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Studies on Physico Chemical Parameters and Plankton Diversity in *Litopenaeus Vannamei* Culture Ponds in Nagapattinam Area, Tamilnadu

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Abstract
Due to over fishing, most of the wild fishery resources were over exploited. Aquaculture is very important for our future because our future generation more than 50% peoples will depend upon the cultured seafood's for their protein source. In the present study, the plankton diversity and physico-chemical parameters analysis was done in aquaculture ponds in Nagapattinam area. For physico chemical parameters, the water samples were collected in plastic bottles and for plankton analysis the water samples were collected in plankton net was made up of bolting silk cloth no 30, mesh size 48 µm and preserved in 4% buffered formalin at regular intervals. pH and salinity measurement was done by using pH meter and hand refractometer. Totally 39 species of phytoplankton and 24 species of zooplankton were recorded. In summer crop, phytoplankton and zooplankton densities varied from 240-350x10^4cells ml^{-1}, 70-330 cells 1^{-1} respectively, whereas in winter crop, phytoplankton and zooplankton densities varied from 60-103x10^4cells ml^{-1}, 59-160 cells 1^{-1} m^{-2} respectively. pH value ranges from 7.80 to 8.48 during summer crop and 7.50 to 8.32 during winter season. Salinity was recorded 30 to 40ppt in summer and 15 to 30ppt in winter. The mean value of nitrate concentration was 0.182ppm. From the results it is concluded, there is a significant variation in plankton diversity and abundance between summer and winter culture.

Keywords
physico-chemical parameters, Nagapattinam area

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INTRODUCTION
Around the world the demand for seafood's are increasing but our resources are limited. Aquaculture plays an important role in producing enough aquatic foods and over the scarcity of *seafood's.* Seafood's are the cheapest major source of protein around the world. It is estimated that the demand for seafood around the world is over 160 million metric tons per year and rising (FAO). Already our oceans are overfished and most of the fish species are over

exploited. To meet the future demands of seafood, aquaculture will play an important role. Fish has been a cheapest source of protein, source of income and it play important role economy in developing countries.

Aquaculture involves the cultivation of freshwater and saltwater animals under controlled conditions. Mariculture refers to aquaculture practiced in marine environments and in underwater habitats. According to the Food and Agriculture Organization (FAO), aquaculture "is understood to mean the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. The reported output from global aquaculture operations in 2014 supplied over one half of the fish and shellfish that is directly consumed by humans.

India is also an important country that produces fish through aquaculture in the world. India is home to more than 10 percent of the global fish diversity. In India, the annual fisheries and aquaculture production increased from 0.75 million tons in 1950-51 to 9.6 million tons in 2013-2014(NFDB). Globally the country now takes the second position, after China, with regard to annual fisheries and aquaculture production. According to the FAO, the total aquaculture production in 2012-2013 was 4.21 million tones. This constituted over a third of the country's total fish production. This quantity is almost fully consumed on the domestic market, except for shrimps and freshwater prawns, which are mainly exported. Presently, the country ranks second in the world in total fish production with an annual fish production of about 9.58 million metric tons. Indian fisheries and aquaculture is an important sector of food production, providing nutritional security to the food basket, contributing to the agricultural exports and engaging about fourteen million people in different activities. With diverse resources ranging from deep seas to lakes in the mountains and more than 10% of the global biodiversity in terms of fish and shellfish species, the country has shown continuous and sustained increments in fish production since independence. Constituting about 6.3% of the global fish production, the sector contributes to 1.1% of the GDP and 5.15% of the agricultural GDP. The total fish production of 10.07 million metric tons presently has nearly 65% contribution from the inland sector and nearly the same from culture fisheries.

MATERIALS AND METHODS

The study was carried out in *Litopenaeus vannamei* culture ponds located in Nagapattinam district with stocking density of 40-60/m^2 during summer (March to June,2018) and winter season (August to November, 2018).

Collection and analysis of samples

Physico – chemical analysis

The water samples were collected at regular intervals (monthly) between 06:00 and 08:00 hrs in 250 ml plastic bottles and at the same time in-situ measurements were done for pH and salinity by using pH meter (ELICO Grip pH meter) and hand refractometer (ATAGO, Japan). The collected samples were transported to the laboratory in ice-box and were analyzed immediately. Standard procedures were followed as described by Strickland and Parsons (1972) were used [1].

