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RELATIONSHIP BETWEEN PLANKTON COMMUNITY STRUCTURES WITH WATER QUALITY IN RIAM KANAN RIVER SUBDISTRICT KARANG INTAN

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ABSTRACT

This study aimed to verify the relationship between plankton community structures (abundance, diversity index, uniformity index, dominance) with the water quality in Karang Intan River Subdistrict Riam Kanan. The benefits of this research, providing scientific information about environmental parameters that influence the plankton community structure. Based on this research, water quality parameters related (significant correlation) with a plankton community structures were dissolved oxygen, ammonia, nitrate, phosphate, brightness and water current.

Keywords: plankton community structure, water quality.

INTRODUCTION

Since 1980, Riam Kanan River in the Subdistrict Karang Intan has been used by communities around the area for aquaculture with cage system that amounted achieves 6180 units in 2004. Desires of the community through this effort can produce high fish production in a relatively short time by feeding. Although feeding the right way and the right time were socialized, but in the dry season fish production has decreased due to the mass death of fish each year. Thus, the impact of feeding on biological communities in this river is still not clear.

The high activity of fish farming in Riam Kanan River Subdistrict Karang Intan can cause decreasing in river water quality, due to the increased input of organic waste such as food remains and fish waste into it. Based on information from the fish farmers, they were feed the fish reach 10 tons per day. The amount is of course not entirely eaten by fish, will be partially degraded by the degrading microorganisms. According Bizsel *et al*. (2001), the result of decomposition of organic wastes can increase the concentration of nitrate and phosphate. Increasing nitrate and phosphate in waters by nutrients will negatively affect the aquatic organism. One indicator of the enrichment of waters by nutrients are abundant and the dominating type of plankton from the family Chlorophyceae (Scenedesmus sp, Chlamydomonas sp) and Cyanophyceae (Microcystis sp and Anabaena sp) (Basmi, 2000). According to Soetrisno (2001), if Microcystis sp dominating in river, will decrease levels of dissolved oxygen in the water, because its cell colonies cover the surface of the water and difficult to digest, potentially causing the death of aquatic organisms such as fish.

From the above thoughts, it seems that increased input of organic waste such as food remains and fish waste has led to decreasing water quality in rivers. This pollution needs immediate and serious attention, because 70% of the community around these rivers relies on fish farming cage system. As a way to solve this problem, need to do a study on the relationship

of plankton community structure and water quality are concentrated in Riam Kanan River Subdistrict Karang Intan. Based on this research, the expected cause of declining water quality, which one is the impact of mass fish mortality in aquaculture areas, can be answered. The purpose of this study is to determine the relationship with the plankton community structure in water quality Riam Kanan River Subdistrict Karang Intan.

MATERIALS AND METHODS

Determination of Station for Plankton and Water Sample

The station is determined by purposive sampling method, based on the different levels of density cages. Five stations are chosen, Karang Intan Dam (I), Desa Sungai Alang (II), Desa Karang Intan (III), Desa Mali-mali (IV) and Desa Arfat (V).

Plankton Sampling

Plankton samples were taken at each station at a depth of two thirds of subsurface water using water sampler. Then the water filtered by plankton net number 25 and kept in the bottle sample with the addition of 3-4 drops of formalin. Sampling was collected four times with an interval of one week.

Observation and Identification of Plankton

One drop of water sample placed on the object glass and covered with cover glass. Plankton was observed under microscope electric with a magnification of 10x-40x. Plankton found were identified and counted to determine Plankton Abundance (N), Diversity Index (H'), uniformity index (E) and dominance index (D).

Water Quality Measurement

Water from river was taken using the water sampler, and then inserted into the bottle sampler. Water quality parameters measured directly (in situ) include: water temperature (thermometer), pH (pH meter), current velocity (float method), transparency (Secchi disk), and dissolved oxygen (DO meter). Ex situ measurements were done for parameters such as ammonia (titration method), nitrate and phosphate (spectrophotometer).

