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Culture practices of *Litopenaeus vannamei* in fresh water grow-out ponds

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Abstract

Background/Objectives: Shrimp farming has been made an impressive growth in many developing countries especially in Asian countries. This activity is paved way to prominent economic growth and social importance.
Methods/Statistical analysis: The present study was undertaken for shrimp culture during August 2015 – November 2015 from fresh water aquaculture farm. Water samples were collected from culture ponds during the study period to analyze various physico-chemical parameters. The *L.vannamei*seeds (post larval stage 14) that had been acclimatized to the 0ppt salinity and it were confirmed disease free, transport with maintained optimum condition and reached to the ponds. The seeds were properly stocked in the culture ponds.
Findings: The water temperature values varied from 24°C and 28°C.Ranges of salinity 0.5 - 2.5 ppt were recorded. DO (dissolved oxygen) values varied from 4 and 7.1ml/l. The maximum pH values of 8.0 was recorded during the month of November 2015 and minimum of 7.3 was observed during August 2015. The maximum of feed provision 3.635tn was recorded in P3 (pond 3) and minimum of 3.145 was recorded at P1 (pond 1). The maximum ABW 25.3g was recorded in P3 and minimum of 24.5 was recorded at P1. The maximum biomass 2.340tn was recorded in P3 and minimum of 2.058tn was recorded at P2.
Application/Improvements: Shrimp culture has been increasing recent years in Indian Subcontinent. Liberalization of economy, high profitability and good international market are the factors, this has been given new impetus for shrimp culture boom in India. Hence, the present has been carried out the culture activity of *L. vannamei* in fresh water environment. This will be motivated and enhanced the culture practices.
Keywords**:** *L. vannamei,* Pond preparation, Physic-chemical parameter, Seed stocking, Mineral supplementation, Feed management, Growth monitoring and harvesting.

1. Introduction

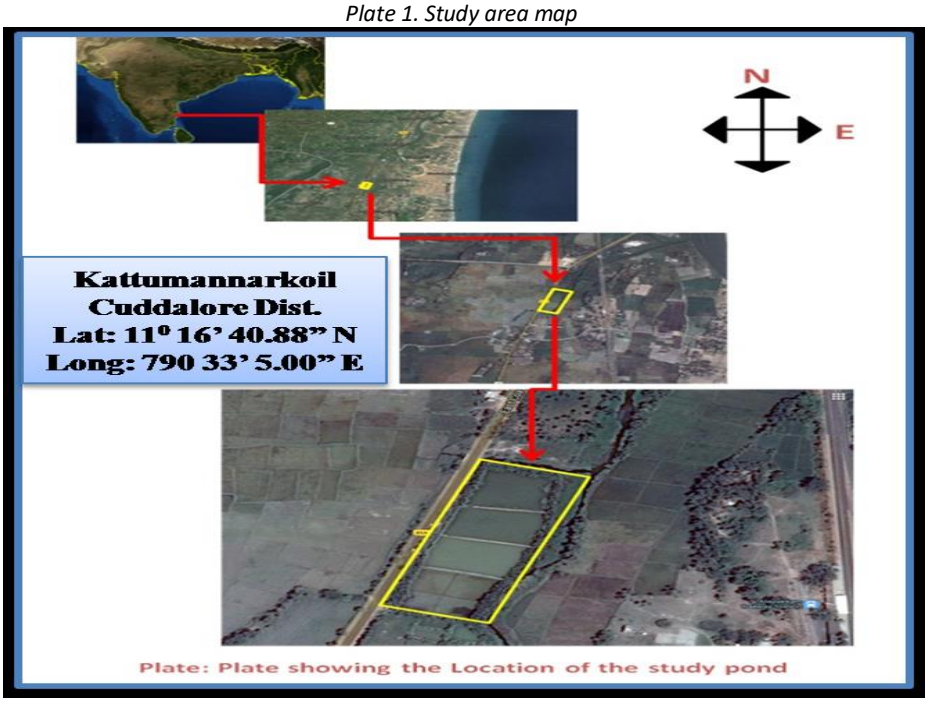
Marine fisheries and aquaculture sector contributes a significant position in supplying protein rich food to the exploding population, employment generation and foreign exchange earnings. The FAO estimated that half of the world's seafood demand will be satisfied only by aquaculture in 2020. Fishery products retained its position as the principal export item in quantity terms and are second largest export products. Economic point of view, they share of about 32.97% in quantity. The increased grow out production of Pacific White Shrimp; *L. vannamei* has been helping to achieve higher export income [1]. India is bestowed with an extensive coastline of over 8129 km, 0.5million sq.km of continental shelf, 2.018 million sq.km .of exclusive economic zone and 1.2 million hectares of brackish water area. Shrimp farming area in India has increased from 65,100 ha in 1990-1991 to 150,000 ha in 2015 with the production level has also increased manifold [2], [1]. Shrimp culture in India has begun on a commercial scale from the beginning 1990's. About 1.2 million hectares of land has been already identified as reliable and suitable for aquaculture of which about 0.17 million hectares are only under cultivation. The culture has been taking fast growth in Andhra Pradesh and Tamil Nadu. The moderate culture has extended in the states of Karnataka, Kerala, Orissa, Maharashtra, Goa, Pondicherry, and west Bengal. Liberalization of economy, high profitability and good international market are the factors, which has given new impetus for shrimp culture boom in India [3].