Plankton analysis

Water samples were collected in plankton net was made up of bolting silk cloth no 30, mesh size 48 µm and preserved in 4% buffered formalin for plankton abundance and identification. Identification of plankton was done under a compound light microscope by using the keys provided by Venketraman (1939), Subramaniyam (1946), Prescott (1954) and Steidinger and Williams (1970).

RESULT AND DISCUSSION

The range of pH value differs from 7.80 to 8.48 during summer crop and 7.50 to 8.32 during winter season. So, there was no seasonal influence of pH in shrimp culture in Nagapattinam areas. The mean value of salinity in summer season was between 30 to 40ppt and in winter season was 15 to 30ppt. there was a vast different in salinity between the summer and winter culture due to heavy rain (Northeast monsoon) and dilution of fresh water. Likewise, the range alkalinity and hardness was very high in summer crop when compare to the winter crop. Nitrate and phosphate values increased as the culture days progressed and there is a significant difference in between with the month in both cultures. During the culture period the mean value of nitrate concentration was 0.182ppm which was higher than winter crop. Likewise, phosphate concentration was observed in same manner. The physico-chemical parameters of the pond waters in the both crop was presented in 1 & 2.

Species level identification of phytoplankton and zooplankton was made as shown in table. 3. The plankton diversity range showed that the physico-chemical parameters in utilizable range and the nutrient rich water influenced the growth of phytoplankton and zooplankton groups. Totally 39 species of phytoplankton and 24 species of zooplankton were recorded during the study period. Phytoplankton is the primary producer in the food chain and serving food to primary consumers like zooplankton, shellfish and finfish [2,3]. Similar observation was reported by [4,5]. [6] Identified 38 genera of phytoplankton and 13 genera of zooplankton during a three-month study period in earthen fish ponds in the Mymensingh region, Bangaladesh. [7] Stated that the total quantity of plankton present in the water of any water body may undergo reasonable and rapid variation. [8] Reported 30 species of phytoplankton in a village pond, dhanuvachapuram, Trivandrum. [9] Reported 67 species of phytoplankton and 35 species of zooplankton in three fresh water perennial tanks of kolharpur district, India. [10] Reported 27 species of plankton diversity in aquaculture pond in zimma zone, southwest Ethiopia. [11] Recorded 35 species of phytoplankton in earthen aquaculture pond, Brazil. Similarly, [12] stated that the variation in plankton densities is influenced not only by temperature and other factors such as pH, alkalinity and nutrients are responsible for the organic production.

Table. 1. Average - Physico-chemical parameters during summer culture

pH	Salinity	Carbonate	Bicarbonate	Total Alkalinity	Total Hardness	Ammonia
7.8	30	40	130	170	5430	0.25
7.72	26	60	150	210	5393	0.18
7.65	27	60	170	230	5548	0.4
7.54	28	50	150	200	5742	0.2
7.69	26	70	160	230	5315	0.05
8.02	25	40	120	160	5179	0.06
8.03	26	50	130	180	5412	0.16
8.34	25	60	140	200	5516	0.15
8	27	40	160	200	5414	1.5
8.01	26	60	150	210	5612	1.1
8.48	40	70	130	200	5232	0.05