Data Analysis

The regression and correlation analysis were performed to determine the relationship between plankton community structures with parameters of water quality. In this study, regression and correlation analysis calculated with SPSS version 10.0.

RESULTS

From observation and analysis, water quality parameter values at each sampling station can be seen in Table 1, whereas Table 2 describes results from plankton community structure.

Table 1. Results from analysis of water quality parameters

Parameter	Station				
	I	II	III	IV	V
Temperature (°C)	29.59±0.04	29.53±0.05	28.60±0.01	29.63±0.04	28.63±0.20
pH	7.28±0.01	7.45±0.04	7.67±0.01	7.90±0.01	7.94±0.01
Dissolved oxygen (ppm)	5.07±0.12	4.41±0.16	4.50±0.06	4.25±0.07	4.20±0.06
Ammonia (ppm)	0.110±0.01	0.358±0.01	0.324±0.01	0.223±0.01	0.215±0.01
Nitrate (ppm)	0.089±0.01	0.193±0.01	0.274±0.01	0.404±0.01	0.450±0.01

Phosphate (ppm)	0.086±0.01	0.212±0.01	0.153±0.01	0.190±0.01	0.125±0.01
Brightness (cm)	119±0.52	112±0.89	109±0.15	106±0.87	105±0.22
Water current (m/s)	0.74±0.01	0.62±0.01	0.60±0.01	0.53±0.01	0.40±0.02

Table 2. Results from plankton community structure

Community Index	**Station**				
	I	**II**	**III**	**IV**	**V**
Abundance (cell/L)	6079±0.01	7284±0.01	8289±0.01	8789±0.01	9360±0.01
Diversity (H')	2.772±0.01	1.536±0.01	1.458±0.01	1.401±0.01	1.355±0.01
Uniformity (E)	0.65±0.01	0.57±0.01	0.54±0.01	0.52±0.01	0.50±0.01
Dominancy (D)	0.182±0.01	0.284±0.01	0.323±0.01	0.351±0.01	0.374±0.01

Observations on plankton community structure conducted at five sampling locations. In the five locations, was found 15 genera of plankton, namely Desmium, Scenedesmus, Selenastrum, Zygnema, Chlamydomonas, Spirogyra, Pinnularia, Cymbella, Surille, diatomaceous, Anabaena, Euglena, Diaptomus and Eucyclops.

DISCUSSION

Riam Kanan Dam is the first station located at the upstream and not used as fish farming. Thus the enrichment of waters by nutrients does not occur at this station. This is shown by the average content of nitrate and phosphate are low, amounting to 0089 mg / L and 0086 mg / L. Genus of plankton dominate at this station were Cymbella, Pinnularia, Diatoma, Surirella. According to Anonymous (2005), Bacillariophyceae species such as Cymbella, Pinnularia, and Surirella plankton that inhabit the waters are not polluted by organic waste. In this

station also found copepods (26%). According to Umar (2002), the main predator of Bacillariophyceae was the copepods, which have the ability to break the framework of diatom cell walls are made of silicate. The concentration of dissolved oxygen which has a correlation with plankton community structure, with a coefficient value (0.512). Riam Kanan Dam is lightly polluted waters based on a diversity index value for 2.772.

While the four other stations seen from the diversity index values respectively 1.536, 1.458, 1.402 and 1.335 are classified as polluted. Water quality parameters associated with the structure of plankton communities in these four stations is the concentration of dissolved oxygen, ammonia, nitrate, phosphate, brightness and speed of flow. Plankton found in these four stations was Chlorophyceae, Euglenophyceae, Cyanophyceae and Rotifera. Community structure at this station was influenced by nitrate and phosphate. Nitrate can act as nutrients for growth and increased abundance of plankton in the waters especially from class Chlorophyceae (Lafrancois et al., 2004).

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