This will be motivated by high profitability in limited Days of Culture (DOC). *L. vannamei* is widely considered as a cultured shrimp species around the world and it is owing to winsome qualities such as high market demand, adaptability to grow out conditions, euryhaline nature, fast growth and larger size. The present scenario of shrimp culture industry in India and also in global level is an appealing state despite of several setbacks like disease out breaks, unscientific farm management practices and high production cost which paved way to continuous damage of crop and heavy financial loss to shrimp farmers. Scientific and sustainable aquaculture practices are needed to solve the problems [4]. Educating the shrimp farmers hands on training through and awareness creation will play a vital role for safe guard them from the clutches of the crop loss and subsequent financial burden [5]. *L. vannamei* is slowly progressing as a profitable candidate species for culture in freshwater pond, which considering as the high adaptability to rear on freshwater grows out in 0 ppt salinity conditions. So far a limited works are available on this species especially in culture aspects. Hence, the present has been undertaken on pond preparation, physic-chemical parameter, seed stocking, mineral supplementation, feed management, growth monitoring and harvesting of the cultured species in fresh water farm, Cuddalore district, Tamil Nadu.

2. Description of the study area

The present study was conducted in a conventional freshwater grow-out ponds (Rajasurabhi aqua Farm) located in Pelungalur village, Cuddalore district, Tamil Nadu (Plate 1). The farm is surrounded by paddy fields. The source of water is receiving from VeeranamLake near Kattumannarkovil. Three ponds were selected with rectangular type and each pond has 0.5ha water spread area.

Plate 1. Study area map



3. Materials and Methods

1. Pond Preparation, pumping and Chlorination

The present study was undertaken for shrimp culture during August 2015 – November 2015 from fresh water aquaculture in Rajasurabhi aqua farm in Cuddalore (Dt), Tamil Nadu, India (Plate. 1). The ponds (P1, P2, P3) were selected for shrimp culture. They were allowed to dry and to release H_2S (hydrogen sulphide) with eradicate the fish eggs and other predators. Then the pond bottom was ploughed to remove the obnoxious gases in the soil and liming to maintain optimum pH of soil (Plate 2). Thread fencing and netting were used in ponds to prevent the auto-entrants. Filter bags were used to prevent the predators in inlet and outlets.

