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Diversity of Phytoplankton in Vembanad Lake Kerala, Southeast Coast of India

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ABSTRACT

Phytoplankton samples were collected at monthly intervals from the surface waters of the study areas. Phytoplankton samples were collected by towing a plankton net (mouth diameter 0.35 m) made of bolting silk (No.30, mesh size 48 µm) for half an hour at one nautical mile speed. After the net operation was over, some plankton that remains on the gauze was washed into the bucket using water. Then the concentrated plankton samples were transferred in to a clean polythene container with 5% neutralized formalin as preservatives and used for qualitative analysis. In the present study total number of 74 species of phytoplankton was observed phytoplankton in the study area.

Keywords: Phytoplankton, Bolting Silk, Polythene Container, Formalin And Qualitative Analysis

I. INTRODUCTION

Aquatic ecosystems are rich with their biotic resources and they hold the key for the protein food security in India, where, phytoplankton is one of such important reserves. Phytoplankton plays a vital role in aquaculture as food for the larval stages of crustaceans, fish and all stages of bivalves, in addition to serving as food for various zooplankton organisms (Volkman et al., 1989). Marine phytoplankton comprises a complex community of several thousand floating micro-algae, ranging in size from about 1 µm up to a few millimeters. Based on the size, phytoplankton can be classified as macro-plankton (more than 1 mm), micro-plankton (between 5 and 60 micrometers) and ultra-plankton (less than 5 micrometers) (Boynton et al., 1982; Bo Riemann et al., 1989).

Phytoplankton being the autotrophs (primary producers), initiate the aquatic food-chain. Secondary producers (zooplankton) and tertiary producers (shell fish, finfish and others) depend on them directly or indirectly for food. Phytoplankton also serves as indicators of water quality and 'natural regions' which are characterized by typical species or species groups (Sampathkumar and Ananthan, 2007). In addition, phytoplankton clearly plays a significant role in the global biogeochemical cycling of carbon, nitrogen, phosphorus, silicon and many other elements. Blooms including red-tides caused by phytoplankton are of significant value in the aquatic environment as they affect aquatic economy. Hence, analysis of phytoplankton becomes essential in any study concerning with hydro-biological investigations.

II. METHODS AND MATERIALS

Phytoplankton samples were collected at monthly intervals from the surface waters of the study areas. Phytoplankton samples were collected by towing a plankton net (mouth diameter 0.35 m) made of bolting silk (No.30, mesh size 48 µm) for half an hour at one nautical mile speed. After the net operation was over, some plankton that remains on the gauze was washed into the bucket using water. Then the concentrated plankton samples were transferred in to a clean polythene container with 5% neutralized formalin as preservatives and used for qualitative analysis. For the quantitative analysis of phytoplankton, the settling method described by Davis (1957); Newwell & Newwell, 1963; Sukhanova (1978) and Mitra et al. (2004) was adopted. Numerical plankton analysis was carried out using Utermohl's inverted plankton microscope.

For the identification of phytoplankton, a standard research microscope magnification X 1000, with phase-contrast illumination can be used. Phytoplankton was identified using the standard works of Hustedt (1930-1966), Venkataraman (1939), Cupp (1943), Subrahamaniyan (1946), Prescott (1954), Hendey (1964), Steidinger and Williams (1970), Taylor (1976), Sournia (1978), Anand et al. (1986) and Desikachary (1987). For the sake of convenience, the phytoplankton collected were assigned to four major groups viz.,Diatoms, Dinoflagellates, Blue-green algae and 'others'.

III. RESULTS AND DISCUSSION

In the present study total number of 74 species of phytoplankton were recorded .Ceratium furca, C. macroceros, Noctilucas cintillans, Noctiluca sp, Prorocentrum micans, P. depressum, Chaetoceros orientalis, Coscino discusgigas, C. centralis, Navicula amphibian, N. cincta, N. radiosa, Nitzschia acuta, Odentella heteroceros, O. Sinensis, Pleurosigma sps, Skeletonema costatum, Oscillatoria limosa, Oscillatoria sp, Pseudo anabaena sp, Spirulina sp and Trichodesmium erythraeum are very commonly observed phytoplankton in the study area (Table.1).

