# Some Observations on the Growth and Survival of the Jumbo Prawns *Penaeus monodon* Fabricius and *Penaeus indicus* H. M. Edwards in a Solar Salt Works along the Okhamandal Coast of the Gulf of Kutch

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Early juveniles of the jumbo prawns *Penaeus monodon* and *Penaeus indicus* were reared in an earthern pond within a solar salt works to experiment integration of their farming with salt works system along the Gulf of Kutch. During the 180 days rearing in hypersalinity conditions, an average length of 125mm and weight of 22g in the former and an average length of 133mm and weight of 18.5g in the latter were recorded. The survival was only 4.2 and 5.8 % respectively. The growth and survival characteristics related to the hydrology of salt works are analysed and discussed.

The selection of quick growing species is an essential aspect of intensive prawn farming. Among the penaeid prawn species the green tiger jumbo, *Penaeus monodon* Fabricius and the Indian white jumbo *Penaeus indicus* H.M. Edwards, are preferred due to the fast growth to marketable size within short period of 90 to 180 days, giving two crops in a year. These species have been reported to tolerate high salinity conditions and achieve reasonable growth within short duration (Raj & Raj 1982). The Gulf of Kutch is characterised by higher salinity compared to other coastal areas of the country. Therefore, in order to study their suitability in farming in ponds fully integrated with solar salt works along the coast, an experimental culture for 180 days was conducted from April 1988 to September 1988, using early juveniles of both species. The observations are reported in this paper.

## Materials and Methods

38,989 early juveniles of *P. monodon* and 11,500 early juveniles of *P. indicus* raised from post larvae of the species obtained from elsewhere stocked in a pond within salt works. Sea water pumped in from the mangrove chanel and passed through settling tanks was fed to the pond through a sluice provided with 18 mesh/sq. inch 'garfil' screen in order to prevent entry of predators. Water level in the 1.92 hectare pond was maintained at 0.8 to 0.9 metre depth. Daily exchange of 10% water was ensured except during June-July. Prior to stocking with juvenils, the pond was treated with slaked lime @ 152 kg/hectare to eradicate pests. Fertilisers, both organic and inorganic were used. Raw cow dung @ 1500 kg/hectare and chemical fertilisers namely, urea @ 50 kg/hectare and N:P:K/DAP @ 30 kg/hectare were used in a monthly schedule to induce and sustain organic food production. The prawns were fed with TOMCO shrimp feed pellets @ 10–20% of body weight of biomass in pond, assessed by monthly sampling and food was always ensured in excess of requirements. The feeding was done by spreading them on suspended feeding trays. Monthly sampling of the prawns was done using cast net of 18 mm mesh size. Hydrological data of pond was recorded during the sampling. The salinity was measured in °Be (Baume) by a 'Leimco' brand hydrometer converting it into pass per thousand referring to standardised tables prepared using Mohr's method of salinity analysis. The pH was measured using a digital pH meter having 0.01 sensiti-

**Table 1.** *The hydrology of pond during April to September 1988*

| Number of days after stocking | Succession of salinity range (‰) | pH | Succession of temperature range (°C) | Dissolved oxygen ml/litre |
|---|---|---|---|---|
| 30 | 41-45 | 8.2 | 27-32 | 5.0 |
| 60 | 40-44 | 8.2 | 29.5-33.3 | 9.0 |
| 90 | 41-54 | 8.3-9.3 | 29.7-33.8 | 7.0 |
| 120 | 54-50-35 | 8.8 | 29.2-32.0 – 26.8 | 7.0 |
| 150 | 35-42 | 8.7 | 26.5-31.5 | 7.4 |
| 180 | 41-45 | 8.2 | 30.5-27.1 – 33.4-30.0 | 6.0 |