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The pumping was done then water was chlorinated (60ppm/ha). The excess chlorine was neutralized by de-chlorination (allowed 72 hours).After that it was applied probiotic (300gm/ha) for beneficial bacterial environment. Ponds were maintained 1.5mwater depth.

Plate 2. Pond preparation, soil culture and water culture

Plate 3. Seeds and stocking ponds

2. Physico-chemical parameters in water

Water samples were collected from P1, 2P, 3P to analyze various physico-chemical parameters. Dissolved Oxygen (DO) analyzed by winkler's method [6].

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4. Seed stocking

PL 14 (post larva) had been acclimatized to the 0ppt salinity and it was confirmed free from the WSSV (white spot syndrome virus) etc. The seeds were transported with proper condition and 50/ m^2 were stoked into the ponds (Plate3).

1. Feeding regime and aeration

Pellet feed were fed with stocked PL for four times/ day. Water was pumped (reservoir) at regular intervals to overcome the evaporation or seepage. Ponds were properly maintained the aeration (Plate4).

Plate 4. Paddle wheel with Long arm Aerators and check tray

55th days of culture (DOC) was sampled for monitoring the health and growth of the shrimp with every seven days once (Plate 5).Feed conversion ratio (FCR) and Average daily growth (ADG) were calculated as:

FCR = Total weight of the harvested shrimps / total feed used, ADG = Total weight gained by the shrimps / Total days of culture

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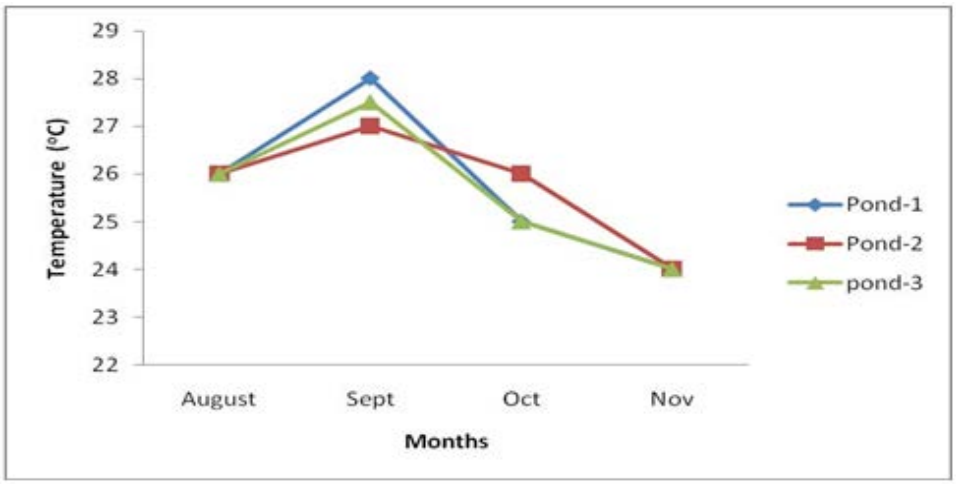
Plate 5. Check tray observation, growth monitoring and harvested shrimps

5. Results

1. Temperature

The water temperature values varied from 24°C and 28°C. Maximum was recorded at September 2015 and the minimum was found in the month of November 2015 (Figure 1).

Figure 1. Water Temperature



2. Salinity

The maximum salinity (2.5ppt) was recorded in Nov.' 2015 and minimum (0.5ppt) was observed at Aug.' 2015 (Figure 2).

3. DO Concentration

DO values varied from 4.6 to 7.1ml/l. Minimum was recorded at Sept.' 2015 and maximum was found in Nov.' 2015 (Figure 3).

4. pH

The maximum pH values of 8.0 was recorded in Nov.' 2015 and minimum (7.3) was observed during Aug.' 2015 (Figure 4).

