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The effect of various protein levels on growth and survival rates of *Penaeus monodon* Fabricius

By

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Postlarvae (P_{10}) of the tiger prawn, *Penaeus monodon,* were reared in experimental tanks at the Feed Laboratory, SEAFDEC, Tigbauan, Iloilo, Philippines for 16 weeks. Prawns with an average mean total length of 1.2 mm and an average mean weight of 5.5 mg were used as experimental animals. Various combinations of rice bran and fish meal, determined by the Pearson Square method, were formulated to give an estimated 0, 30, 40 and 50% protein level in the experimental feeds. Chemical analysis of the formulated feeds showed slight deviation of the actual protein content from the computed values (Table 1), although differences were not significant.

The entire experiment was divided into two phases. Phase I was conducted during the first four weeks followed by Phase II which lasted until the experiment ended in the 16th week. In both phases, filtered seawater was used as the stocking medium. Two replicates were made for each feeding regimen. Physico-chemical parameters such as temperature, salinity, dissolved oxygen, ammonia and nitrite were monitored. Twenty shrimps were randomly sampled from the rearing tanks every month. Growth rates, survival rates and feed conversion ratios were determined at the end of each phase. Feed conversion ratios are, however, approximate figures because of the technical difficulty in separating left-over feed from fecal matter.

Phase I. Postlarvae with an initial stocking density of 5 shrimps per liter were placed in 150-liter capacity fiberglass tanks and fed with the 0, 30, 40 and 50% protein diets. Feeding was done twice daily at a feeding rate of 100% body weight. Results show that growth rate of prawns given the 30% protein diet was significantly higher than those fed with other diets (Table 2 and Fig. 1). The lowest growth rate was shown by the group fed 0% protein. The best feed conversion ratio was also obtained from the group given the 30% protein diet (Table 3). Survival rate of the group fed 40% protein was higher (81.7%) but was not significantly different from those fed 30% (68.1%) or 50% protein (61.4%) (Table 4).

Phase II. After one month, juveniles from Phase I fed the different experimental diets were transferred to one-ton fiberglass tanks and reared in 600 liters of filtered sea water at a stocking density of one animal per liter. The 0% protein group was not included in Phase II because of the few survivors left in Phase I. Feeding rate was reduced to 20% and 10% body weight during the subsequent months.

Measurements taken at the end of 16 weeks reveal that growth rate of prawns fed 40% protein was significantly higher than those fed 30% or 50% protein (Table 5 and Fig. 2) and gave the lowest feed conversion ratio (Table 3). No significant difference in survival rates of the groups fed 30% or 40% protein (86.4% and 90.9%, respectively) was recorded but these were significantly higher than for the group fed 50% protein (Table 4).

The results of this study are difficult to compare with those reported in the literature since different species of prawns were used and experiments were conducted under different environmental conditions. This study, however, shows that under the conditions of the experiment, *P. monodon* postlarvae fed a 30% protein diet at an early stage had a significantly higher growth rate. Older postlarvae on the other hand seem to require a higher protein diet as evident from the significantly higher growth and survival rates of the group fed the 40% protein diet in Phase II. Further studies will have to be carried out to confirm these preliminary results.

Table 1. Protein analysis of pellets.

Computed values (%)	Chemically-analyzed values (%)
0	1.7
30	34.3
40	40.2
50	47.7

Table 2. Percentage mean weight and mean length increments of *P. monodon* postlarvae after one month feeding period.*

% protein levels	% weight increment per day	% length increment per day
0	10.0^{b}	0.1^{b}
30	32.1^{a}	3^{a}
40	16.7^{b}	$1.9^{a, b}$
50	16.9^{b}	1.1^{b}

* Values with the same superscripts are not significantly different from each other at 5% level of significance.

Table 3. Feed conversion ratios of *P. monodon* juveniles: Phase I and II

	30% protein	40% protein	50% protein
Phase I	4.7	9.3	12.4
Phase II	4.6	2.8	4.5

Table 4. Percentage mean survival rates of *P. monodon* juveniles: Phase I and II*

	% protein	30% protein	40% protein	50% protein
Phase I	10.5^{b}	68.1^{a}	81.7^{a}	61.4^{a}
Phase II	–	86.4^{a}	90.9^{a}	47.3^{b}

* Values with the same superscript are not significantly different from each other at the 5% level.

