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Aquatic Procedia 7 (2016) 277 – 284

Aquatic Procedia

www.elsevier.com/locate/procedia

2nd International Symposium on Aquatic Products Processing and Health
ISAPPROSH 2015

Implementation of ARIMA Model to Asses Seasonal Variability Macrobenthic Assemblages

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Abstract

Human activities, including industrial and aquaculture, may have impact on water environment, especially organic enrichment. One of bioindicator of pollution that affect the quality of the water ecosystem is macrobenthic community. In general, the more diverse macrobenthic assemblages indicate the better of the waters quality. Understanding spatial and temporal distribution of macrobenthic abundance has become an important part of research in the field of ecology in understanding the level of environmental disturbance over time. This study discussed the application of the method of Autoregressive Integrated Moving Average (ARIMA) to asses seasonal variability ofmacrobentic assemblages. We found that forecasting using autoregressive integrated moving average method with the model of ARIMA (0,1,1) is obtained the smallest value of the Mean Square Deviation (MSD).

Keyworods : ARIMA; forecasting; macrobenthos; MSD; waters quality.

Peer-review under responsibility of the science and editorial board of ISAPPROSH 2015

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doi:10.1016/j.aqpro.2016.07.039

1. Introduction

Macrobenthos are living organisms that live in the bottom of water sediments. Macrobenthic organisms are considered sensitive as aquatic organisms in response to environmental changes. With such properties, changes in water quality and substrate (sediment) greatly affects the abundance of macrobenthos (Robert, 2006; Day et al., 1989). Macrobenthos abundance depends on the tolerance or sensitivity to environmental changes (Dobson and Frid, 1998). Each community responds to changes in habitat quality in a way adjustment on the community structure. In a relatively stable environment, composition and abundance macrobenthos are relatively fixed (Putro et al., 2014; Ardi, 2002; Ruswahyuni, 1988).

Research in the field of ecology, especially discussion of the spatial and temporal distribution of macrobenthic abundance can be used to determine the level of environmental disturbance over time. Through their spatial and temporal variability, the water ecosystem may be in disturbed or undisturbed situation. If their abundance is relatively high in diversity, the water quality is considered good or not polluted, and vise versa.

Mathematics as one of the basic science has provided a solution to the problems of the real world, for example in mathemacical modeling, control problems, optimization problems, the spread of the population, and many more. In this case, we proposed one of time series models (Makridarkis, 1992), i.e, Autoregressive Integrated Moving Average (ARIMA) model to asses seasonal variability macrobenthicassemblages. Settlement of these matters related to mathematical statistics and mathematical modeling. The goal is to analyze the macrobenthic assemblages using ARIMA model corresponding to seasonal variability, while theoretically benefit is the understanding of mathematical and statistical models.

2. Material and methods

The material of this research was the abundance of macrobenthos in the waters. Data sample for this study are the data obtained from Putro (2010). Plot of the time series original data macrobenthic assemblages is given in the figure bellow. Fig. 1 looks abundance macrobenthos plot of the original data, where the abundance macrobenthos with individual units/corer and index with units of one station at a time of sampling.

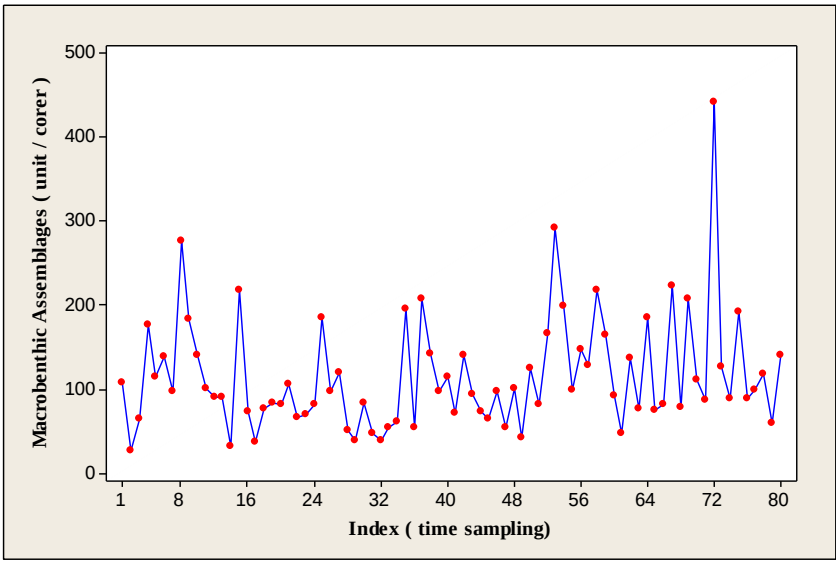

Fig. 1. Plot of original data macrobenthic assemblages