**Table 2.** *Comparison of growth of prawns*

| Number of days after stocking | *Penaeus indicus* Mithapur Average size | | Growth rate/ day | | *Penaeus indicus* Veppalodai Average size | | Growth rate/ day | | *Penaeus monodon* Mithapur Average size | | Growth rate/ day | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | g | mm | g | mm | g | mm | g | mm | g | mm | g |
| 00 | 21.0 | 0.3 | - | - | 25 | 0.3 | - | - | 31 | 0.3 | - | - |
| 30 | 93.0 | 3.0 | 2.40 | 0.09 | 58 | 2.0 | 1.10 | 0.05 | 76 | 4.4 | 1.50 | 0.14 |
| 60 | 102.0 | 68.0 | 1.35 | 0.11 | 71 | 2.8 | 0.76 | 0.04 | 91 | 6.6 | 1.00 | 0.10 |
| 90 | 112.0 | 9.8 | 1.01 | 0.10 | 85 | 3.4 | 0.67 | 0.03 | 99 | 9.3 | 0.76 | 0.10 |
| 120 | 120.0 | 13.0 | 0.82 | 0.10 | 99 | 6.2 | 0.61 | 0.05 | 113 | 13.7 | 0.68 | 0.11 |
| 150 | 123.9 | 15.0 | 0.68 | 0.10 | 106 | 7.2 | 0.54 | 0.05 | 122 | 20.0 | 0.67 | 0.13 |
| 180 | 133.0 | 18.5 | 0.62 | 0.10 | - | - | - | - | 125 | 22.0 | 0.52 | 0.12 |

vity and the dissolved oxygen was estimated by Winkler's method.

**Results and Discussion**

Hypersalinity and high pH prevailed during most of the culture period (Table 1). While rearing the postlarvae in 45% salinity for 60 days, Raj & Raj (1982) observed 87.5% survival in P. monodon and 70% survival in *P. indicus*. Marichamy & Motha (1986) growing *P. indicus* in a pond at a site adjacent to a salt pan area in Veppalodai observed 73.2% survival in 166 days in salinity range of 39-50‰ and pH of 7.6 to 8.4. During the present experiments in 38-54‰ and 8.2-8.3 pH, the survival was only 5.8% in *P. indicus* and 4.2% in *P. monodon*. The growth rate in both the experiments compared in Table 2 showed 0.62 mm and 0.10g/day in respect of Mithapur experiment whereas in Veppalodai experiment, it was only 0.50 m and 0.05 g per day. The reason for the poor survival, despite better growth rate, seen in the present experiment is the abrupt increase and prolonged persistence of the hypersalinity accompanied by high pH. The better rate of growth appears to be the result of abundance of high protein pellet feed available in the pond at *ad libitum* despite the regularly declining population. This indicated that while hypersalinity and high pH may adversely affect the survival of prawn its growth rate can be accelerated by providing quality feed in abundance. In an earlier experiment, Gopalakrishnan & Raju (in press), observed a growth rate of 0.11 mm in length and 0.056 g. in weight per day during the 187 day culture of *P. merguensis* under similar hypersaline and high pH conditions of same pond. In this case, the survival was only 6.44% and the food was

groundnut oil cake. However, *Metapenaeus kutchensis*, a species endemic to Gulf of Kutch, which constitutes around 96% of the prawn catch from salt works reservoirs annually, showed a survival of 19.36% in the above experiment. Gopalakrishnan *et. al.* (1987) had analysed the composition of annual recruitment of prawn seed into the salt works reservoirs of Okhamandal and reported 54% *P. merguensis*, 17.5% *M. kutchensis* and 18.5% *brevicornis*.

The present observations showed that prawn culture integrated with a salt works, both operations of salt production and prawn culture co-existing is altogether different from prawn culture in a site adjacent to a salt pan area. The reasons are the hypersalinity beyond 45‰ prevailed throughout the year causing slow growth and poor survival. Thus the productivity seen in Veppalodai experiment could not be achieved here.

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## References

Gopalakrishnan, P., Krishna Raju, V., Madhusudhan Pillai, K., Joshi, K.D., Somaiya, V.J. & Devmurari, H.L. (1987) *Fish. Technol.* **24**, 4.

Gopalakrishnan. P. & Raju, K.V. (in press) *Proc. National Symposium on R & D in Marine Fisheries*, Mandapam Camp, 16 & 18 September 1987.

Marichamy, R. & Motha (1986) *Mar. Fish. Infor. Serv. T. & E. Ser.*, **70**, 1.

Raj Paul, R. & Raj Sanjeeva, P.J. (1982) *Proc. Symp. Coastal Aquaculture Pt.* **1**, 236.