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OBSERVATIONS ON THE GROWTH OF *PENAEUS MONODON* (FABRICIUS) IN THE LESS SALINE PONDS OF SUNDERBANS WITH NOTES ON ACCLIMATISATION AND TRANSPORT OF THEIR SEED

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ABSTRACT

Growth of juveniles of *Penaeus monodon* of 18-26 mm length range in nursery and stock ponds containing water of low salinity (0.16-0.28 ppt) was very rapid. When this species was reared in a 0.25 ha pond in combination with Indian and exotic carps and *Mugil cephalus* at an overall density of 8,000 per ha, through multiple stocking and repeated harvesting a higher percentage of retrieval of the prawn was obtained. The growth in the rainfed ponds in Sunderbans was compared with that reported from elsewhere. Gradual acclimatisation of seed reared for 32 days to a salinity of 1.5 ppt before transport and a density of 54 seed (18-26 mm long) per litre without oxygen resulted in 10% survival during transport involving a journey of 3 hours.

INTRODUCTION

THE TIGER PRAWN *Penaeus monodon* Fabricius is a very much sought-after species for culture in brackishwater impoundments in view of its fast growth and the export demand. As the advantages of its selective culture are being realised by the fish culturists, a seed trade is established in some parts of West Bengal like Basirhat, Canning, Kakdwip and Namkhana with the price of the fry depending on their size varying between Rs. 12 and Rs. 22 per thousand. As the fishermen employed in the seed trade adopt crude and empirical methods for collection and transport involving heavy mortality of the fry, there is an urgent need to evolve and standardize scientifically sound techniques for maximum utilization of the naturally available seed.

Though some information is available (Villadolid and Villaluz, 1950; Delmendo and Rabanal, 1956; Jhingran and Natarajan, 1969; Subrahmanyam, 1973; Liao and Huang, 1973; Verghese *et al.*, 1975) on the growth of tiger prawn in brackishwaters both under natural and controlled conditions, no recorded information is available on their growth and possibilities of their farming in very less saline and freshwaters. Therefore in the present communication observations on the growth of *P. monodon* in less saline ponds are presented together with notes on the technique of fry collection, nursery rearing, acclimatisation to low salinities and transport.

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COLLECTION AND REARING OF POSTLARVAE

Postlarvae were collected with a standard Midnapore type of fry collection net (shooting net) of mesh size 1.59 mm during spring tides by setting up the net against the water current.

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The mixed collection accumulated at the cod-end was scooped out from time to time and kept in sufficiently large tubs containing clear estuarine water. The postlarvae of *P. monodon* of 10-15 mm total length were observed to swim near the surface, trying to cling in to floating debris like dead leaves and grass shoots. They were scooped out along with the debris by means of white porcelain or plastic saucers and put into enamel trays. The debris was shaken off the larvae and placed again in the tubs for fresh accumulation of postlarvae. In this way during the peak season of their abundance it has been possible to segregate as many as 10,000 fry per net per tide (Verghese, 1976).

After proper conditioning of the fry to lentic conditions they were reared in PVC pools of 400 l capacity containing diluted estuarine water with a salinity of 10+1 ppt. The pools were provided with frames of PVC sleevings bearing abundantly periphytic diatoms, blue-green algae and other microscopic organisms. These frames serve both as substratum and grazing areas for the young prawns. In addition to this natural food, artificial feed in the form of finely powdered fish meal mixed with wheat flour in a ratio of 1:1 was given @ 20% of the total weight of the prawn per day in three or four instalments. The water in the pools was kept clean by siphoning out every day the unutilized food and the faecal matter. The level of water was made up with water of the same salinity. For the experiments on acclimatisation and transport reported in the present communication fry reared for 32 days and grown to a size of 18-26 mm total length were used.

Acclimatisation and Transport

For acclimatisation of the fry to low salinities, saline water from the estuary was mixed in required proportion with tube-well water. The fry were acclimatised without any mortality for three hours at each of the grades of salinity 10.5, 6.0, 3.3 and 1.5 ppt maintained in the experimental pools. It was observed that fry of *P. monodon* withstood lower salinities through gradual acclimatisation. The dissolved oxygen and pH of the water during acclimatization varied respectively from 5.6 to 6.8 ppm and 8.2 to 8.6.