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Figure 2. Salinity conc. in the culture ponds

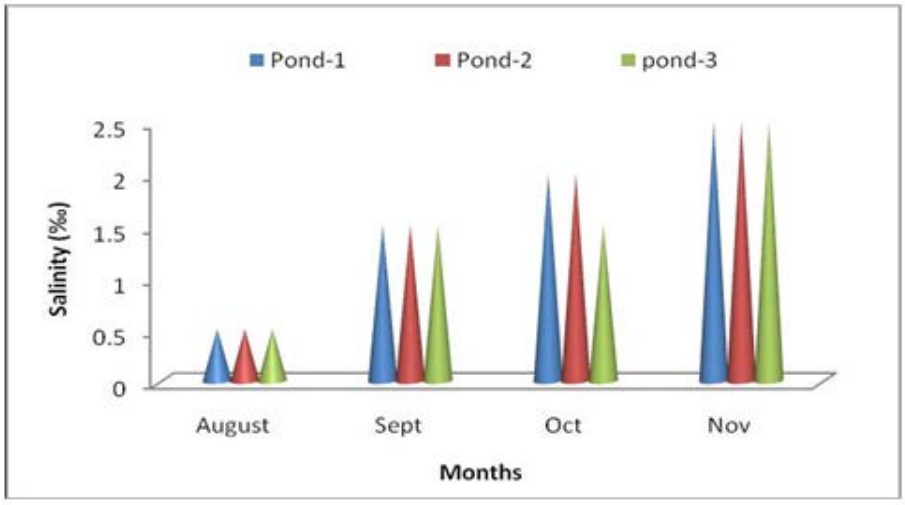


Figure 3. DO conc. in the culture ponds

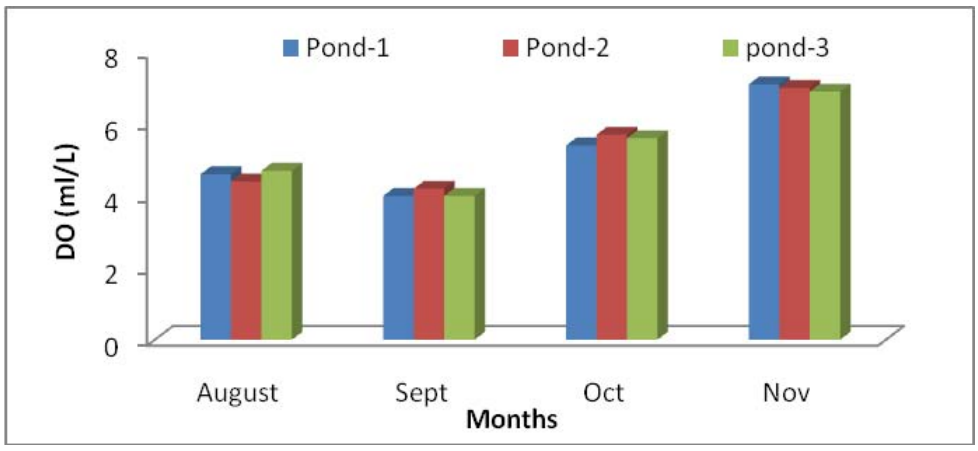
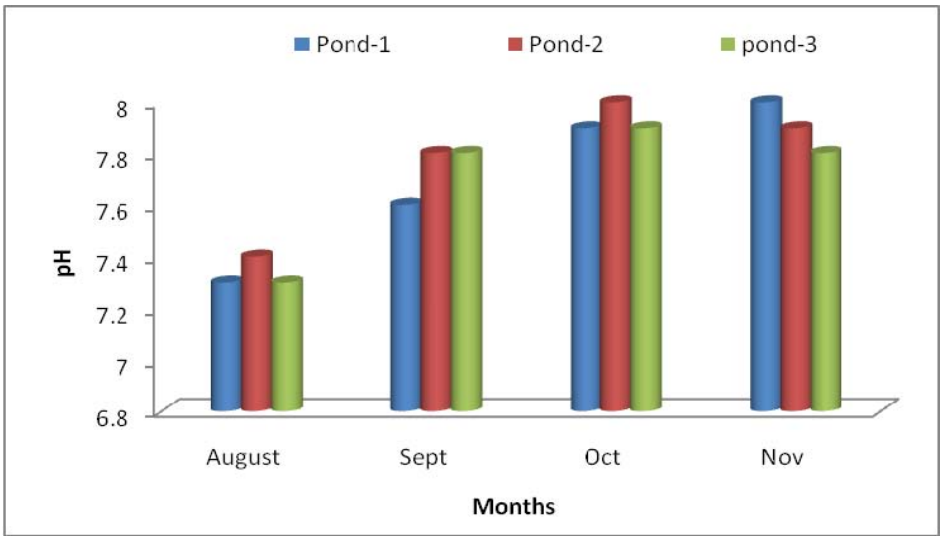


