

## DISTRIBUTIONS OF DIATOM PHYTOPLANKTON BASED ON SEA CURRENT IN INDONESIA

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### ABSTRACT

Phytoplankton is an autotrophic component of plankton, which is an organism capable of providing /synthesizing self-feeding organic material from inorganic materials with the help of energy such as sunlight and chemical. Diatoms are single cell organisms that are abundant in the coastal areas and open there. Diatoms are the most common type of phytoplankton doing photosynthesis. Photosynthesis so they must be on the surface, which is suitable for waking and waking. The purpose of this paper is to provide and display the distribution of phytoplankton in Indonesia from 2014-2016 which is strongly influenced by the sea surface current. The results of this study showed that the distribution of diatom phytoplankton in Indonesia ranged from 0,03-6,33 mmolC / m<sup>3</sup> with the fastest current velocity of 0,81398 m/s.

**Keywords:** Phytoplankton, Diatom, and Surface Current

### 1. Introduction

Phytoplankton is a group of autotrophic plant biota, has chlorophyll and other pigments in its cells and is capable of absorbing radiant energy and CO<sub>2</sub> for photosynthesis. This biota is able to synthesize inorganic materials to be converted into organic material (the most important is carbohydrates) (Zhong, 1989). All plankton of the phytoplankton class have a color, which is partly green because it contains various types of chlorophyll pigments, i.e. chlorophyll-a to chlorophyll-d. However, the naming or algae classification is based on the color basis, although the pigment content consists of several pigments (Sachlan, 1982). Phytoplankton obtains energy through photosynthesis and therefore must live on the surface of the water layer (referred to as the euphotic zone) from the sea, lake, or other bodies of water and cause the phytoplankton of its life to be swept away by the presence of ocean currents. Phytoplankton includes half the activity of photosynthesis on Earth.

Sea current is the horizontal or vertical movement of the water mass to the stability that occurs continuously. The resulting movement is the resultant result of various forces acting on the surface, column, and bottom of the water. The result of mass water movement is a vector that has a magnitude of speed and direction. There are two types of forces that work that is external and internal. External forces include the gradient of sea water density, horizontal pressure gradient and friction layer of water (Gross,1990).

According to Nining (2002) the circulation of the current is divided into two, namely the circulation of surface currents caused more by wind movement, and inner circulation currents more due to thermohaline currents. According to Hutabarat and Evans (1985), the movement of water at sea level is mainly caused by the wind blowing above it. The other reason is that the currents are affected by at least three other factors, apart from the wind. As a result, currents flowing from the ocean surface are the result of combined work of these factors.

Benefits from the current are food supply, oxygen solubility, plankton dispersal and removal of CO<sub>2</sub> as well as remnants of marine biota products (Romimohtarto, 2003). The benefits of the flow for many biota are related to the addition of food to the biota and the disposal of the manure. For algae lack of chemicals and CO<sub>2</sub> can be met. As for animals, CO<sub>2</sub> and waste products can be removed and O<sub>2</sub> remains available. Flow also plays an important role for the spread of plankton, both holoplankton and meroplankton, especially surface and horizontal currents greatly affect the spread of marine mineral nutrients. Life Phytoplankton depends on the mineral. These minerals are primarily macronutrients such as nitrate, phosphate or silicic acid, where the availability of these minerals is governed by a balance between biological pumps and upwelling, a nutrient rich in phytoplankton.

The open waters of phytoplankton are dominated by the presence of diatoms, the diatoms which are another term for the Bacillariophyceae class, are the dominant phytoplankton in the ocean. Diatoms may be single cells or long cell sequences; each cell is protected by a box-like silica wall (Sachlan, 1982; Arinardi et al., 1997). The types of diatoms that are commonly found in coastal waters or river mouths are chaetoceros, rhizosolenia, and coscinodiscus (Arinardi et al., 1997). The distribution of diatoms is very broad including sea water to fresh water, both in plankton and benthic communities. This condition is caused by greater diatom reproductive ability compared to other phytoplankton groups. Based on its shape, diatoms are grouped into two, namely the diatomic centric group and the diatoms pennate group. Centrales groups have valve shapes that are arranged radially or concentrated one point (Lalli and Parsons, 1995). Generally this group has a picture of round cell wall shape, cylindrical, or triangular and mostly planktonic. While the pennate group has a long form with bilateral symmetry along the axis of the cell wall valve (Lalli and Parsons, 1995).

