Among the postlarvae of *Penaeus, P. (Fenneropenaeus) indicus* was dominant followed by *P. (Penaeus) monodon, P. (P.) semisulcatus, P. (F.) merguiensis* and *P. (Melicertus) latisulcatus.* In *Metapenaeus,* postlarvae of *M. monoceros* were abundant followed by *M. dobsoni, M. affinis, M. brevicornis* and *M. lysianassa.*

Two peaks were observed in the postlarval penaeid prawn population. In *P (F.) indicus* and *P. (P.) monodon,* the primary peak occurred from January to April and the secondary peak from July to September. In *M. monoceros* and *M. dobsoni,* the primary peak was from March to May and the secondary peak from August to September. The postlarvae of *P. (F.) indicus, P. (P.) monodon, M. monoceros* and *M. dobsoni* were available throughout the year while the others were seasonal. The distribution of postlarvae in the estuary is related to the type of substratum, salinity and temperature. The postlarval population declined during the northeast monsoon (November-December) and in peak summer (May-June). Their abundance decreased in the lower salinity areas of the upper reaches of the estuary.

Environmental Physiology of the Prawn *Penaeus (Melicertus) latisulcatus*

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There are a number of intrinsic and extrinsic factors which affect the normal routine activity of the prawn. The present study attempts to elucidate the optimum levels of various environmental factors for the culture of prawns.

The salinity tolerance capacity of *Penaeus* (*Melicertus*) *latisulcatus* was estimated in 13 different test salinities from 0 to 60 ppt (at 5 ppt increments). The prawns can tolerate a wide salinity range of 20-50 ppt. Maximum survival, however, was between 25 to 45 ppt. The extreme low (0-10 ppt) and high (60 ppt) salinities were highly lethal to the prawns. The change in acclimation temperature from 30 to 35°C increased the upper incipient lethal level from 38.5 to 39.5°C. The prawns acclimated to 30°C tolerated 42°C for 275 sec and 45.5°C for 13 sec, while prawns acclimated to 35°C tolerated 42°C for 505 sec and 46.5°C for 11 sec.

Prawns were acclimated to a salinity of 26 ppt and oxygen consumption was measured at 5, 15, 26, and 38 ppt in a continuous water-flow method. The total oxygen consumption showed an inverse relationship with weight. Oxygen consumption declined with increase in salinity. The resistance of prawns to hydrogen sulphide was tested in 18 different concentrations of sodium sulphide mixed with seawater. The prawns tolerated sodium sulphide concentrations up to 20 mg/ℓ. The dissolved oxygen in the water was found to be reduced to very low levels with the increase in the concentration of sodium sulphide (from 5.9 ml O_2/ℓ to 0.54 ml O_2/ℓ). This may cause heavy mortality of the prawns.

Molt Staging in Adult *Penaeus monodon*

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Changes and formation of cuticular layers and setae bordering the uropods and endopodites of the pleopods of adult *Penaeus monodon* were examined under a light microscope. Observations and photographs were made at 0, 12 and 24 hours after molting and every 24 hours thereafter until second molting occurred. Results show that the internal structures of the setae and cuticle undergo marked changes throughout the molt cycle. It was possible to identify the molt stages A, B, C and D. Rapid examination of the molt stages allows the proper timing of eyestalk ablation to induce ovarian maturation.

Effect of Temperature and Salinity on the Hatching of Eggs and Larval Development of Sugpo, *Penaeus monodon*

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Incubation of *Penaeus monodon* eggs and rearing of different larval stages were undertaken at nine temperature-salinity combinations. The eggs, nauplii, zoea and mysis from one spawner kept as stock culture at ambient temperatures of 26-30°C and salinity of 32-33 ppt were exposed to temperature levels of 23, 28 and 33°C and salinity levels of 23, 28 and 33 ppt.

Eggs and nauplii survived the sudden change of temperature and salinity (from ambient to experimental) but the zoea and mysis did not. However, salinities of 23 and 28 ppt in combination with any of the temperature levels produced weak larvae. Highest mean hatching rate was obtained at the temperature-salinity combination of 23°C-33 ppt, followed by 28°C-33 ppt and 33°C-33 ppt. Incubation periods for these treatments were 22, 16 and 14 hr, respectively. Survival rate of nauplius (taken from stock cultures) to first zoeal stage was highest at 28°C-33 ppt, followed by 33°C-33 ppt and 23°C-33 ppt with molting time of 50, 45 and 75 hr, respectively.

