PHYTOPLANKTON COMMUNITY STRUCTURE AT MAJAKERTA ESTUARY, INDRAMAYU, WEST JAVA, INDONESIA

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ABSTRACT

Majakerta estuary has a high potential of fishery resource, and it is commonly utilized by the surrounding community. Fluctuation of physical and chemical parameters of the waters and fishery activity around the estuary can affect the sustainability of the phytoplankton. This study on the phytoplankton structure community at Majakerta estuary was conducted from December 2014 to May 2015. Samples of the phytoplankton were collected once in each month at four stations. Based on the study, phytoplankton in Majakerta estuary consisted of six classes; Bacillariophyceae (36 genera), Cyanophyceae (7 genera), Dinophyceae (5 genera), Chlorophyceae (4 genera), Zygnemaphyceae (2 genera) and Euglenophyceae (2 genera). Based on the phytoplankton diversity index, it can be inferred that the value is relatively low. There are two habitat groups based on some water quality parameters, namely group 1 (Station 1 and 2; river and estuary) and group 2 (Station 3 and 4; sea) which have influencing parameters that is turbidity, pH, and salinity.

Keywords: Phytoplankton, community structure, estuary, Majakerta, Indonesia

INTRODUCTION

Estuary of Majakerta River is located in the coordination point of 6°23'17"S-108°24'5" E, of Balongan District, Indramayu Regency, West Java. The area has a high potential of fishery resources and is commonly utilized by the local community as sources of life.

Information of the environmental conditions that include physics, chemistry and biology as phytoplankton in the estuary of Majakerta River has not been studied. This information can be used as a basis data for management and usage of the estuary of Majakerta river and fishery resources in a sustainable manner.

This study aims to examine the phytoplankton community structure and its relation to the condition of the water quality in the estuary.

MATERIALS AND METHODS

Time and Location

This research was conducted for 6 months since December 2014 to May 2015. The samples were taken along the estuary of Majakerta River, Indramayu (Fig. 1).

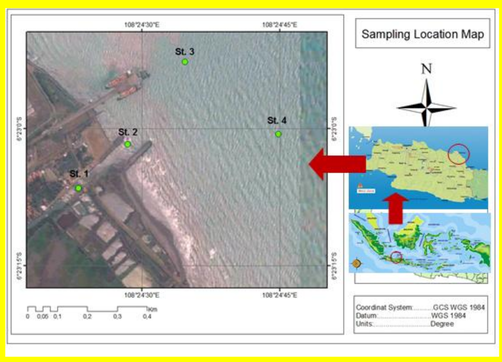

Fig. 1. Sampling station in Majakerta estuary, Indramayu, West Java, Indonesia. (Note: St=Station; insert: West Java and Indonesia Map)

Sampling Methods

Samples of the phytoplankton were collected by filtering 100 L of sea water by means of a 30 µm-sized plankton net and then placed in a 50 mL *polyethylene* bottle preserved by 1% lugol's solution (APHA AWWA WEF, 2005).

Samples Anaysis

The phytoplankton species identification was performed by microscope of Olympus CH-2 with 10x10 and 10x40 magnification. Samples were analized by using 1 mL *Sedgwick-Rafter Counting Cell* (SRC) and using species identification book of Mizuno (1979) and Yamaji's (1979). Water quality parameters were measured in-situ and laboratory (Table 1).

Data Analysis

Three indices were used to obtain the estimation of species diversity, species evenness, and species dominance (Odum 1993).

Table 1. Water quality parameters observed

Parameters	Units	Equipments/Methods	Analysis
Physical			
Temperature	°C	Thermometer/*Conductivity*	*In situ*
Turbidity	NTU	Turbidity meter/*Nephelometric*	*In situ*
Transparency	cm	Secchi Disk/Visual	*In situ*
TSS	mg/L	Gravimetric	Laboratory
TDS	g/L	SCT meter	Laboratory
Chemical			
Salinity	PSU	Refractometer	*In situ*
pH	-	pH indicator	*In situ*
DO	mg/L	DO meter	*In situ*
Nitrit (NO_2-N)	mg/L	Spectrofotometer/*Sulfanilamide*	Laboratory
Nitrat (NO_3-N)	mg/L	Spectrofotometer/*Phenate*	Laboratory
Amonia (NH_3-N)	mg/L	Spectrofotometer/*Brucine*	Laboratory
Ortofosfat	mg/L	Spectrofotometer	Laboratory

RESULTS AND DISCUSSIONS

Phytoplankton composition

Based on the phytoplankton identification results from 5 observing stations in Majakerta estuary waters, there were six classes of phytoplankton i.e. Bacillariophyceae (36 genera), Cyanophyceae (7 genera), Dinophyceae (5 genera), Chlorophyceae (4 genera), Zygnematophyceae (2 genera) and Euglenophyceae (2 genera) (Fig. 2).