Table 1: Check list of phytoplankton species recorded from April 2013 to March 2014

S. No.	Species list	
	CHLOROPHYCEAE (Green Algae)	
1	Spirogyra sp.	+
2	Eudorina sp.	+
3	Closterium sp.	+
4	Pediastrum duplex	+
5	Pediastrum simplex	+
6	Chlorella Vulgaris	+
7	Ulothrix sp.	+
	BACILLARIOPHYCEAE (Diatoms)	
8	Chaetoceros orientalis	+
9	Bacillariaparadoxa	+
10	Bacillariavarians	+
11	Bacilariaparillifer	+
12	Campylodiscusindicus	+
13	Ditylum sol	+
14	Skeletonemacostatum	+
15	Amphora coffeaeformis	+
16	Coscinodiscusthori	+
17	Coscinodiscussubtilis	+
18	Coscinodiscus radiates	+
19	Coscinodiscusgigas	+
20	Coscinodiscuscentralis	+
21	Odentellaheterocera	+
22	Odentellasinensis	+
23	Grammatophora marina	+
24	Guinardia flaccid	+
25	Nitzschiaacuta	+
26	Nitzschia amphibian	+
27	Pleurosigma sp.	+
28	Naviculacincta	+
29	Navicularostellata	+
30	Navicularadiosa	+
31	Naviculamutica	+
32	Amphora ovalis	+
33	Spirogyra sp.	+
34	Eudorina sp.	+
35	Closterium sp.	+
36	Pediastrum duplex	+
37	Pediastrum simplex	-
38	Chlorella Vulgaris	+
39	Ulothrix sp.	+
40	Cladophora crispate	+
41	Odogonium sp.	+
42	Uronema sp.	+
43	Volvox sp.	+
44	Chlorococcum sp.	+
45	Eudorinamorum	+
	EUGLENOPHYCEAE	
46	Phacustriqueter	+
47	Euglena geniculate	+
48	Eugleneviridissps.	+
49	Euglene spirogyra	+
50	Euglena viridius	+
51	Phacusacuminatus	+
52	Phacuslongicauda	+
53	Phacuspleuronectes	+
	CYANOPHYCEAE (Blue)	
54	Anabaena sp.	+
55	Trichodesmiumerythracum	+
56	Oscillatoria	+
57	Oscillatorialimosa	+
58	Spirulina sp.	+
59	nagbya sp.	+
60	Pseudo anabaena	+
61	Spirullina sp.	+
62	Microcystisflosaquae	-
63	Arthospira sp.	+
64	Aphanocapsakoordersi	+
65	Aphanocapsia Montana	+
66	Gomphosphaeria sp.	+
67	Nostocpruniforme	+
68	Oocystis sp.	-
69	Micractinium radiate	+
	Fragilariaceae	
70	Thalassionemanitzschioides	+
71	Thalassiothrixfraunfeldii	+
72	T. longissima	+
73	Fragillaria sp.	+
74	F. intermedia	+

+ Common, - Rare

Phytoplanktons are limited in the uppermost layers of the water where light intensity is sufficient for photosynthesis to occur. The light incidence at different depths of water depends on a number of factors, like absorption of light by the water, the wave length of light, transparency of the water, reflection from the surface of the water, reflection from suspended particles, latitude and seasons of the year. When light strikes the surface of the water, certain amount of light is reflected the amount depends on the angle at which the light strikes the surface of the water. Most of the phytoplankton, the photosynthetic rate varies with light intensity. Different species have different curves of photosynthetic rate when plotted against light intensity, giving different optimal light intensified for maximum photosynthesis.
Species composition of phytoplankton observed in the present study was more or less similar for both the stations. In the present study, almost all the species observed were higher numbers in November. The dominant forms include diatoms (T. fraunfeldii and T. nitzschioides) and dino flagellates C. trichoceros and P. depressium) were predominant during November because of high nutrients in this month and enhance the growth of phytoplankton. This was coincide with earlier reports that they are dominant forms of phytoplankton population in tidal area near Seronicos Bay (Ignatiades et al., 1985), in Dutch Wadden Sea (Chang, 1983) and in Greater Cook Strait (Bradford et al., 1986). In India similar observations of diatoms domination amidst various groups of phytoplankton were made by Vasantha (1989) from Portonovo waters, Kannan and Vasantha (1992) and Mani (1994) from Pichavaram mangroves. Satheskumar and Perumal (2012) from Ayyampattinam.Studies proving this hypothesis in laboratory-based plankton populations have been reported by Sommer (1995). Weithoff et al. (2001) have proved the same in plankton data obtained from field experiments.

IV. CONCULSION

Species composition of phytoplankton observed in the present study was more or less similar for both the stations. In the present study, almost all the species observed were higher numbers in November and predominant during November because of high nutrients in this month and enhance the growth of phytoplankton.

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