ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2020; 6(1): 253-255
www.allresearchjournal.com
Received: 13-11-2019
Accepted: 15-12-2019

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Study the zooplankton population in relation to physico-chemical factors of sewage fed pond in Darbhanga

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Abstract
The water body is receiving domestic discharge leading to large amount of nutrient inputs and high amount of phosphate and nitrate in the water body indicates the Plankton biodiversity is a fundamental research area in the aquatic ecological studies and it is used for the variety of marine ecological problems, such as protection of biodiversity, bionetwork roles and services. Therefore, the phytoplankton is involving the various ecological processes with influence the species diversity. The present studies were made on the diversity of phytoplankton in relation to Physico-chemical parameters with respect to pollution status of Ennore mangrove ecosystem, Bihar, India. Surface water samples were collected from six different locations of Ennore at monsoon, post monsoon, summer and pre-monsoon seasons. A total of 101 species of phytoplankton observed belonging to different taxonomic groups were identified, out of which 48 species belong bacillariophyceae, 34 species to cyanophyceae and 19 species to chlorophyceae.

Keywords: zooplankton population and physico-chemical factors

Introduction
Among the various environs, mangroves are one of the most important ecosystem for distribution of plankton in tropical region because their physical and chemical variables. Biomass production of phytoplankton in different size ranges are important factors regulating the productivity of higher tropic-level organisms. Phytoplankton production contributes about 95% of total production in the marine environment [1–10]. The phytoplankton distribution is not always consistent and varies spatially and temporally. Among all nutrients, availability plays a key role in determining the phytoplankton population density. The qualitative and quantitative studies of phytoplankton have been utilized to assess the quality of water. Several phytoplankton species are reported as a bioindicators and water pollution studies.

Present scenario Ennore manrove is mostly polluted by various pollutants and anthropogenic activities so with this aspect, this project focuses on the effect of pollutants in Ennore ecosystem. A regular monitoring of water bodies with required number of parameters, not only prevents outbreak of diseases and occurrence of other hazards but also checks the water from further deterioration. The management of any aquatic ecosystem is a means of conservation of fresh water habitat with an aim to maintain the water quality or to rehabilitate the Physico-chemical and biological settling of water. Based on the above mentioned facts, it is suggested to make an inventory of the physicochemical parameters and phytoplankton diversity of Ennore mangrove ecosystem.

Materials and Methods
The water samples were collected from six different locations Ennore mangrove ecosystem Biological samplings and observations are carried out seasonally during the pre monsoon, monsoon, post monsoon and summer seasons except the samples of heavy metal analysis (done by post monsoon season - February 2019). The Sampling was done during morning hours, the water samples were collected in polypropylene plastic bottles, which were pre-cleaned with 1 N HCl and the samples were kept in an icebox on immediately after collection. The water temperature and pH were noted immediately on the spot after

collection, whereas the remaining parameters were analyzed in the laboratory. All the water quality parameters were collect at season wise analyzed according to APHA. The salinity was estimated by argentometric method dissolved oxygen was analyzed by modified Winkler's method, carbon dioxide was analyzed by titrimetric method, nitrate was determined by calorimetric method, sulfate was be determined by molybdosilicate method, sulfate was be determined by turbidimetric method the phosphate was determined by ascorbic acid method, the BOD was determined as given in APHA, 1995 and COD was determined by dichromate reflux method. The estimation of chlorophyll was done by spectropotometric method and the primary productivity was measured by light and dark bottle method according to Strickland and Parsons. All the biological parameters (flora and fauna) were collected and identified according to Kathiresan and Rajendran.

The plankton samples were collected by planktons net made up of bolting silk (mesh size 64 µm) and preserved in lugol's solution. The preserved samples were brought to the laboratory for qualitative and quantitative analysis. Phytoplanktons were identified by using the standard methods suggested by Smith, Phillipose, and Adoni Quantitative studies were made by using Sedgwick rafter cell. Sample was properly agitated to distribute the organisms evenly. By using a pipette, one ml of sample was transferred onto the cell. The Cover slip was placed properly avoiding any air bubble. The planktons were allowed to settle for some time and counting was made under microscope. All the planktons, present in the cell were counted by moving the cell vertically and horizontally, covering the whole area.

Results and discussion

The result of physicochemical parameters observed from Ennore mangrove ecosystem were tabulated in Table 1, 2 and 3.

Table 1: Physicochemical parameters of Ennore Mangrove Ecosystem

Locations	Monsoon					Post Monsoon					Summer					Pre Monsoon				
	AT	WT	pH	DO	CO_2	AT	WT	pH	DO	CO_2	AT	WT	pH	DO	CO_2	AT	WT	pH	DO	CO_2
1	31^0C	27^0C	8.3	3.2	22.0	32^0C	30^0C	8.3	2.8	17.6	32^0C	29^0C	8.2	3.2	30.8	31^0C	28^0C	8.3	2.4	26.4
2	31^0C	28^0C	7.9	2.8	17.6	32^0C	30^0C	8.1	2.4	22.0	32^0C	29^0C	8.1	2.0	26.4	31^0C	27^0C	8.1	2.0	17.6
3	32^0C	28^0C	7.8	2.8	22.0	32^0C	31^0C	8.0	2.4	22.0	32^0C	30^0C	8.0	2.4	26.4	31^0C	28^0C	8.0	2.8	22.0
4	32^0C	30^0C	7.8	2.0	13.2	32^0C	32^0C	8.2	2.0	13.2	32^0C	31^0C	8.1	2.0	22.0	31^0C	29^0C	8.1	1.6	13.2
5	31^0C	28^0C	7.6	3.6	30.8	32^0C	30^0C	8.1	3.2	26.4	32^0C	30^0C	8.0	3.2	30.8	30^0C	26^0C	8.0	2.8	26.4
6	31^0C	28^0C	7.6	2.8	17.6	32^0C	30^0C	8.1	2.8	22.0	32^0C	30^0C	8.0	2.8	26.4	30^0C	26^0C	8.0	2.4	22.0