The nauplii exposed to 33°C-33 ppt molted to zoea stage within 38 to 40 hr but later died. Those exposed to 23°C-33 ppt and 28°C-33 ppt reached zoea stage within 57 to 60 hr and 48 to 50 hr, respectively. Similarly, the nauplii taken from the stock cultures and reared until postlarval stage (P_1) under experimental conditions completed the zoea and mysis

stages in 9 to 11 days at 28°C C-33 ppt, 7 to 9 days at 33°C-33 ppt, and 13 to 15 days at 23°C-33 ppt.

Statistical analysis showed that salinity had highly significant effect on rates of hatching of eggs and survival from nauplius to first zoeal stage but not temperature although the latter had an apparent effect. However, both factors affected time of hatching of eggs and time of molting from nauplius to zoea. Interaction effect was significant only on rate and time of hatching. Different sources (spawners) of eggs and nauplii did not have significant effect on time of hatching and molting from nauplius to zoea, but significantly affected the hatching rate of eggs and survival rate of nauplii to zoea stage.

The Influence of Temperature and Salinity on Oxygen Consumption of *Penaeus monodon* Postlarvae

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The effect of salinity and temperature on oxygen consumption at different developmental ages of *Penaeus monodon* postlarvae (P_5 to P_{60}) was studied. The design was a 2×5 factorial, using two levels of temperature (15 and 30°C) and 4 levels of salinity (10, 15, 20 and 30 ppt). One-day old postlarvae (P_1) were acclimated to various salinities prior to the start of the experiments. Oxygen consumption was determined after three hours using a YSI dissolved oxygen meter *vis-a-vis* Winkler titration method.

Respiratory activity as affected by temperature and salinity varies, dependent on the postlarval stage tested. Statistical analyses showed that temperature did not significantly influence oxygen uptake at early stages (P_5-P_8) until P_{25}-P_{28}. Its effect started to become apparent when the postlarvae were P_{35}-P_{38} and was most pronounced at P_{49}-P_{52}. general, the postlarvae consumed more oxygen at higher temperature and the variation in the oxygen consumption of the postlarvae under the two temperatures become less obvious as the postlarvae were older. Salinity seemed to affect the oxygen consumption of the young postlarvae, P_5-P_8 and P_{25}-P_{28}, more than temperature. Differences in rate of oxygen consumption at various salinities were greater in younger postlarvae (P_5-P_{38}) than in older postlarvae (P_{42}–P_{60}). The relationship between rate of oxygen consumption and body weight is nearly linear in the various salinity-temperature treatments. In all cases, the regression was significant at 1% level. *P. monodon* postlarvae behaved as respiratory conformers in all the salinities tested at ambient temperatures.

The least oxygen consumption rate was noted at salinities of 20 and 30 ppt at low temperature (15°C) and 20 ppt at high temperature (30°C). The importance of these findings is discussed and related to improvement of postlarvae transport methodology.

Effect of Carrageenan Micro-Binded Diet on the Larval Stages of *Penaeus indicus*

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At present, most hatcheries depend on live food like diatoms, *Chlorella,* rotifer and brine shrimp to rear the larval stages of various penaeid species. Mass production of live feed requires much space (tanks) and labor, and is often affected by environmental conditions. The possibility of substituting live food with artificial diet for *Penaeus indicus* larvae was evaluated. Carrageenan micro-binded diet (C-MBD) was selected as test diet and its composition was modified from C-MBD designed for *P. japonicus* (about 45% protein).

Larvae stocked at 100/ℓ and fed five times/day at 0.8 mg/larva/day had an average survival rate of 45% from Z_1 to M_1. Water temperature was 26.5-30.5°C and salinity 32-33 ppt. An average survival rate of 70.2% from M_1 to PL_1 was attained when the stocking density was 30/ℓ and feeding was three times/day at 0.3 mg/larva/day (water temperature 25.5-28.5°C, salinity 27-32 ppt). From PL_1 to PL_5 at stocking density of 20/ℓ with feeding rate of 0.3 mg/larva/day (fed 3 times a day), the average survival rate was 64.9% (water temperature 25.5-28.5% C, salinity 28-32 ppt).

The results show that the present composition of C-MBD is highly effective for myses up to the early postlarval stages of *P. indicus*.

Effects of Diet on Reproductive Performance of Ablated *Penaeus monodon* Broodstock

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Four practical diets were compared for their effects upon ovarian maturation and spawning of ablated *Penaeus monodon* broodstock. Diets were formulated based upon the fatty acid profile of wild *P. monodon.* Diets 1 and 3 were cod liver oil-based while Diets 2 and 4 were soybean oil-based. Experimental treatments consisted of each of the formulated diets given in combination with natural food (squid, mussel, and annelids). An all-natural diet served as control. The fatty