

Effects of supplementary feeds on growth and survival of freshwater giant prawn (*Macrobrachium rosenbergii* deMan)

S.U. Ahmed*, S. Rahman and M. Rahman

Bangladesh Fisheries Research Institute, Riverine Station, Chandpur 3602, Bangladesh

Present address & corresponding author: Brackishwater Station, BFRI, Khulna 9280, Bangladesh

Abstract

Highest growth of prawn was obtained with Feed B (743kg/ha) with highest survival rate (60.88%) followed by Feed A where production and survival rate was 659 kg/ha and 53.50%, respectively. Feed A contained 30% dry ground cow viscera, 40% oil cake, 20% rice-bran and 10% wheat bran. Feed conversion ratios were found to be 7.60:1 for Feed A and 6.46:1 for Feed B, which indicated that Feed B was more efficiently utilized by the prawn than Feed A. Statistical analysis revealed that the differences in production of prawns among the treatments were highly significant ($P < 0.01$).

Key words : *Macrobrachium rosenbergii*, Feed, Survival

Introduction

Macrobrachium rosenbergii, locally known as "Golda chingri" has great potential for culture in freshwater ponds, but in practice, culture of this species in the country is still in the primitive stage and the production rate is also very low. Simultaneously the natural stock of prawn is declined day by day due various environmental and man-made factors. Absence of improved culture and management practices are also responsible for such adverse situation. As little work have been done on mono-culture of "gold" in Bangladesh so more investigations are needed to develop the culture techniques of the species to increase the production. Considering the above facts the study was undertaken to find out the effects of different feeding treatments on the growth, survival and production of *M. rosenbergii* pond culture system.

Materials and methods

Nine earthen ponds each of 0.16 ha were selected for this study and marked as P-1, P-2, P-3. All the ponds were dried-up to eradicate insects, poisonous gases and undesirable fishes. Lime (CaCO_3) was applied at the rate of 200kg/ha and then fertilized with both organic and inorganic fertilizers. Each pond was divided into three equal compartments (area of each compartment was 0.053 ha) by bamboo fencing. Physico-chemical factors of pond water *viz.* water depth, temperature, transparency and pH were determined at fortnightly intervals, and free carbondioxide, dissolved oxygen and water hardness were recorded at bimonthly intervals.

Juveniles of *M. rosenbergii* which are available from local rivers (Dakatia and Meghna) were collected and then kept for nine days in cement cisterns, filled with pond water for acclimatization. They were finally stocked on August'95 at the rate of 15000 juveniles/ha (800 juveniles in each compartment) in all the ponds. Initial mean weight of the juveniles were 4.85g in P-1, 4.20g in P-2 and 4.00g in P-3. All the ponds were fertilized monthly with cow dung at the rate of 750 kg/ha (40 kg in each compartment), and urea at the rate of 40 kg/ha (2.1 kg in each compartment). After two months, compost fertilizer of cow dung, water hyacinth and lime at the ratio of 10:20:1 were used instead of cow-dung.

Ponds of P-1 were considered as controlled (without any supplementary feed). Feed was supplied at the rate of 5% of the body weight of prawn every day in the evening in the ponds of P-2 and P-3. Feed-A was used in P-2 and Feed-B in P-3.

Sampling of prawn was conducted once in a month the final harvest was done after 180 days of culture on February'96 by dewatering the ponds.

Results and discussion

Physico-chemical parameters

Initially same water depth was tried to maintain in all the ponds. However, the depth increased gradually and reached its peak during the month of October (261.34cm to 300.17cm) and then gradually fall down up to the minimum level (131.67cm to 167.67cm) in the month of January (Table 1). Hanson and Goodwin (1977) observed that the water depth ranging from 91 cm to 122cm is known to be beneficial for growth and survival of prawns. Transparency and pH generally increased with the increase of water level with an exception of minimum pH recorded in November. Minimum water temperature (22.37^o to 22.94^o) was recorded in all the ponds during January and the maximum was recorded during August in the ponds of P-1 and P-2, and in October in P-3. The water transparency become higher in P-1 ponds probably due to low plankton growth and suspended particles in the pond water.

