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Fattening of the Blue Swimming Crab *Portunus pelagicus* (Linnaeus)

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Abstract: In the present study, two types of experiments were conducted. First experiment was designed to know the optimum salinity and second experiment was to know the suitable live feeds for fattening. They were kept in different salinities (20, 25, 30 ppt). Weight gain of the crab's cultured in 30 ppt (58.3 g) was significantly higher than 20 (49.6 g) and 25 ppt (52.3 g) and also the shell hardens in shorter duration (11.6 days). Hence 30 ppt salinity was selected as optimum salinity for further experiment. After knowing the salinity 3 different live feeds viz., oyster, clam, trash fish were offered individually. Fourth feed was offered in combined manner. Proximate analysis was also performed for feeds used in the present study. Weight gain was higher when the water crabs were fed with mixed feed (59.00 g). The shell hardening duration (11.6 days) also shorter when compared to other feeds. From the present study 30 ppt salinity was optimum and mixed feed is suitable feed for fattening of *P. pelagicus* as evidenced by shorter duration and higher weight gain.

Key words: *Portunus pelagicus*, fattening, weight gain, mixed feeds, fisher folk, oyster

INTRODUCTION

The blue swimming crab (*Portuns pelagicus*) is the most common edible crab of the Atlantic coast and several million pounds are fished commercially each by trapping or trawling (Allan and Fielder, 2004). In Indian scenario the blue swimming crabs are processed and finally sold as a processed food. So demand for these crabs is increasing day-by-day. Usually the soft-shelled or water crabs are discarded from the landing center. This discarded water crabs will be purchased in less cost and reared until the exoskeleton becomes hard. Although resources are available for crab fattening from Nagappattinam to Cuddalore coastal areas of Tamil Nadu, India. But farmers are not concerned about crab fattening due to lack of awareness and proper technology. To create awareness, economically viable technology is the need of the hour to prevent the loss of useful income generating resource (Soundarapandian *et al*., 2004). To create awareness among farmers and fisher folk, fattening experiment was tried in two objectives: 1. It is designed to know the optimum salinity for better weight gain and survival of crab, *P. pelagicus* 2. It is planned to know which feed supports maximum growth of *P. pelagicus*.

MATERIALS AND METHODS

The water crabs of *P. pelagicus* was collected from the Parangipettai (Lat.11°29'N; Long.79°49'E) landing center and the size was ranged from 63-67 g. Healthy, live, disease free water

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crabs were selected and checked for any loss of appendages. They were brought to the laboratory by using bucket and acclimatized to the laboratory conditions (Temperature 26-31°C; pH 7.5-8.2; Dissolved oxygen 5 ppm).

Before entering into actual fattening experiment, the animals were exposed to different salinities to know the optimum salinity for fattening. Filter water was used for the preparation of different salinities. For this experiment 100 liter fibre glass tanks were selected and 2 animals were introduced in each salinity. The experimental salinities were ranging from 25-35 ppt. During experimental period the crabs were fed with trash fish at 10% of their body weight. Feeding was done twice in a day in the morning (6 Am) and evening (6 PM). Weekly sampling was done to assess the healthy condition and weight gain of crabs. Fifty percent of the water was changed regularly in the morning and replaced with respective salinities. The crabs were harvested once the shell becomes hard (Soundarapandian *et al*., 2004).

After knowing the optimum environmental conditions for fattening the water crabs were exposed to different feeds to ascertain better feed for fattening. The water crabs were offered with three different live feeds (clam, oyster and trash fish) and fourth one was mixture of the three live feeds. Clam and trash fish were purchased from the fisher folk. Oyster was collected from Vellar estuary. The water crabs of the present study were offered with live feeds at the rate of 10% of their body weight. Optimum environmental conditions were maintained during experimental period (Salinity 30 ppt; Temperature 26-31°C; pH 7.5-8.2; Dissolved oxygen 5 ppm). Proximate analysis of feeds was determined. The protein, carbohydrate and lipid contents were estimated by adopting the standard methods of Raymont *et al*. (1964), Dubis *et al*. (1956) and Folch *et al*. (1956), respectively. One gram of live feed was dried in hot air oven at 60°C for 48 h and reweighed. The difference in weight gave the moisture content of the feeds. Ash content was estimated by incinerating the test material in a muffle furnance at 500°C for a period of 5 h and weighing the residue as recommended by Paine (1964).The gross energy of the feed was calculated from the biochemical constituents by using the conversion factors i.e., 4.18 kcal g^{-1} for carbohydrate, 9.46 kcal g^{-1} for lipid and 4.32 kcal g^{-1} for protein (Bages and Sloane, 1981).