For transporting the fry (18-26 mm) a clean open container (aluminium vessel) and water of 1.5 ppt salinity were used. The density at the time of transport was 54 fry per litre of water. Total survival was observed after three hours of transport by road without any anaesthetics or change of medium. The fry were stocked in less saline rain-fed ponds at Bakkhali in the lower Sunderbans.

Characteristics of Less Saline Ponds

At the Pilot Fish Farm of the Central Inland Fisheries Research Institute on Henry Island in the lower Sunderbans the juvenile prawns were reared initially in a nursery pond and subsequently stocked in a large pond for culturing them upto table size. These ponds constructed in 1968 on the saline soils of Henry Island had considerable salinity both in the water and soil phases - 20.12 ppt in the water and 2.95% in the soil phases. With progressive desalination in both the phases (Jhingran *et al.*, 1973) near freshwater conditions were created. At the time of the present observations (1976) the prevailing hydrological conditions were as follows:

	Water phase	*Soil phase*
	Range	Range
pH	8.0 - 8.4	7.4 - 8.2
Salinity	0.16 - 0.28 ppt	0.002-0.003%
Temperature	28.4 - 32.3°C	
Dissolved oxygen	6.2 - 6.8 ppm	
Total alkalinity	180 - 210 ppm	

The ponds had luxurious growth of marginal grasses with abundant growth of periphyton over them.

GROWTH

Growth in nursery pond

The fry with an initial mean length of 21.7 mm were stocked @ 1,60,000 nos per ha in a low saline nursery pond of 0.003 ha in area. The details of growth are furnished in Table 1.

wherein polyculture of Indian and exotic carps (*Catla catla, Labeo rohita, Cirrhinus mrigala, Hypophthalmichthys molitrix* and *Cyprinus carpio* var. *communis*), *Mugil cephalus, Liza parsia, L. tade* and *Chanos chanos* @8,000 nos per ha was in progress. The pond was fertilized from time to time with N–P fertilizers @ 600 kg/ha/annum to maintain sufficient plankton and supplementary feeding with a mixture of mustard oil cake and maize powder in a proportion of 1:1 @ 1% of the body weight of the fishes. Apart from this

TABLE 1. *Growth of* P. monodon *in a less saline nursery ponds* (0.003 *ha*) *at Bakkhali*

Sampling date	Number caught	No. sampled	Length range (mm)	Mean length (mm)	Mean weight (g)	Rearing period (days)	Increment Length (mm)	per day weight (mg)
6.5.76	460 (stocking)	15	18–26	21.7	0.06	Nil		
20.5.76	32	32	45–61	51.9	1.16	14	2.15	78.5
28.5.76	34	34	55–95	74.2	3.53	22	2.39	157.7
8.6.76	16	16	80–93	85.7	5.00	33	1.94	149.7
23.6.76	14	14	84–102	94.0	6.60	48	1.506	136.3
8.7.76	12	12	97–112	103.6	8.40	61	1.343	136.7
27.7.76	6	6	111–121	115.0	15.70	80	1.166	195.5
11.8.76	4	4	116–121	117.8	16.25	95	1.010	170.4

It can be seen that the daily increment in length in general progressively decreased. The growth in body weight was faster only between the 15th and 22nd day and again between the 62nd and 80th day as compared to other periods. In this pond no supplementary feed was given and the observed growth rate was entirely due to natural food.

Growth in stocking ponds

Juveniles above 45 mm total length were removed from the nursery pond and stocked in an adjacent larger stocking pond (0.25 ha), during May to July 1976 the pond was stocked with juveniles of tiger prawn of size range 45-86 mm total length collected from borrow-pits inundated by tidal water.