Table 1. Physico-chemical parameters of the ponds under different treatments

Month s	Water depth (cm)	Temp. (°C)	Trans- perancy (cm)	pH	DO (mg/l)	CO ₂ (mg/l)	Hardness (mg/l)
Aug.	176.5-195.8	33.97-35.20	31.10-35.20	8.12-8.59	-	-	-
Sep.	244.7-276.8	30.88-32.00	34.10-46.34	8.00-8.38	3.47-4.42	3.88-5.42	64.46-92.58
Oct.	261.3-300.2	33.14-33.79	38.05-49.17	7.67-7.90	-	-	-
Nov.	214.3-250.3	30.32-31.82	36.20-42.17	8.88-9.37	5.56-6.78	3.05-5.21	61.71-86.23
Dec.	168.7-218.8	24.22-27.05	35.20-39.43	8.54-9.10	-	-	-
Jan.	131.7-167.7	22.72-22.94	29.84-33.54	8.72-9.22	4.65-6.27	4.32-5.93	64.98-87.88

Minimum values of dissolved oxygen (3.47 to 4.42mg/l) in all the ponds were found in September, whereas maximum values for P-2 and P-3 ponds were recorded in November and for P-1 ponds in January. Water hardness showed maximum values (64.46 to 92.58 mg/l) in September for P-1 and P-2 ponds and in January for P-3 ponds. Maximum free CO₂ was recorded (4.32mg/l and 5.93mg/l) for P-2 and P-3 ponds in January and for P-1 ponds in November and the minimum (3.05mg/l and 3.34mg/l) for P-2 and P-3 pond during November and for P-1 ponds in September (Table 1). According to Hanson and Goodwin (1977), this species can tolerate a wide and fluctuating range of temperature and dissolved oxygen. Swingle (1971) described pH values ranging from 7.21 to 8.84 as the desired level for pond fish culture.

Survival and mortality rate of juveniles

A total of 8,427 galda juveniles were collected of which 9.21% and 4.15% died during the period of transportation and acclimatization, respectively. The rate of survival was 87.17%.

The causes of the mortality of juveniles might be due to shortage of oxygen, physical injury caused by friction with rough surface of the container during transportation period, higher water temperature in the cistern and secondary infection as a result of physical injury of the juveniles during the period of acclimatization.

Production and growth

The highest average weight (36.16g) increment were found in P-3 ponds and lowest value in P-1 ponds (22.38g). Similar results were found in their daily average individual growth increment (Table 2). The daily increment of weight ranging from 0.12g to 0.20g, although these were close to observation of Arieli *et al.* (1981) and Ling (1967a) but seems secured quite low when compared with that of Arieli and Rappaport (1982) who recorded 0.29g/ day individual increment over a growing period of 120 days.

Table 2. Growth and production of *M. rosenbergii* in monoculture experiment

Ponds	Final wt. (g)	Individual increment /day (g)	Total % increment (g)	Survival (%)	FCR	Total wt. at harvest (kg)	Production (kg/ha)
P-1	27.73	0.12	463.80	53.50	-	11.70	441
P-2	37.00	0.18	781.09	58.50	7.6	17.64	659
P-3	40.25	0.20	892.64	60.88	6.7	19.69	743

During the grow out period, the survival rates of prawn in P-2 and P-3 ponds were almost similar (53.5% and 60.8%) and lowest in P-1 ponds (53.5%), but as a

whole it reflected high mortality rate ranging from 39.12 to 46.50%. High mortality rate and consequent low production may be due to cannibalism, predation by birds and animals and pouching . Takata (1974) observed 18% survival rate over a culture period of 300 days with the stocking density of 18 individuals of *M. rosenbergii* per square meter. Maximum increase in weight (40.25g) was also recorded for P-3 ponds followed by P-2 (37g) and P-1 ponds (27.73g) where the rate of increment is in agreement with the findings of Khan *et al.* (1980).

Prawns of P-3 ponds showed higher feed conversion ratio (6.5:1) with the supplementary feed "B" than those of the prawns of P-2 ponds where the average feed conversion ratio was 7.6:1 with the supplementary feed "A". The results indicate that, the feed "B" is more acceptable for consumption and growth of these prawns.

In the ponds of P-3, highest rate of production (743kg/ha) was recorded, followed by a gradual decrease in P-2 (659kg/ha) and P-1 ponds (441kg/ha) which might occur due to the differences in feeding treatments of the ponds. Results also indicate that the feed type "B" enhanced the production in comparison to feed type "A" and controlled treatment.

