



MACROZOOBENTHOS COMMUNITY STRUCTURE IN THE ESTUARY OF DONAN RIVER, CILACAP, CENTRAL JAVA PROVINCE, INDONESIA

Taufik Fakh Hakiki, Isdradjad Setyobudiandi, Sulistiono^{*)}.

Department of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University
^{*)}E-mail:onosulistiono@gmail.com

ABSTRACT

Estuary of Donan River which is adjacent to Segara Anakan Lagoon in Cilacap, Central Java Province (Indonesia) has been used for many activities i.e. fisheries, agriculture, industry, harbor, and tourism activities. The aim of this study is to analyze ecosystem condition based on macrozoobenthos community structure. This study was conducted from August 2015 to January 2016. Samples were collected monthly at five stations from the river close area to the ocean close area. The study was conducted to identify kinds of genera and density of the macrozoobenthos, and analyze substrates and water quality. Data analysis was performed on abundance, diversity, evenness and dominance indices. Based on the study, macrozoobenthos at the estuary of Donan River consists of three classes i.e. Gastropod (16 genera), Bivalvia (9 genera), and Polychaeta (3 genera). Based on the sampling location, Gastropod and Bivalvia are the largest composition found at five stations. Macrozoobenthos density, diversity index, evenness index, and dominance index varied ranging from 30-918 ind/m², 1.47-2.53, 0.86-0.92 and 0.22-0.40, respectively. Based on the index values, it can be inferred that the estuary of Donan River is classified to be moderate ecological polluted.

Keywords: Structure community, macrozoobenthos, estuary, Donan River, Indonesia

INTRODUCTION

Estuary of Donan River is located in Cilacap, Central Java Province, Indonesia. This estuary is directly adjacent to Segara Anakan Lagoon and connected with the Indian Ocean through Nusakambangan Strait. Estuary is a transitional zone between land and ocean, and this water is affected by tide containing salt water, thereby, increasing its salinity. The water flows of the river bring fresh water, thus lowering the salinity level in the estuary (Savenije 2012); however, this will cause a fluctuation in salinity and will affect the unique community of aquatic organisms in the estuary (Rositasari and Rahayu 1994). Aquatic organism community of the estuary is mixture of the endemic organisms (permanent) inhabiting the estuary and organisms that can migrate into the estuary waters which have a wide salinity tolerance.

The objective of this study is to analyze the condition of estuary of Donan River in reference to the macrozoobenthos community structure. The significance of this research is to evaluate the ecological pressures at the estuary of Donan River based on the information of the macrozoobenthos community structure in the region. Subsequently, this study is expected to be a reference in managing the estuary.

MATERIALS AND METHODS

Time and Location

This study was conducted in estuary of Donan River, Cilacap, Central Java, Indonesia from August 2015 to January 2016 (Fig. 1).

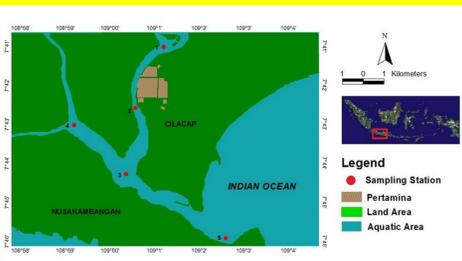


Fig. 1 Study location Map, estuary of Donan River, Cilacap, Indonesia

Materials and Equipments

The equipments utilized in this study included Ekman grab sized of 13 cm x 26 cm, a sieve with a mesh size of ± 1 mm, sample plastic bags, a magnifying glass, a microscope and an identification book.

The materials used in this study consisted of sediment substrate samples, macrozoobenthos, water samples and formaline of 10%.

Data Collection

Data collection in this study was divided into two parts i.e. the direct measurement and observation in the field (sampling macrozoobenthos, environmental conditions - transparency, depth, temperature, pH, salinity, and DO), and analysis performed in the laboratory (macrozoobenthos identification and sediment substrates analysis).

Macrozoobenthos and substrate sample collections were conducted by using Ekman grab (13 cm x 26 cm). The samples of the sediments were then filtered to obtain a sample of macrozoobenthos by using a sieve (with a mesh of ± 1 mm). The macrozoobenthos samples were inserted into a sample bottle and added by 10% of formaline. The macrozoobenthos identification was performed by observing the morphological traits directly using the microscope, and based on the Gosner's identification book (1971).

Data Analysis

The density of the identified macrozoobenthos kinds of genera was then calculated in individual units per meter square. Three indices were used to obtain the estimation of species diversity, species evenness, and species dominance (Odum 1993).

RESULTS AND DISCUSSIONS

Macrozoobenthos Compositions

Composition of macrozoobenthos species found based on sampling station in estuary of Donan River is presented in Fig. 2. Macrozoobenthos kinds found and identified consisting of three classes i.e. Gastropods, Bivalvia, and Polychaeta. In reference to Fig. 2, it can be seen that the genera of Gastropods and Bivalvia spread evenly across each sampling station. Polychaeta was found only at Stations 1, 2, 4 and 5. Moreover, genera of Gastropods and Bivalvia were most commonly found in each sampling station.

