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POND CULTURE OF JAIRA AND KALRI (PENAEID SHRIMPS) IN PAKISTAN

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Preliminary investigations were conducted in experimental pond having an area of 50 m X 2 m. In this pond 2,500 juveniles of *Penaeus merguiensis, Penaeus penicillatus* (*"jaira"*), *Metapenaeus affinis* and *Metapenaeus monoceros* ("kalri") were stocked at 3-5 cm size. After feeding for three months, the shrimps were harvested on 21 July 1986. The catch was 60 kg of large shrimps with an average length of 15 cm and average weight of 33 g each, which is the largest size available in the local market today at a cost of about Rs. 200/- per kg.

Key words: Penacid shrimps, Pond culture, shrimp trade.

INTRODUCTION

The importance and productivity of shrimp culture for human food and its contribution to the economy of a nation has been clearly demonstrated in Ecuador. The value of farm-produced shrimp has increased from less than $ 10 million in 1977 to nearly $ 100 million per year in 1982 [7]. Moreover shrimp trade has expanded rapidly since 1977, from 350,000 tonnes (valued at US $ 1.2 billion) that year to nearly 490,000 tonnes (valued at $ 3.2 billion) in 1983 [2]. These conditions are very encouraging for nations that are planning to go into shrimp farming.

Most of the shrimp mariculture industry involves the use of penaeids, such as *Penaeus monodon* in the Philippines, Indonesia and Sri Lanka, *P. indicus, P. merguiensis* and *P. penicillatus* in India and Bangladesh, *P. japonicus* in Japan and *P. semisulcatus* in Taiwan. These industries rely on the supply of seed stock (juveniles) from natural populations, with a very small percentage coming from youngs produced in hatcheries.

In the Pakistani waters, *P. merguiensis, P. penicillatus* ("jaira") and *Metapenaeus affinis, M. monoceros* ("kalri") are major contributors to the local shrimp industry. As these shrimps are also suitable for mariculature, the present investigations were carried out to evaluate the possibilities of their culture on mass scale and the availability of their juveniles in the coastal waters of Pakistan.

MATERIAL AND METHODS

An experimental pond having an area of 50 m X 50 m was excavated near Garho town (30 miles from Gharo and 70 miles from Karachi) adjacent to the salty Ambara creek. The pond was 2.5 m deep. A 24 H.P. water pump was fitted to pump water from the creek into the pond. A drain pipe was also provided at one end to drain water from the pond.

Treatment of the pond. Before stocking, the pond was treated with 5 kg agriculture lime and 175 kg of organic fertilizer (cattle dung) and was left for 15 days to dry-up. Ten days before stocking, the pond was filled to 1.5 m depth with creek water. The temperature and salinity of the pond were recorded during this period. A heavy growth of phytoplankton followed by zooplankton was observed in the pond.

Stocking. A small wooden boat 20 feet long and 10 feet wide fitted with a locally made 12 H.P. outboard engine, was used for transportation in the creek. A net was used to catch the penaeid juveniles from the creek. Two wings of the net were 6 feet long and 6 feet broad, ending in a net bag having a 4-feet mouth diameter. The net bag itself was 6 feet long, having an opening at the codend, which was closed by a rope during towing. The net was towed by two fishermen against the incoming or receeding tides for 15 min. at each tow. The catch was immediately transferred to the boat in plastic buckets and then emptied into large plastic containers (500 litre capacity) aerated with portable battery driven aerators. When aerators were not available, water of the containers was changed continuously, otherwise heavy mortalities occurred. The juveniles were then identified, measured, and released into the pond.

During the period from 11 April to 25 April, 1986 a total of 2,500 juveniles were stocked in the pond; out of which 1861 were "jaira" (*P. merguiensis, P. penicillatus*) and 639 were "kalri" (*M. affinis, M. monoceros*). In addi-

ı to this, five "patapati jaira" (*P. semisulcatus*) were also stocked in the pond. Sizes of the juveniles were between 3 to 5 cm in length.

Feeding. Feeding was started when stocking of the pond was completed. The formula of the food is given in Table 1. Three kg of food were given every day between 1600 to 1700 hours. After every 10 to 15 days the juveniles were sampled from the pond and measured.

Water change. About 10 % of the pond water was changed daily.

Hydrographic conditions. The temperature in the Ambara creek (Table 2) ranged between 26 and 32° during 11 April to 21 July, 1986. The highest temperature prevailed during May-July. The pond temperature ranged between 28 and 30°. The pond salinity during this period ranged between 31.5 and 42.0 % and in the creek it was between 29 and 40 %. In the Ambara creek the salinity was high; therefore, there was little change in the pond salinity through pumping of creek water into the pond.

RESULTS

Growth. Growth of the juveniles of *P. merguiensis* and *P. penicillatus* during 11 April to 21 July, 1986 is shown in Fig. 1. A high rate of growth was observed in the pond (30-60 mm stocking size; 130-160 mm harvesting size). From 50 mm average stocking size an average growth of 150 mm was recorded in only 82 days. Therefore the average growth appear to be more than 1 mm per day (100 mm in 82 days). A little lower growth was recorded in *M. affinis* and *M. monoceros*; starting from 50 mm average size an average growth of 133 mm was observed in 82 days 83 mm in 82 days), i.e. about 1 mm/day. Earlier investigations in pond culture indicated more or less similar or lower growth in penaeids; as Hassan [3,4,5,6] reported 1 mm/day growth in *P. semisulcatus* and 0.5 mm in *M. affinis* and *M. monoceros.* Wheeler [10] indicated 100 mm growth in *P. setiferus* and 80 mm in *P. aztecus* in only two months. Delmendo and Rabanal [1] reported 230 mm growth in *P. monodon* in a year.