From Table 3 it is apparent that among the total catch 27.10% 30.70% and 63.16% of prawn harvested from the ponds of P-3, P-2 and P-1, respectively. Brody *et.al.* (1980) stated that the size of prawn above 30g in weight is regarded as marketable size in many parts of the world. The results show that highest average weight gain was in the ponds of P-3 with the supplementary feed type "B". In all the ponds, a smaller no. of prawns were found within the range of 8.0 to 12.0g, most of them were infected by parasitic isopodes. However, the growth in weight per month in all the ponds increased almost in a similar fashion during the first two months of this experiment (4.73g to 5.55g) and reached its peak ranging from 27.39g to 38.58g in the month of November. Monthly increment in growth of weight was also highest (8.78g to 7.65g) in November. The increment in growth during the month of December and January were lowest ranging from 0.36g to 1.5g, which might due to the unavailability of moulted prawn at sampling, low water temperature, variation in the physico chemical condition of water, use of insufficient feed and other environmental factors. Menon *et al.* (1972) and Islam *et al.* (1984) also observed similar trends of growth variation in *M. rosenbergii*. During the harvesting period (February) growth of prawns in all the ponds decreased because of the inclusion of all sizes of specimen together which was mostly due to the variation in individual growth rate(Ling 1967b).

However, from the above results, it is clear that in prawn monoculture system, sub optimal environmental conditions and management procedures are the main limiting factors. Although the feed type B gave the best result but the maximum yield was only 743kg/ha/yr. Whereas in Hawaii 1360kg of prawns/acre/year are produced by adopting the intensive culture system. However the production level of 743kg /ha/yr in this experiment is quite satisfactory compared to our national production level of 75-100kg/ha/yr.

References

- Arieli, Y., S. Saring and Y. Bejerano, 1981. Observation on pond growth of *Macrobrachium rosenbergii* at the Ginosar Fish Culture station in 1978 and 1979. *Bamidge*, 33(2): 57-68.
- Arieli, Y. and U. Rappaport, 1982. Experimental cultivation of the freshwater prawn *Macrobrachium rosenbergii*. *Bamidge*, 34(4): 140-143.
- Brody, T., D. Cohen, A. Barnes and A. Spector, 1980. Yield characteristics of the prawn, *Macrobrachium rosenbergii* in temperate zone aquaculture. *Aquaculture*, 21:357-385.
- Hamson J.A. and L.H. Goodwin, 1977. Shrimp and prawn farming in the western hemisphere. Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania. 439 pp.
- Islam, M. A., M. A. Hossain, A.K. M.A. Haque and M.S. Rahman, 1984. Raising of freshwater giant shrimp *Macrobrachium rosenbergii* in a semi controlled pond under various dietary conditions with notes on some limnological conditions of the stocking pond. *Bangladesh J. Fish.*, 5(1): 139-144.
- Khan, Y.S.A., N. Mahmood and K. Bhuiyan, 1980. Study on the culture and growth of *Macrobrachium rosenbergii* (de Man) in a freshwater pond of Bangladesh. *Bangladesh J. Agril.*, 5(2): 96-102.
- Ling, S.W., 1967a. Methods of rearing and cultured of *Macrobrachium rosenbergii*. FAO world Sci. Conf. on the Biology and Culture of Shrimp and Prawns, Mexico city, June 12-24.
- Ling, S. W., 1967b. The general biology and development of *Macrobrachium rosenbergii* (de Man), FAO. Fisheries Report No. 57(3): pp. 589-606.
- Memon, R.W., A. Rajagopal and R. Srinivsan, 1972. A preliminary report on pond culture and breeding of freshwater prawn *Macrobrachium rosenbergii* in Tamilnadu. Proc. Symp. on the Prawn Fisheries and Modern Fishing Vessels, Tamilnadu, India.
- Swingle, H.S., 1971. The inland fisheries progress in Thailand. International Centre for Aquaculture, Auburn Univ. Auburn, USA. 106 pp. (un published)
- Takada, M., 1974. Development of the prawn culture industry in Hawaii, NTIS Scr. COM-75. 10112, 26pp.

(Manuscript received 27 November 1998)