The Sampling of crabs was done once in two days to ascertain the healthy condition, weight gain and hardening of the crabs. Fifty percent of the water was changed regularly in the morning and unconsumed feed settle at the bottom was removed while water exchange. The crabs were harvested once the shell becomes hard and duration also calculated (Soundarapandian *et al*., 2004). To know the statistical significance ($p<0.05$) the data were treated with one way analysis of variance. Individual differences between treatments were determined by Duncan's multiple range test using SPSS/PC^{+}package.

RESULTS

The biochemical composition of live feed is given in Table 1. Among 4 feeds used in the present study, oyster showed highest percentage of protein (48.71%) followed by Trash fish (48.05%) and clam (46.08%).The percentage of carbohydrate was highest in the trash fish (6.09%) and lowest in clam (5.89%).The percentage of lipid was highest in Trash fish (5.89%) and lowest in oyster (4.01%).

Table 1: Proximate composition of test diets

Feeds	Protein (%)	Carbohydrate (%)	Lipid (%)	Ash (%)	Moisture (%)	Gross energy (Kcal g^{-1})
Oyster	48.71	6.08	4.01	15.06	73.61	2.75
Clam	46.08	5.89	4.02	15.98	74.00	2.78
Trash fish	48.05	6.09	5.89	15.90	74.98	3.01

Table 2: Weight gain and survival of *P. pelagicus* reared in different salinities

Salinity (ppt)	Initial weight (g)	Final weight (g)	Days	Weight gain (g)	Survival rate (%)
20	67.6±2.51	117.3±2.51^{a}	17.0±1.00^{b}	49.6±0.57^{b}	100
25	63.6±3.05	116.0±2.64^{a}	15.6±0.57^{b}	52.3±2.51^{b}	100
30	65.0±5.00	123.0±3.06^{b}	11.6±0.57^{a}	58.3±2.88^{a}	100

Means with different superscript are statistically different ($p<0.05$)

Table 3: Fattening of *P. pelagicus* offered with different foods

Feeds	Initial weight (g)	Final weight (g)	Weight gain(g)	Days	Feed consumed (g)	Survival (%)
Oyster	66.0±1.00	119.0±3.06^{b}	51.00±2.04^{b}	15.0±1.00^{b}	20.0±1.20^{a}	100
Clam	67.6±2.31	117.3±2.51^{a}	49.70±1.06^{a}	18.6±0.57^{a}	21.0±2.31^{a}	100
Trash fish	63.6±2.05	116.0±2.64^{a}	52.40±2.06^{b}	17.6±0.57^{a}	20.0±1.56^{a}	100
Mixed feeds	65.0±3.02	124.0±3.28^{c}	59.00±3.06^{c}	11.6±0.57^{c}	17.0±2.56^{b}	100

Means with different superscript are statistically different ($p<0.05$)

Regarding ash content, trash fish showed the maximum of 15.90% and the minimum of 15.06% was in oyster. The gross energy content was high in trash fish (3.01 Kcal g^{-1}) followed by clam (2.78 Kcal g^{-1}) and oyster (2.75 Kcal g^{-1}).

Salinity Experiment

The results of salinity experiment are presented in Table 2. For fattening three different salinities were tried (20, 25 and 30 ppt). Weight gain of the crabs cultured in 30 ppt was (58.3 g) significantly higher than 20 (49.6 g) and 25 (52.3 g) ppt. Weight gain did not show significant difference between 20 and 25 ppt. The shell was become hard in shorter duration (11.6 days) when the water crabs were cultured in 30 ppt rather than other salinities (20 and 25 ppt). The survival of crabs was 100% irrespective of the salinities. From the result 30 ppt was selected as optimum salinity for the culture of water crabs as evidenced by higher weight gain and shorter duration for shell hardening.