Figure 4. pH conc. in the culture ponds



5. TAN(total ammonia nitrogen)

TAM ammonia nitrogen ranged from 0.065 to 0.261mg/l. Minimum was recorded at Aug.' 2015 and the maximum were found at Nov.'2015 (Figure 5).

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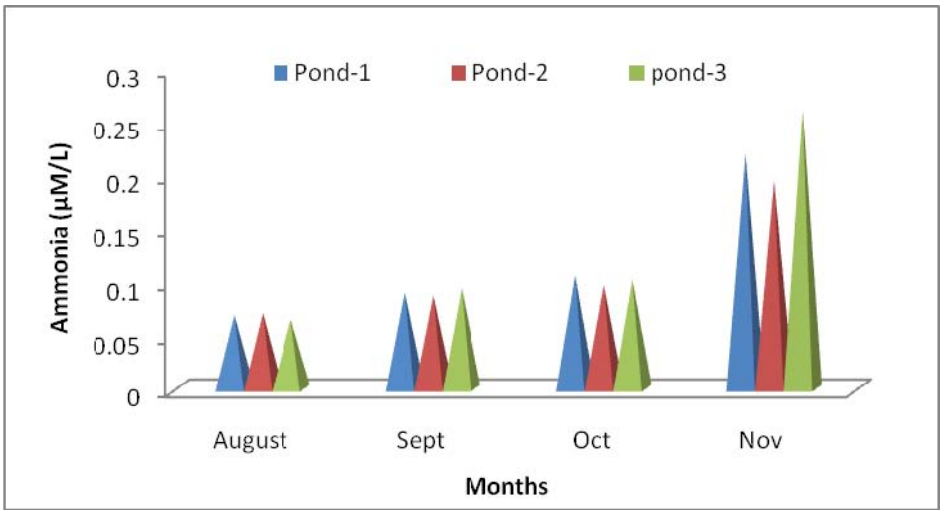
Figure 5. TAM conc. in the culture ponds



6. Total feed provision

The maximum amount of feed provision 3.635tn was recorded in pond 3 and minimum (3.145) was observed at pond 1(Figure 6).