Weight. The average increase in weight was also recorded in the four species (Fig. 2). In *P. merguiensis* and *P. penicillatus* the increase was of the order of 31 g in 82 days. In *M. affinis* and *M. monoceros* the increase was 28 g during the same period. Wheeler [10] reported about 9 g increase in *P. setiferus* and *P. aztecus* in two months. Parker [9] reported 0.14 g per day increase (13 g in 3 months) in *P. setiferus.* The above results are much lower than the present findings.

Table 1. The formula for food maintained more or less throughout experiment.

Ingredients	Composition (%)	Quantity (g)
Fish meal	20	600
Shrimp head meal	20	600
Blood	20	600
Rice bran	15	450
Wheat floor	15	450
Khali	5	150
Vitamin-mineral mixture	5	150
Total	100.0	3000.0

Table 2. Distribution of temperature in experimental pond and Ambara creek during 1986.

Date	Temperature (^{o}C) Experimental pond	Temperature (^{o}C) Ambara Creek
11.4.86	29-30	28.0
17.4.86	30.0	28.0
18.4.86	29.0	27.0
24.4.86	28.0	26.0
25.4.86	28.0	26.0
11.5.86	29.0	32.0
21.7.86	29.0	32.0

Table 3. Distribution of salinity (%) in experimental pond and Ambara creek during 1986.

Date	Salinity (%) Experimental pond	Salinity (/) Ambara creek
11.4.86	31.5	33.5
17.4.86	40.0	29.0
18.4.86	39.0	30.0
24.4.86	39.0	40.0
25.4.86	40.0	40.0
11.5.86	40.0	35.0
21.7.86	42.0	40.0

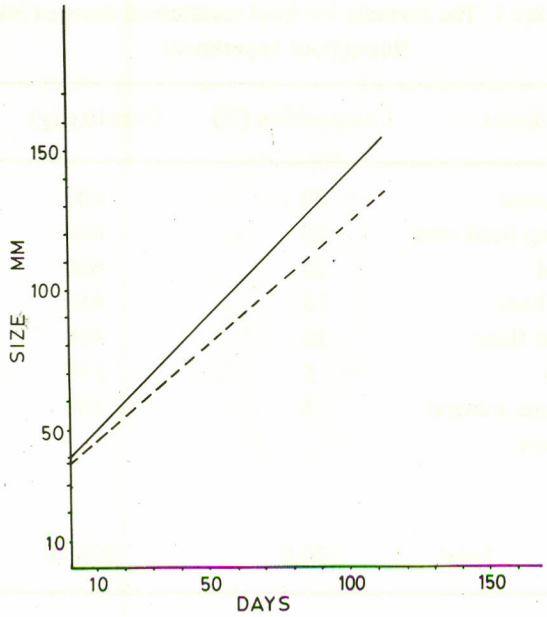

Fig. 1. Growth of *Penaeus merguiensis, Penaeus penicillatu* (solid lines), *Metapenaeus affinis* and *Metapenaeus monoceros* (broken lines) in experimental pond.

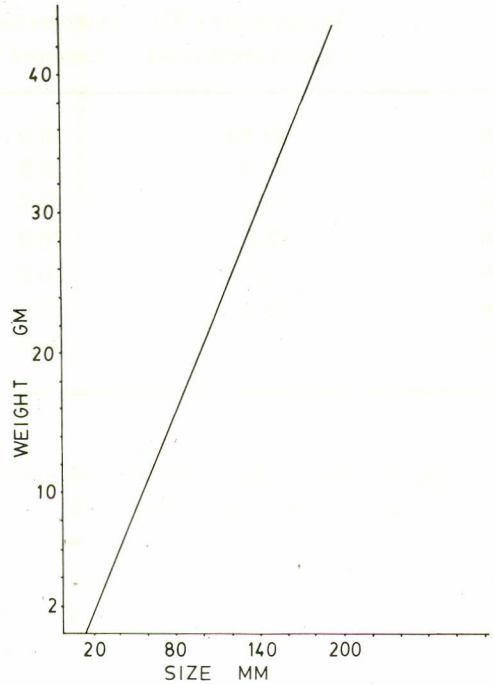

Fig. 2. Approximate weight and length relationship for *P. merguiensis* and *P. penicillatus.*

DISCUSSION

The experiment described above provided some interesting results which will be of great help to the shrimp farmers in Pakistan. *P. merguiensis* and *P. penicillatus* grew well in the pond and attained the maximum market size and weight (15 cm and 33 g) in only 3 months. This will cost in the local market about Rs. 200 kg. More important, juveniles of these shrimps are available in the adjacent creeks in significant numbers so as to meet a limited stocking demand of the local growers. *P. semisulcatus* "patapati" is another promising species. This species was grown equally well in the pond (14 cm and 32 g) during the same period, but few of their juveniles were found in the Indus Delta system. However a limited brood stock of this species is available in our waters and could be utilised for producing juveniles of this species on commercial scale in hatcheries [5,8].

The presence of an unlimited brood stock of the two species of "jaira" (*P. merguiensis* and *P. penicillatus*) [6,11] in Pakistani waters promises expansion of shrimp farming to a large scale in future in the Indus delta area, based on juveniles produced in hatcheries. The juveniles of "kalri" (*M. affinis* and *M. monoceros*) [3,6] were found to be the most abundant in the study area. Therefore, mixed farming using both "jaira" and "kalri" is suggested.

The fear that prevailing high salinity and temperature (Table 2,3) in the Indus delta area may decrease growth of juveniles seems unjustified. Growth of both "kalri" and "jaira" in pond water of 40 % salinity and 29° temperature indicates that the above species are adapted to grow well under these conditions.

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