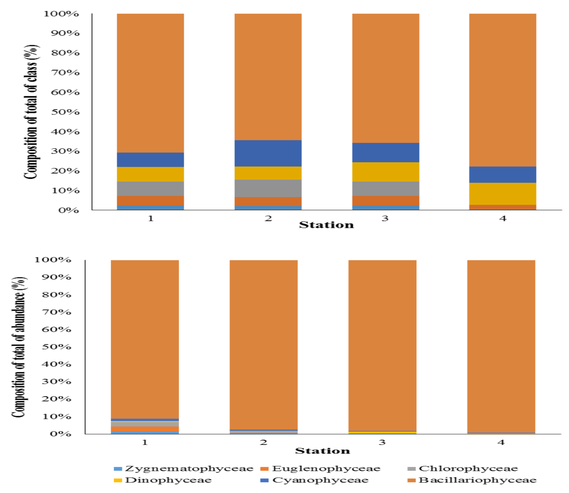

Fig. 2. Composition percentage of total of order and abundance of phytoplankton on each station during the study

Phytoplankton Diversity, Evennes and Dominance Indeces

Phytoplankton community structure is determined by its species diversity. The index value of phytoplankton diversity (1,42-2,64), evennes (0,14-0,83) and dominance (0,09-0,32) is presented in Table 2. These values indicate that the condition of the estuary waters is still moderate

Table 2. Diversity index value (H'), evennes index (E) and dominance index (C) of phytoplankton in estuary of Majakerta River.

Index	Observation Period					
	Dec	Jan	Feb	Mar	Apr	May
H'	1.94-2.34	1.89-2.11	2.29-2.63	2.00-2.64	1.42-2.28	2.03-2.43
E	0.58-0.73	0.14-0.67	0.69-0.78	0.64-0.83	0.51-0.76	0.68-0.78
C	0.15-0.32	0.2-0.26	0.10-0.18	0.09-0.20	0.14-0.40	0.12-0.20

Water quality condition

Water quality parameters measured in this study were temperature, transparency, turbidity, TSS, TDS, DO, pH, salinity, orthophosphate, nitrate, nitrite, and ammonia (Table 3). The results of the water physico-chemical parameters shows in the normal range of aquatic organisms

Table 3. Water quality parameters in estuary of Majakerta River

Parameters	Units	St 1	St 2	St 3	St 4
Physical					
Temperature	°C	29.95 ± 1.348	30.90 ± 0.79	28.27 ± 3.76	28.70 ± 3.32
Tranparency	cm	29.50 ± 3.54	80.50 ± 2.12	113.50 ± 6.36	123 ± 16.97
Turbidity	NTU	47.80 ± 14.99	39.95 ± 25.24	2.25 ± 1.39	2.56 ± 0.47
TSS	mg/L	42.00 ± 36.37	20.00 ± 6.00	11.00 ± 5.19	8.33 ± 0.57
TDS	g/L	12.15 ± 15.48	10.50 ± 11.09	24.86 ± 31.11	24.91 ± 0.11
Chemical					
DO	mg/L	7.82 ± 1.88	7.53 ± 2.30	6.60 ± 5.10	5.40 ± 3.74
pH		7.00 ± 0	7.00 ± 0	7.33 ± 0.58	7.33 ± 0.58
Salinity	PSU	0 ± 0	8.50 ± 4.23	25.67 ± 4.96	28.83 ± 2.56
Ortophosphat	mg/L	0.021 ± 0.014	0.019 ± 0.002	0.006 ± 0.003	0.008 ± 0.006
Ammonia	mg/L	0.416 ± 0.353	0.252 ± 0.249	0.140 ± 0.159	0.141 ± 0.136
Nitrate	mg/L	1.153 ± 1.287	0.851 ± 0.664	0.074 ± 0.043	0.33 ± 0.021
Nitrite	mg/L	0.010 ± 0.012	0.012 ± 0.014	0.004 ± 0.004	0.006 ± 0.007

Physical, chemical, and biological parameters relationship

Physical-chemical parameters used in Principal Component Analysis included temperature, turbidity, transparency, TSS, TDS, salinity, pH, DO, nitrite, nitrate, ammonia, and phytoplankton abundance. Principal Component Analysis shows that the rooted sign of primary and secondary components can explain 91% and 6.9% of total diversity. The results show that Station 3 and 4 were signified more on the presence of phytoplankton, salinity, and brightness. Water quality parameters which signify Station 1 and 2 were temperature, turbidity, nitrate, and ortho-phosphate. The result of the Principal Component Analysis is presented in Fig. 3.

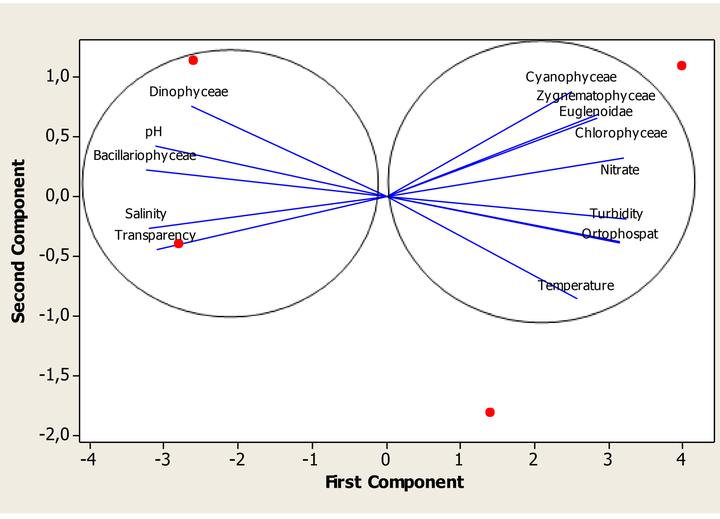

Fig. 3. Tendency of water quality parameter and phytoplankton abundance on each observation station