Table 2: Physicochemical parameters of Ennore Mangrove Ecosystem

Locations	Monsoon					Post Monsoon					Summer					Pre Monsoon				
	Sal	Gro	Net	Ch'a'	NO_2	Sal	Gro	Net	Ch'a'	NO_2	Sal	Gro	Net	Ch'a'	NO_2	Sal	Gro	Net	Ch'a'	NO_2
1	39.9	0.15	0.03	3.20	0.20	39.9	0.26	0.18	2.06	0.20	40.9	0.22	0.11	2.91	0.19	40.4	0.22	0.11	3.76	0.20
2	40.4	0.15	0.03	2.81	0.23	35.9	0.22	0.15	2.19	0.21	39.9	0.18	0.15	3.20	0.24	40.9	0.11	0.03	3.65	0.23
3	32.9	0.15	0.03	4.70	0.23	31.9	0.30	0.18	2.48	0.22	32.9	0.22	0.18	4.54	0.25	32.4	0.11	0.03	4.33	0.24
4	41.4	0.11	0.03	1.87	0.14	40.9	0.18	0.15	1.93	0.18	41.9	0.03	0.03	2.32	0.14	40.9	0.04	0.03	2.39	0.14
5	32.9	0.30	0.03	4.83	0.30	32.4	0.33	0.11	3.14	0.25	31.9	0.33	0.15	4.76	0.26	32.4	0.30	0.11	4.09	0.27
6	33.9	0.22	0.03	3.28	0.23	33.4	0.26	0.15	1.99	0.26	32.9	0.22	0.11	3.24	0.25	33.4	0.22	0.11	3.69	0.27

Table 3: Physicochemical parameters of Ennore Mangrove Ecosystem

Locations	Monsoon					Post Monsoon					Summer					Pre Monsoon				
	PO_4	SiO_2	SO_4	BOD	COD	PO_4	SiO_2	SO_4	BOD	COD	PO_4	SiO_2	SO_4	BOD	COD	PO_4	SiO_2	SO_4	BOD	COD
1	0.32	0.15	0.52	1.6	1.71	0.26	0.24	0.78	1.2	1.71	0.30	0.25	0.84	1.6	2.85	0.31	0.24	0.68	1.2	1.71
2	0.33	0.25	1.36	1.2	1.71	0.32	0.29	1.28	1.2	1.14	0.34	0.31	1.21	0.8	2.28	0.33	0.15	0.73	1.2	1.14
3	0.37	0.19	0.78	1.6	1.14	0.36	0.38	1.10	1.2	1.71	0.37	0.35	1.15	1.6	1.71	0.35	0.14	1.13	1.6	1.14
4	0.24	0.42	1.21	0.8	1.14	0.19	0.39	1.52	0.8	0.57	0.31	0.47	1.55	0.8	1.14	0.24	0.31	1.47	0.4	0.57
5	0.40	0.23	0.81	2.0	0.50	0.40	0.41	1.0	1.6	1.14	0.38	0.36	1.05	2.0	1.14	0.39	0.21	1.0	2.0	1.14
6	0.39	0.43	1.13	1.6	1.14	0.37	0.36	1.05	1.6	0.57	0.38	0.34	0.97	1.2	0.57	0.37	0.43	1.42	1.6	0.57

Atmospheric and surface water temperature varied from 30^0C to 32^0C and 26^0C to 32^0C respectively during monsoon and summer seasons. The surface water temperature showed an increasing trend from December 2015 to March 2015. In general, surface water temperature is influenced by the solar radiation intensity, evaporation and insolation and the recorded low temperature during monsoon could be due to strong sea breeze and cloudy sky. The observed spatial variation in temperature could be due to the viable intensity of prevailing currents and the consequent mixing of water.

In the present study estimated that the high COD (2.85 mg/l) was recorded at summer season and low (0.50 mg/l) concentration was recorded at location 5 of monsoon season. The high (2.4mg/l) BOD concentration was recorded at post monsoon seasons and the low (0.4mg/l) BOD concentration was recorded at pre-monsoon season (2.4mg/l). The high BOD might be due to the decomposition of organic matter and decay of vegetation in river which mixed sea water during rainy season and high COD due to runoff from the surrounding areas of Ennore mangrove ecosystem. The concentration of water quality parameters depends upon the fresh water inflow, discharge of domestic sewage and industrial effluent. Due to the seasonal environmental fluctuations, the distribution and abundance of phytoplankton in tropical waters, varied remarkably. These variations are well pronounced in the sheltered system of coastal mangrove waters. In the present investigation, diatoms formed the dominant group followed by blue greens and greens at all the 6 locations of Ennore mangrove ecosystem. Many authors emphasized that the

diatoms were found to be dominant in mangrove waters, which could be due to the fact that diatoms can tolerate the widely changing hydrographical conditions.

Conclusion

The present findings show that there are certain members of species in the Chlorophyceae and Cyanophyceae which are tolerant to organic pollution and resist the stress caused by pollutants. Abundance of such taxa in the polluted habitats suggests their possible use a "indicator organism". Therefore, the results of this investigation suggest that the Ennore mangrove ecosystem is heavily contaminated by rapid urbanization and industrialization to release untreated industrial effluents and domestic sewages to this ecosystem. However urgently need the regular biological monitoring of water and fish for safety in seafood consumption from Ennore area. So avoid such kind of problem in the Ennore ecosystem to practicing safe disposal mechanism of industrial effluents and domestic sewages.

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