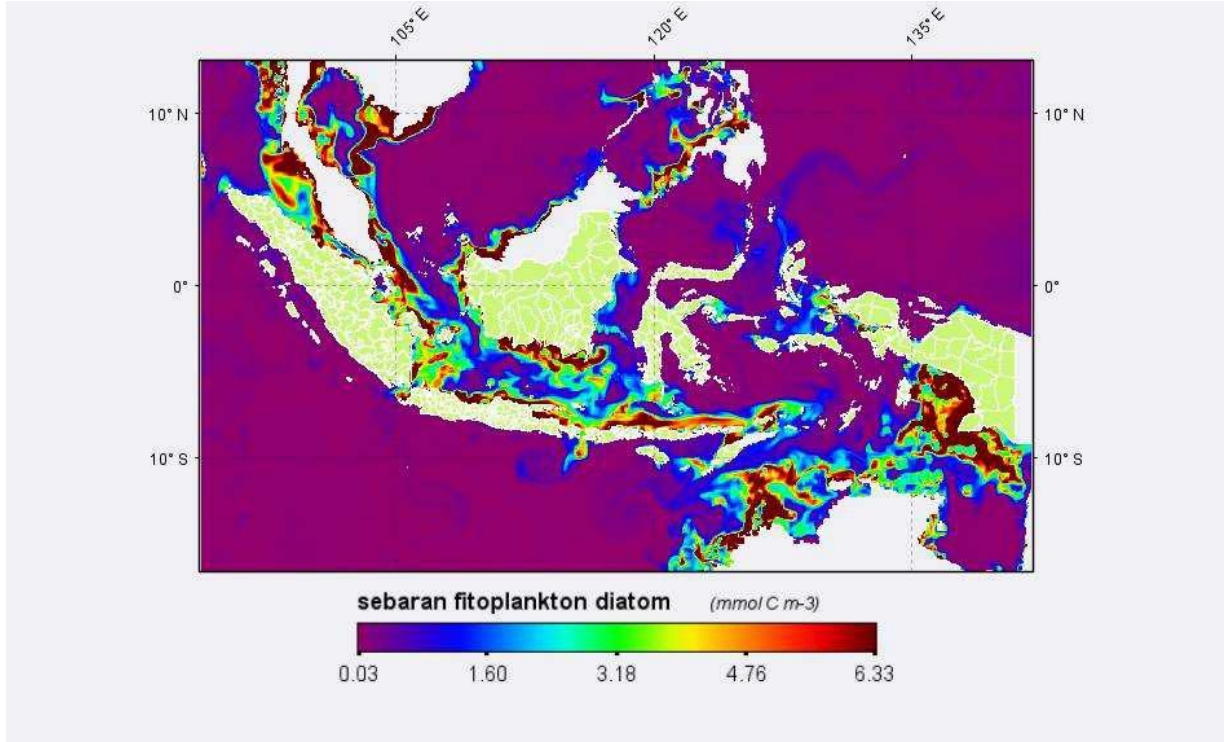
## **2. Data and Method**

This research analyzed diatom phytoplankton diffusion data and current velocity using satellite image data which can show the abundance of diatom phytoplankton distribution and surface current velocity at sea. Satellite image data for abundance of diatom phytoplankton is obtained from the download on the website <http://www.indeso.web.id/>, and the data for current velocity is obtained from the download on the website <https://podaac.jpl.nasa.gov>. Data processing is done by using ArcGIS software. The data used is the data of diatom phytoplankton distribution and current velocity year 2014-2016.