The results of water crabs cultured with different fees are displayed in Table 3. The water crabs offered with mixed feed showed significantly higher weight gain (59.0 g). However it was lower when the animals fed with clam (49.70 g) and did not show significant difference between oyster and trash fish offered crabs. The crabs were hardened significantly in very short duration when they were fed with mixed feeds (11.6 days). However the animals were took long duration when fed with clam (18.6 days) and trash fish (17.6 days). The duration of the clam and trash fish fed animals did not show significant difference. The animals consumed significantly less amount (17 g) of feed when fed with mixed feeds. However, the animals consumed more or less same amount of other feeds.

DISCUSSION

Salinity is important parameters to control growth and survival of crabs. Each and every aquatic organism requires particular salinity for normal growth and survival. If it is exposed higher and lower from the optimum will affect growth and survival. In higher and lower salinities, the animals are under stress so it delays the deposition of calcium on the exoskeleton. In the present study the water crabs was taking more time for hardening of the exoskeleton when kept in 20 and 25 ppt salinities. Where as it was shorter when the crabs were exposed to 30 ppt. Soundarapandian *et al*. (2004) conducted similar experiment for *Scylla tranquebarica*. From the study they confirm that 25 ppt was optimum salinity for *S. tranquebarica*. Eventhough they have exposed the crabs with 20 and 30 ppt.

In most of the studies in crustaceans, weight gain was mainly dependent on the nutritional quality of feeds (Koshio *et al*., 1990). Hence the weight gain was assumed to be improved by offering high quality foods to the water crabs.

The average weight gain of *P.pelagicus* noticed in the present study was directly related to the levels of protein in the diet. Variations in weight gain were found to be associated with differences in

chemical composition of diets. Water crabs are known to mobilize greater amount of protein for energy metabolism. Consequently the protein requirement in the water crabs might be high. The dietary protein content in the present study was 48.1% in oyster, 46.08 in clam and 48, 05% in trash fish. The weight gains of water crabs fed with oyster and clam did not differed significantly. The water crabs fed with mixed feeds showed the highest weight gain. Kanazawa *et al*. (1970) reported that the fresh diets of short neck calm (*Tapes philippinaruum*) gave superior growth compared to the compounded diet for *P. japonicus*.Similar results were obtained by Forster and Beard (1973).Frequent moulting was observed during feeding with fresh clam meat (Ali, 1982). One major nutritional difference between live food organisms and compound feed is the presence of digestive enzymes in the live food organisms. These enzymes of dietary origin play important role in promoting the digestion and growth of crustacean (Soundarapandian *et al.,* 1998).

Feed consumption is not always related with weight gain. In the present study *P. pelagicus* consumed more amounts of oyster, clam and trash fish individually. But weight gain was not significantly differing each other. When all the above said feeds are given together than the weight gain was high. This indicated that these three feeds support weight gain better than fed individually. Senthilkumar (1996) used three types of live feeds viz., clam meat, fish meat and beef meat for the water crabs of *S. serrta*. He used those feeds individually and combined together as in the present study. Growth, survival and production rate was maximum when the water crabs were fed with combined feeds rather than fed individually. Williams (1982) also suggested that the mixed diets support superior growth. No significant change was observed in the total weight of *S. serrta* fed with trash fish, slaughter house waste and clam meat during fattening (Anil and Suseelan, 2001).

The survival was 100% in all the feeds used individually and in combination. So environmental conditions used in the present study was optimum (Salinity 30 ppt; Temperature 26-31°C; pH 7.5-8.2; Dissolved oxygen 5 ppm).The water crabs used for fattening in the present study was mostly same size (63.67 g) with same degree of shell hardness were stocked to reduce cannibalism and facilitate easy harvest. This may be one of the reasons for higher survival in the present study.

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