Figure 6. Feed consumption during the culture period

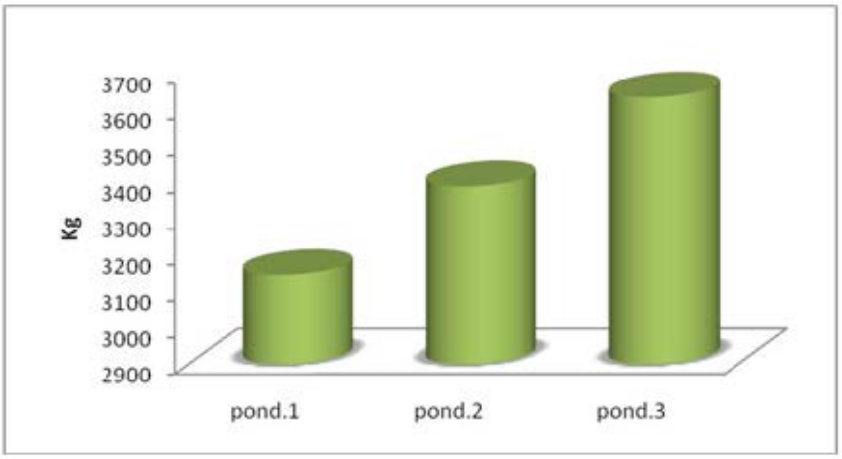
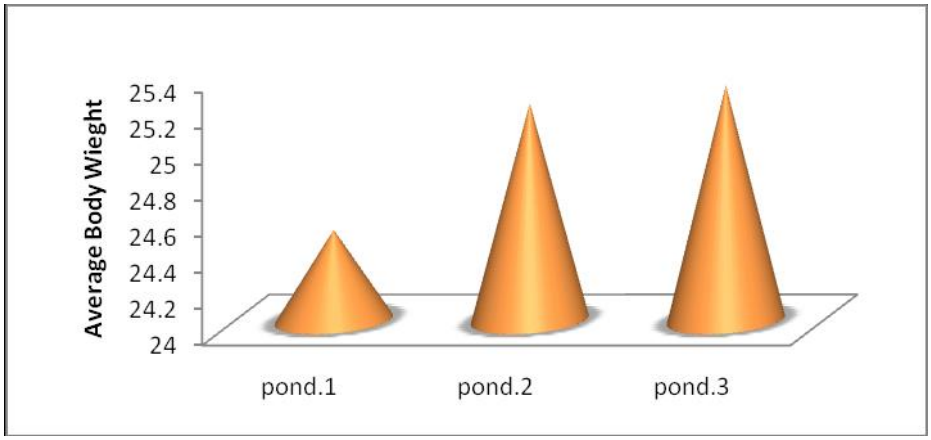


Figure 7. ABW of shrimps during the culture period



7. ABW

The ABW maximum (25.3g) was recorded in pond 3 and minimum of 24.5 was recorded at pond 1 (Figure 7).

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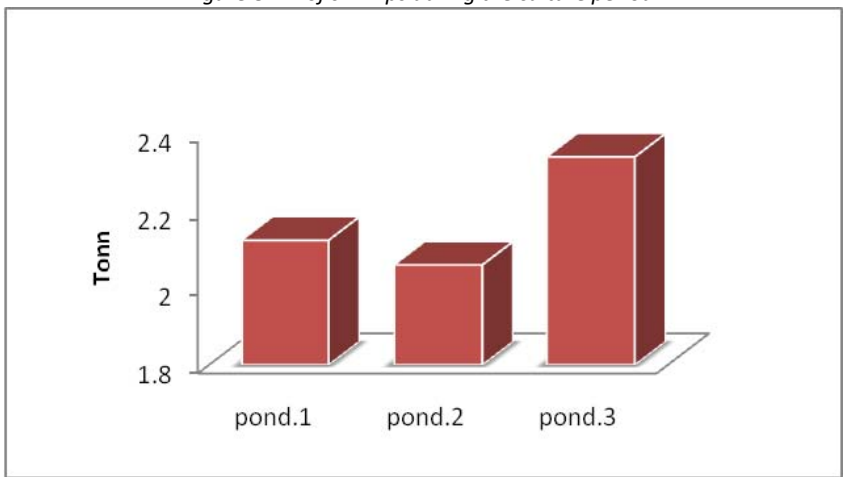
8. TB (Total Biomass)

The maximum TB (2.340tn) was recorded in pond 3 and minimum of 2.058tn was recorded at pond 2 (Figure 8).

Figure 8. TB of shrimps during the culture period



The area of ponds, stocking density, feed provisions, ABW, FCR, TB etc. were described in the cultured ponds (Table 1).