Table 5. Percentage mean weight and mean length increments of *P. monodon* juvenile after 81 days.*

% protein levels	% weight increment per day	% length increment per day
30	11.5^{a}	1.3
40	30.6^{b}	2.0
50	15.0^{a}	1.8

* Values with the same superscripts are not significantly different from each other at the 5% level.

Fig. 1. Percentage length and weight increment of *P. monodon* fed with 30% (A), 40% (B), 50% (C), 0% (D) protein levels. September 2 – October 2, 1976.

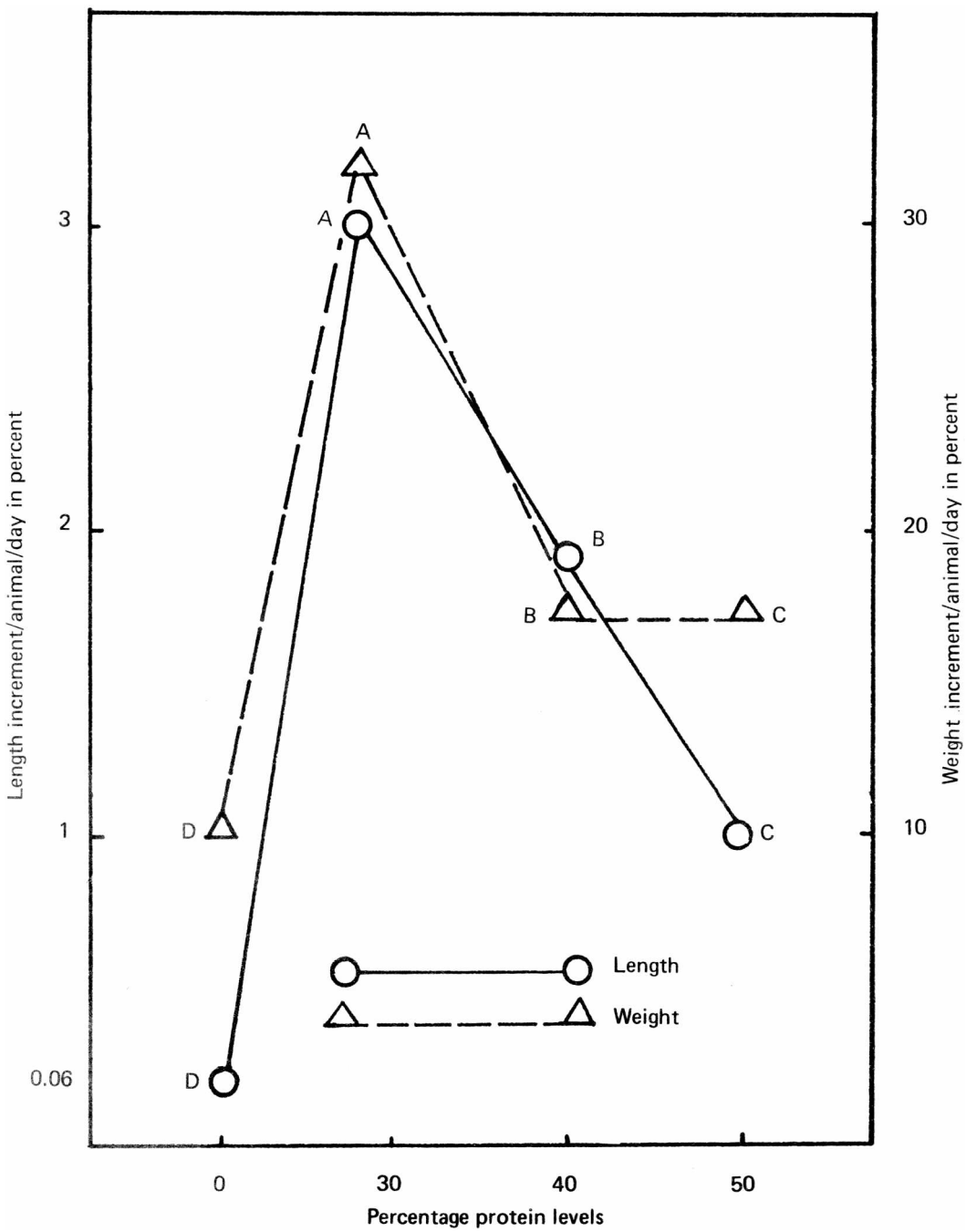

Fig. 2. Percentage length and weight increment per day per animal compared growth of *P. monodon* fed with 30% (A), 40% (B), 50% (C), 0% (D) protein levels, October 2 – December 22, 1976