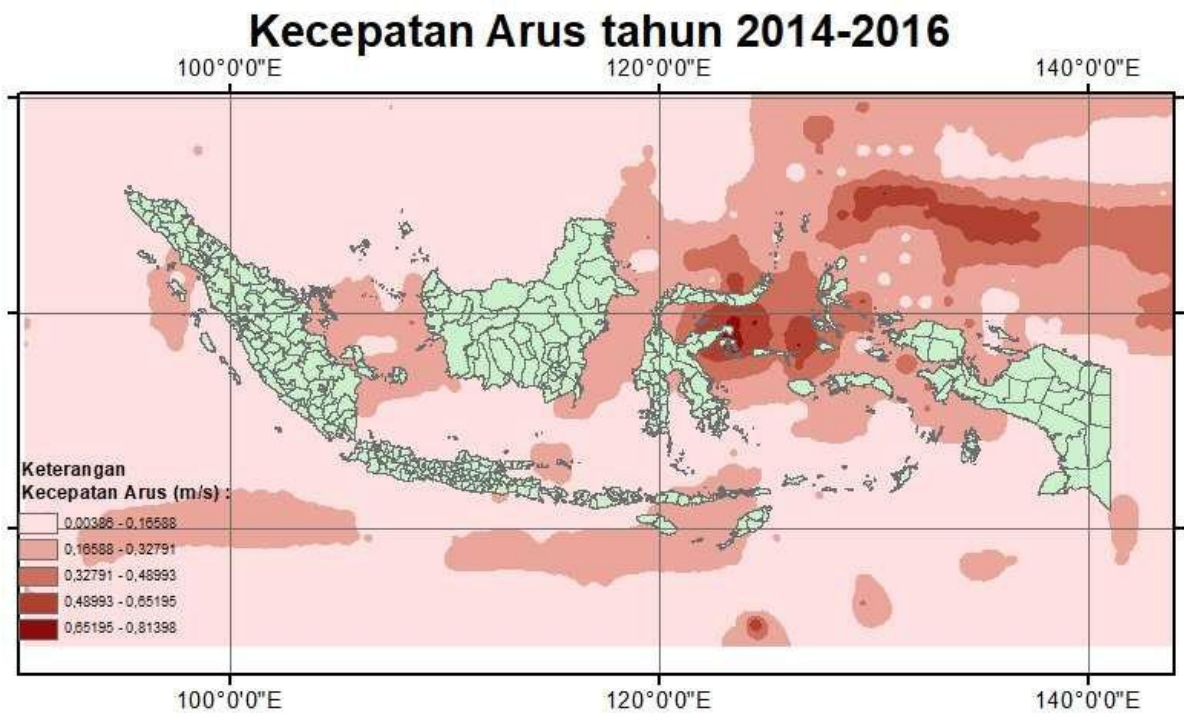
The data of abundance of phytoplankton used is the abundance of diatom phytoplankton; this is done because diatom is one type of phytoplankton which predominates in open water area.

### 3. Result and Discussion

The results displayed in the form of maps are:



Picture 1. Distribution of Diatom Fitoplankton



Picture 2. Current velocity

The results show that the current velocity around the islands of Sumatra and Kalimantan is high, and in the same area the abundance of phytoplankton also shows high numbers. In areas with high current velocity, the high phytoplankton abundance due to ocean currents in the distribution of mineral nutrients at sea, the phytoplankton of life is highly dependent on nutrients.

Plankton has a vital function for the waters as a primary producer because the biota produces carbohydrates which then become food for the first consumer (Kavanaugh et al., 2009). Plankton is divided into 2 i.e. Phytoplankton and zooplankton. Sutomo (2013) says that phytoplankton is fundamentally plankton of plants such as microscopic algae which is the first level in the food chain, as well as zooplankton invertebrates located at the second level. Phytoplankton plays an important role in the sea as a primary producer. Phytoplankton is in the upper pelagic layer where photosynthesis process can occur due to the reception of sunlight so that phytoplankton can produce carbohydrate or main food for consumer I

The distribution of phytoplankton shows that the abundance of phytoplankton at a station is a function of internal and external factors. The internal factor is the ability of phytoplankton to utilize food from the environment to support the process of respiration, metabolism and reproduction. While external factors are currents, tides and waves. Based on internal factors indicating that nutrient availability is able to support the life of phytoplankton, so it can sustain its life and reproduce. Explained by Tsunogai (1979) Basmi (1992), and Wardhana (1994), in Muchtar (2012) certain phosphate levels can support the abundance of phytoplankton which can ultimately support the availability of energy for reproduction. Distribution of phytoplankton is more caused by external factor that is flow.

#### **4. Conclusion**

The relation between sea current especially sea surface current and distribution of Phytoplankton is can;t be sepparated each other because phytoplankton lived depend to current circulation to do activity. The opinion of Quinn & Dunham (1983) in Rani (2003) is that the patterns created in phenomena are the result of interactions between biotic and abiotic because nature is multifactorial. Therefore, it is necessary to consider the physical aspects of the water that may contribute to the pattern of the community.

The velocity current water is supposed to determine the presence of distribution in a column of water containing figs. Circulation of the formation of the stream is suspected to allow the stirring which will affect the distribution and fluctuation of the nutrient concentration, the distribution and nutrient fluctuations can determine the abundance of diatom phytoplankton.

#### **5. Acknowledgement**

Authors would like to thank all the people who were involved in the programmers data to providing free access the data sets to use in this study. The OSCAR data were made available through the National Oceanic and Atmospheric Administration (NOAA) Web ([www.oscar.noaa.gov](http://www.oscar.noaa.gov)) and INDESO (<http://www.indeso.web.id/>)for distribution of fitoplanktom diatom.

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