Based on the study, five genera were found in a large number i.e. *Tellina* sp, *Pyramidella* sp, *Polinices* sp, *Buccium* sp, and *Nassarius* sp. *Tellina* sp. is a genus that has the largest composition at Stations 1, 2, 3, and 5. Meanwhile, *Pyramidella* sp. has the largest composition at Station 4. The composition of macrozoobenthos in reference to the sampling time is presented in Fig. 3.

Based on the Fig. 3, it can be seen that the spreads of the macrozoobenthos genera in a number of observation period are various. Percentage of Gastropoda was higher during sampling conducted in December, while Polychaeta was higher during January. Based on this study, *Tellina* sp was also found in a large number (August, October-January).

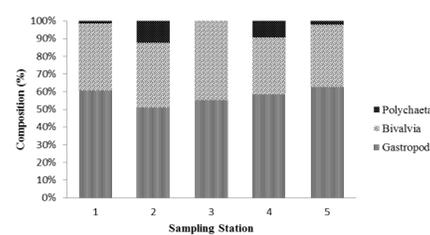


Fig. 2 Compositions of macrozoobenthos species based on sampling Station

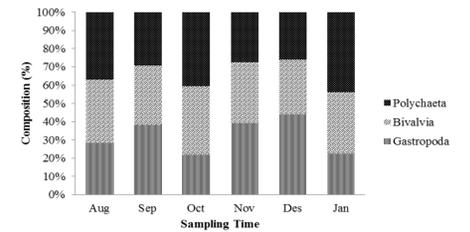


Fig. 3 Compositions of macrozoobenthos species based on sampling time

Diversity, Evenness and Dominance Indices

Based on the diversity, evenness, and dominance index graphs (Fig. 4), it can be seen that the value of the diversity index (H') at every sampling location has a value of >1 with the highest average value found at Station 1, and the smallest average value found at Station 2. Generally, the average value of diversity index ranges from 1.47 to 2.53. Evenness index values of the macrozoobenthos ranges from 0.86 to 0.92. The highest average value is at Station 1, while the smallest average value is at Station 4. Dominance index value generally ranges from 0.22 to 0.40. The highest average value is at Station 3, while the smallest average value was obtained from Station 1. It can be seen, they have a tendency to experience an ecological pressure.

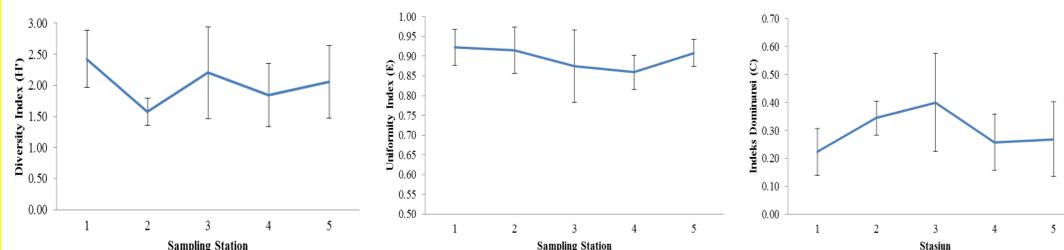


Fig. 4 Diversity, Evenness, and Dominance index graphs based on the sampling location

Substrate Types

The data of the substrate types of estuary of Donan River at each station is presented in Table 1. Sandy substrates were found at Station 3 and 4, clays were found at Station 2, sandy clay loams were found at Station 1, whereas sandy loam were found at station 5.

Table 1. Substrate Textures at each observation station

Stations	Texture (%)			Substrate Classification
	Sand	Silt	Clay	
1	52.34	18.6	29.06	Sandy clay loams
2	2.06	38.12	59.82	Clay
3	94.19	3.48	2.33	Sand
4	88.7	4.72	6.58	Sand
5	86.85	5.35	7.8	Sandy loam

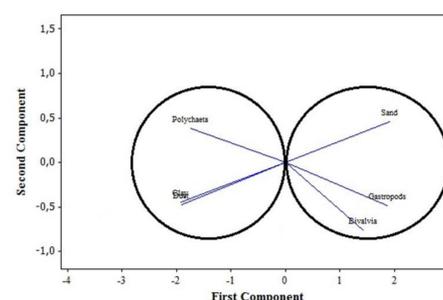


Fig. 5. Trends types of substrates of abundant macrozoobenthos (Ind / m³)

Correlation between macrozoobenthos and substrate types

Macrozoobenthos utilized in this study consisted of four classes: Gastropod, Bivalvia, and Polychaeta in reference to the substrates. The type of substrates consists of dust, clay, and sand. The principal component analysis is presented in Fig. 5. The principal component analysis between the substrates and macrozoobenthos organisms shows that Classes Gastropod and Bivalvia have a positive correlation with the type of substrate of sand. Class Polychaeta is positively correlated with the substrate types of clay and dust