It can be seen from Table 2, showing the growth of *P. monodon* in length and weight that in the stocking pond the growth was very rapid. Thus in 30 days (from 12th July to 11th August) the prawns grew from a mean size of 82.6 mm/4.80 g to 170.8 mm/55.9 g, with a daily increment of 2.94 mm/1.703 g. Subsequent growth stanzas were also very encouraging. Since 18 out of the 24 specimens

harvested on 21-11-'76 were in moulting stage, the average weight was lower for that sample. As a result of multiple stocking and repeated harvesting the percentage of recovery of prawns was as high as 37.4. From the same pond in earlier experiments (1973-'75) where annual culture was practised, the percentage of recovery varied between 6.7 and 15.0.

Discussion

Though *P. monodon* is known to be euryhaline, it was observed during the course of our investigations that sudden change of salinity is detrimental to the species and a gradual acclimatisation is imperative to avoid the attendant mortality. Total survival was obtained through gradual lowering of salinity through the grades already mentioned elsewhere in the text.

De and Subrahmaniyan (1975), Singh *et al.* (1980) and Franklin *et al.* (1980) tried transportation of tiger prawn seed under oxygen packing at different densities. Chloral hydrate @ 400 mg/l was effectively used as sedative for *P. monodon* seed during transportation by Singh *et al.* (1980). Alikunhi *et al.* (1980) tried transportation of prawn seed over distances involving 18 hrs under oxygen packing. They used live feed such as *Artemia* nauplii and *Moina* sp. to minimise predation during transport, apart from lowering the temperature to about 17°C.

The packing density of 54 larvae per litre tried in the present attempt in open containers without oxygenation is comparable to that of De and Subrahmanyam (1975). In the case of transportation of *P. indicus* postlarvae, a density of 250 per litre was tried by Alikunhi *et al.* (1980) in open containers.

Table 2. *Growth of* Penaeus monodon *in a 0.25 ha less saline stock pond under multiple stocking and repeated harvesting*

Stocking					Harvesting				
Date	No. stocked	Length range (mm)	Mean length (mm)	Mean weight (g)	Date	No. harvested	Length range (mm)	Mean length (mm)	Mean weight (g)
20.5.76	82	45–60	51.9	1.16	11.8.76	21	148–184	170.8	55.9
28.5.76	34	55–95	74.18	3.53	21.9.76	12	190–198	196.0	70.0
8.6.76	46	80–93	85.70	3.00	19.10.76	20	169–206	190.3	67.5
12.7.76	55	75–86	82.60	4.80	21.11.76	24	194–224	207.0	70.0
					16.12.76	4	186–224	200.00	95.0
Total	217				Total	81			

P. monodon was reported to have attained a size of 250 mm from the Philippine ponds which is very near to the growth from natural waters (Villadolid and Villaluz, 1950). Delmendo and Rabanal (1956) reported that this species reaches a size of 45.3 mm in four weeks (28 days) of rearing, whereas in the present experiment a size of 85.7 mm was attained in 33 days. Similarly 103.6 mm in 61 days as reported in this paper is higher than 79.0 mm reported by Delmendo and Rabanal (1956) in 2 months (60 days). At the end of 95 days the size of 117.8 mm obtained in the present studies is again higher than the reported sizes

attained during a comparable period of rearing by the above authors. Subrahmanyam (1973) reported an average size of 15.5 mm per month from experiments in jars and cement cisterns. The average growth of 30.3 mm and 21.3 mm per month observed respectively from the less saline nursery and stocking ponds seems to be higher than all the data reported so far. From Table 2 it can be seen that interestingly enough this species can attain a maximum size of 224 mm within 7-8 months as against the one year required to attain that size from the Philippine brackishwater ponds (Delmendo and Rabanal, 1956).

The present observations thus not only prove that the growth rate of *P. monodon* in less saline rain-fed ponds favourably compares with that reported from elsewhere by other workers, but also points out the possibility of their culture in this ecosystem. From the present experience it can be suggested that this species can be stocked in shallow ponds with water depth of 60 to 90 cm to obtain a higher recovery at the time of harvesting, since such ponds can be easily dewatered.

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