Table 1. The summary of semi-intensive culture practices in different ponds

S. No.	Particulars	Pond I	Pond II	Pond III	Total
1	Pond water spread Area (m2)	5000	5000	5000	15000
2	Date of Stocking	13.08.2016	13.08.2016	13.08.2016	0
3	Seed Stocking	100000	100000	100000	300000
4	Stocking Density (m2)	20/m2	20/m2	20/m2	0
5	DOC	120	120	120	360
6	Total Harvested (in kg)	2125	2058	2340	6523
7	ABW (in gm)	25	24.5	25.5	75.5
8	Survival Rate (%)	85	84	90	259
9	Total Feed Utilised	3145	3390	3635	10170
10	FCR	1: 1.4	1: 1.6	1:1.5	0
11	Count/kg	40	40	40	120
12	Gross Income (300/kg)	6,37,500	6,17,400	7,02,000	1,95,6900
13	Total Seed Cost (40 paise/seed)	40,000	40,000	40,000	1,20,000
14	Total Feed Cost (65/kg)	2,04,425	2,20,350	2,36,275	6,61,050
15	Diesel Cost( )	60,355	58,425	63,700	1,82,480
16	Manpower (Rs 5000/per labour/month)( )	15,000	15,000	15,000	45,000
17	Probiotics & Aquamedicines	25,000	20,000	19,500	64,500
18	Miscellaneous Operational Expenses ( )	30,000	25,000	30,000	85,000
19	Total Expenses ( )	3,74,780	3,78,775	4,04,475	11,58,030
20	NET Profit ( )	2,62,720	2,38,625	2,97,525	7,98,870

6. Discussion

The water quality maintenance is essential for growth of the shrimp. The present study, *L. vannamei* culture was concluded successfully in fresh water environments. The growth is directly related to stocking density and food consumption. The maximum growth rate of 0.34 g/wk was recorded at pond 3 and minimum of 0.28 g/wk in pond 1. Growth variation was observed with water quality parameter to meet the proper production of shrimp. Temperature is an indirect effect of metabolic rate. In the present study, the temperature was recorded from 24 to 28.0 ºC (Figure 1). The shrimp was inactive at 24 ºC with low food consumption than the 28 ºC.

The same results were also observed different region of the coastal waters [7], [3]. DO is most important factor to influencing the life of the aquatic organisms. DO values ranged from 4.2 to 7.6 ml/l. The high conc. of

DO enhance the physiological activity due to this attains the fast growth. The pH ranged from 7.3 to 8 has been found in the culture ponds and it was showed permissible limit of pH that has been prescribed [8]. In the present work, salinity ranged from 0.5 to 2.5ppt. The low conc. of salinity (0.5ppt) has preferable for PL up to one week. The initial hightemp, and low salinity would be increased the diet intake and metabolism of the shrimp. The salinity was directly influenced the survival and growth *P. monodon* [9], [10]. It is noteworthy that optimum growth has been recorded from 3 to 14ppt [10], [4]. *L. vannamei* was capable of tolerate and attain maximum growth rate at higher salinity (50ppt) [9]. The synthetic feed could increase shrimp growth and survival rates [1]. The maintenance of conditioned cultured pond will be provided feeding frequency. Protein requirement has important to the shrimps [8]. The different type's pro-biotics were used to control and improve the pond conditions. Minerals are provided to all three culture ponds depending on biomassie. "Booster" has been improved the minerals in the ponds. EDTA 3 kg/0.6ha was used to enhance the moulting and the control the hard shell. Bactericide was controlling the Black gill disease. "Bio curb" was used to controlling the ammonia. Potash 20kg/0.6ha was applied for control the nervous problem of *L. vannamei*. The survival rate was decreased in P1 than the P2 and P3. The maximum growth was received from P3 than P1 and P2 (Table 1).

7. Conclusion

The fish population has been facing declining condition. Hence, necessary step need to be taken for enhancing fishery field.

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