranged between 29.2 and 31.8°C during the experiment.

Five feeding frequencies were tested in triplicate as indicated:

Treatment Code	Frequency of Feeding	Time Schedule (Hrs.)
III/1	Daily thrice	0800-1200-1600
II/1	Daily twice	0800-1600
I/1	Daily once	0800
I/2	Once in two days	0800
I/3	Once in three days	0800

The fish were hand-fed to satiation on a purified diet (modified Halvers' H440). The semi-moist feed was offered to the fish at approximately 12% body weight on the respective feeding days. The amount was divided in equal doses for multiple feeding.

The satiation level at a particular schedule was decided by watching the feeding activity of the fish, after which the leftover food was collected. Individual, initial and final, fish weights were recorded for each treatment; nevertheless group weights were taken every week. Analysis of variance was performed on the food consumption data and 't' test was employed to locate the significant differences between the treatments in weight increment and conversion efficiency.

RESULTS

When offered the fishes eagerly attack the feed mass and later on reaching satiation level they stray away from it. This usually took about an hour, when the fishes were being

food deprivation, poor growth was observed. The growth obtained when fed three times a day was four-fold to that when fed once in three days. The gross conversion efficiency (Table 2) was maximum in the once-a-day fed group though it did not differ significantly ($P > 0.01$) from II/1 and III/1. Depriving the food as in I/2 and I/3 resulted in increased intake towards the latter part of the experiment (Table 2). The gross conversion efficiencies remained relatively low in these groups. In the groups fed more than once a day the appetite was considerably reduced with the progress of the experiment with the minimum food intake during the last week. It was only in group I/1 a consistent feeding rate was observed throughout the period of the experiment. Analysis of variance revealed that food

TABLE 1. Data on growth of *L. parsia* fed at different frequencies

Feeding frequency	Mean initial weight (g)	Mean weight gained during each week (g)					Mean final weight (g)	Mean weight gained (%)
		1st	2nd	3rd	4th	5th		
III/1	.. 0.642	0.154	0.129	0.105	0.089	0.068	1.184	84.42 ^a
II/1	.. 0.626	0.141	0.118	0.094	0.076	0.058	1.113	77.80 ^a
I/1	.. 0.650	0.106	0.077	0.088	0.073	0.057	1.050	61.54 ^b
I/2	.. 0.643	0.059	0.043	0.056	0.048	0.036	0.885	37.64 ^c
I/3	.. 0.643	0.047	0.041	0.028	0.021	0.014	0.793	23.33 ^d

* Means sharing same superscript are not significantly different.

fed for the first time during the day. Subsequent feedings on the same day seemed to attract fish less. This was evident from the amount of feed consumed when multiple feeding was adopted.

The different feeding schedules had influence on growth and food conversion. Multiple feeding during the day increased growth even though it was not significant ($P > 0.01$) between groups II/1 and III/1 (Table 1). At increased

consumption was significantly influenced by the frequency at which food was offered.

DISCUSSION

The feeding frequency acceptable to a fish is directly related to the stomach capacity of the fish (Kono and Nose, 1971). Reports of Shelbourn *et al.* (1973) and Jobling (1982) indicate better growth in fish fed frequently

TABLE 2. Food consumption and conversion efficiency of fish fed at different frequencies

Feeding frequency	Mean food consumption/day as % body weight during different weeks					Gross conversion efficiency (mean)
	1st	2nd	3rd	4th	5th	
III/1	11.03	9.35	8.72	7.96	6.62	20.2 ^a
II/1	10.03	8.36	7.53	7.27	5.93	21.6 ^a
I/1	6.91	6.70	5.95	6.02	5.50	22.4 ^a
I/2	7.28	8.82	10.21	11.46	11.60	18.0 ^{b,c}
I/3	9.27	9.65	11.31	11.44	11.48	16.4 ^c

* Means sharing same superscript are not significantly different.

than in those fed periodically. The result obtained in the present investigation also conforms to this. The growth rates obtained in daily fed groups (III/1 II/1 and I/1) is significantly greater than that of groups I/2 and I/3 (Fig. 1). The decreasing increment in growth with increasing food deprivation, especially, from the second week onwards points out that at least once a day ration should be provided for normal growth.

Previous studies (Teshima *et al.*, 1984; Charles *et al.*, 1984; Sampath, 1984) have advocated against decreasing the feeding frequency beyond once in two days.

For maximum growth, it appears that the fishes have to be fed thrice a day, as the results indicate and so it is suggested that the fry be fed accordingly. The recommended feeding frequencies vary with species: once in two days for *Epinephelus tauvina* (Chua and Teng, 1978); once in a day for *Salvelinus alpinus* (Jobling, 1983), *Channa striatus* (Sampath, 1984) and *Salmo gairdneri* (Luquet *et al.*, 1981); twice a day for *Ictalurus punctatus* (Andrews and Page, 1975) and *Heteropneustes fossilis* (Singh and Srivastava, 1984) and continuous feeding for *Clarias lazera* (Hogendoorn, 1981). If the feeding frequency is increased beyond the optimum level, the intake per feeding will drop considerably as the stomach capacity is restricted by the undigested food already present. This may also cause incomplete digestion (Daves, 1930).

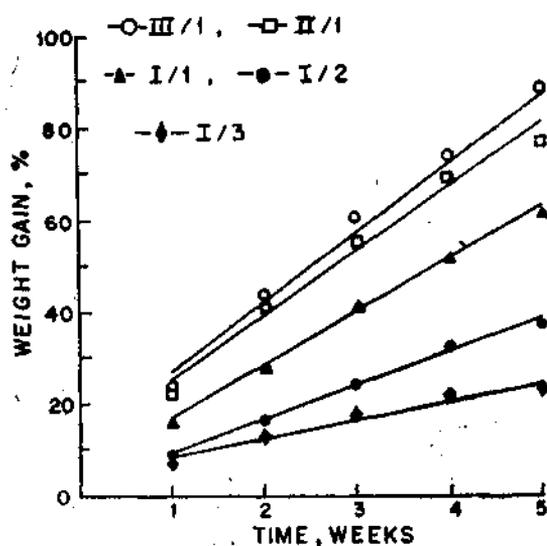


FIG. 1. Growth pattern, in the fish offered food at different frequencies, in relation to time.

The marginal difference in conversion efficiency recorded in groups II/1 and III/1 can be attributed to increased swimming activity and specific dynamic action as described for

Channa striatus (Sampath, 1984). The decrease in food consumption and growth reduction in groups III/1 and II/1 in the latter part of the experiment is similar to the observations of Windell (1967) in *Lepomis macrochirus*.

Thus the study indicates that feeding thrice a day is best suited for obtaining maximum growth and an equally good gross conversion efficiency. However, the fish fry should be fed at least once a day to produce unhindered growth.

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