Table. 2. Average - Physico-chemical parameters during winter culture

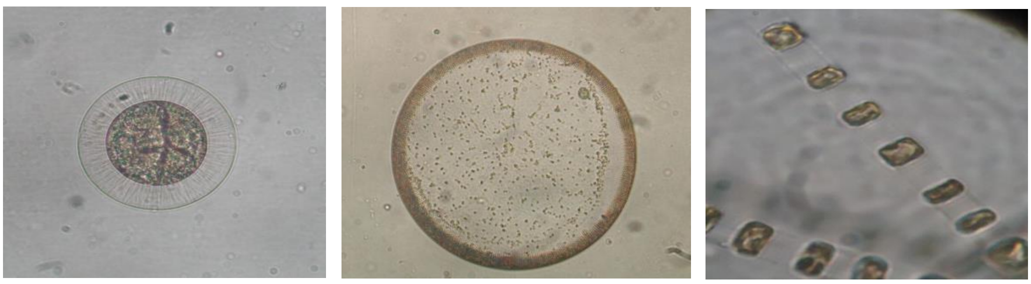
pH	Salinity	Carbonate	Bicarbonate	Total Alkalinity	Total Hardness	Ammonia
7.5	15	0	120	120	3120	0.22
7.72	26	30	130	160	5500	0.15
7.65	27	50	150	200	5530	0.42
7.54	28	40	140	180	6120	0.13
7.69	26	20	120	140	5210	0.05
8.02	25	30	130	160	5540	0.16
8.03	26	0	150	150	5412	0.26
8.34	25	40	160	200	5516	0.45
8	27	50	170	220	5610	1.12
8.01	26	40	150	190	6110	1.14
8.32	30	30	140	170	6840	1.05

Table. 3. Phytoplankton and Zooplankton diversity recorded during the study period

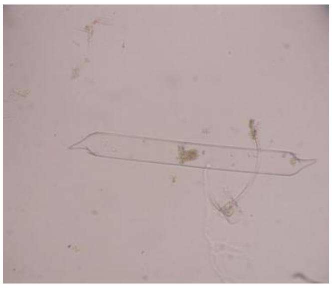
Phytoplankton	Zooplankton
Bacillariophyceae	Bdelloidea sp.
Bacillaria sp	Adineta Oculata
B.sinensis	Lecane stichaea
Coscinodiscus accentricus	Gastropus hyptopus
Coscinodiscus concinnus	Brachionus plicatilis
Planktonella sol	Oithona brevicornis
Rhizosolenia alata	Nannocalanus minor
Skeletonema costatum	Oithona rigida
Triceratium favus	Pseudodiaptomus Annandalei

Actinoptychus splendens	Paracalanus parvus
Chaetoceros sp.	Pseudodiaptomus Aurivilli
Nitzschia sigma	Acartia erythraea
Striatella unipunctata	Oithona brevicornis
Pleurosigma elongatum	Oithona rigita
Nitzschia closterium	Oithona linearis
Epithemia adnata	Microsetella rosea
Mastogloia minuta	Euterpina acutifrons
Pleurosigma directum	Sagitta sp
Rhizosolenia Castracanei	Barnacle nauplius
Pennales	Bivalve veliger
Asterionella japonica	Polychaete worm larvae
Navicula sp	Balanus nauplii
Nitzschia sigma	Gastropod veliger
Nitzschia closterium	Brachionus rubens
Pleurosigma sp	
Thalassiothrix sp	
Peridiniales	
Noctiluca	
Dinophyceae	
Ceratium contortum	
C. furca	
C. fusus	
C. lineatum	
C. macroceros	
C. trichoceros	
C. tripos	
Peridinium depressum	
Procentrum sp	
Cynophydeae	
Oscillatoria	
Trichodesmium erythraeum	
Oscillatoria sp.	
Nostocaceae	
Anabaena sp.	
Nostoc sp.	

Figure. 1 some of the identified plankton during the study period

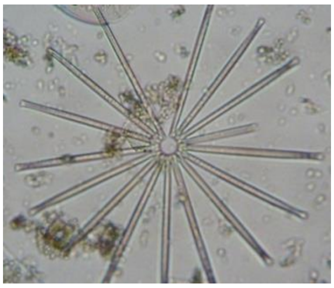


Planktoniella sol ***Coscinodiscus sp.,*** ***Skeletonema costatum***



Rhizosolenia alata

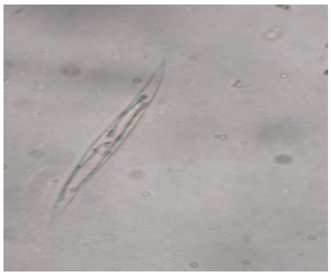
Chaetoceros sp.



Thalassiothrix sp

Nitzschia sp.

Navicula sp.



Pleurosigma sp.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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