Saintek Perikanan: Indonesian Journal of Fisheries Science and Technology
Available at http://ejournal.undip.ac.id/index.php/saintek
Vol.15 No.2 : 149-153, Desember 2019

MAPPING OF SEAGRASS COVER ON CHLOROPHYLL-A, NITRATES AND PHOSPHATE IN THE TELUK AWUR, JEPARA

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Diserahkan tanggal 20 November 2019, Diterima tanggal 05 Desember 2019

ABSTRACT

Teluk Awur Beach Jepara is one of the waters in Central Java that has a seagrass ecosystem. Seagrass role is the ability to support the life of another biota closely related to the fertility of the waters indicated by the content of chlorophyll-a, nitrate, and phosphate. The purpose of this study is to know the relationship between chlorophyll-a, nitrate, and phosphate to seagrass land cover as well as the variables which have major contributions. The method of study used is descriptive with four station sampling and seagrass with a line transect of 50 m, and a 1x1 m² transect Quadrant divided into 16 sub plots measuring 25 x 25 cm² a spatial approach and multiple regression statistics. The results showed that there was a positive correlation between seagrass land cover to the concentration of chlorophyll-a and nitrate but less correlated phosphate. The highest chlorophyll-a concentrations of 0.381 mg/m³, seagrass land cover 40-60%, seagrass density 314 individual/m², nitrate 1.141 mg/l and phosphate 0.54 mg/l. The lowest chlorophyll-a concentration ranges from 0.32-0.35 mg/m³, seagrass cover of 0-10%, seagrass density 3-12 individual/m², nitrate 0.96 mg/l and phosphate 0, 21mg/L. This research shows that there is a strong link between seagrass land cover Concentrations of chlorophyll-a, nitrates and less influential to phosphates.

Keywords: *chlorophyll-a; nitrate; phosphate;, seagrass bed; spatial*

INTRODUCTION

Seagrass is a coastal ecosystem that contributes to the productivity of the water and has the ability to absorb CO^2 which is known as blue carbon and the ecological role of fishery resources, another important role of the ecosystem Seagrass is supporting the life of other biota such as ground nursery and feeding ground (Tuya *et al*., 2014). Globally, there has been a decrease in the area of one of the seagrass fields in Indonesia (Knudby *et al*., 2010; Lyons *et al*., 2013). Some causes of decreased existence and the area of seagrass are natural and anthropogenic factor or combination of the two such as coastal erosion, reclamation, water enrichment due to organic waste (Howari *et al*., 2009; Yang and Yang, 2009; Barille *et al*., 2010). The existence of the types and patterns of seagrass fields are caused by some things, among others, seagrass, which is influenced by biological factors and aquatic physics and ecosystem services (Bostrom *et al*., 2006). Based on this, this research aims to find out the spatial distribution, type and cover of seagrass in the Pantai Awur Bay of Jepara, knowing the difference in the concentration of chlorophyll-a, nitrates and phosphate from the seagrass cover based on density difference from highest to lowest.

RESEARCH METHODS

The research was conducted on the coast of the Teluk Awur Jepara in October 2018. The station determination method uses purposive sampling with a number of sampling stations by four lines with 44 observation points (Fig 1) which are based on the Seagrass Watch 2003 guide and a combination of satellite imagery analysis and field survey results.

The materials used in this study are seagrass samples, water samples according to the Seagrass cover as well as the satellite image of Sentinel 2A recording August 2018 with a spatial resolution of 10 m. Satellite imagery Data obtained from Europe Satellite Agency (ESA) and Earth Explorer of the U.S. Geological Survey (USGS). Sampling and seagrass observation are carried out to obtain seagrass, and seagrass with a line transect of 50 m, and a 1x1 m transect Quadrant divided into 16 subplots measuring 25 x 25 cm (Hulopi *et al*.,2017). The measurement of seagrass refers to the Seagrass watch 2003 with a measurement point distance of 25 m so that in 50 m there are 11 observation points. Water sampling is carried out after known the seagrass density value on each line transect with a very tightly, moderate and rare category that is further filtered by the vacuum pump using *Whatman* paper.

Laboratory Analysis

Seawater samples that have been distinguished based on seagrass are further analyzed using spectrophotometers by adding acetone, nitrate kits and phosphate kits and storing them in cooling for 24 hours to the next. Readings to know the value of chlorophyll-a, nitrate and phosphate.

Data analysis

Density and percentage of cover calculated using the formula (Tuwo,2011) Equation 1

$$Kji = \frac{Ni}{A} \quad \ldots\ldots\ldots\ldots\ldots\ldots 1$$

Kji= Density type -i (ind/m^2); Ni= Total number of individuals type-I (ind); A= Total area of sampling (m^2)

Seagrass cover type is calculated using the formula (Tuwo,2011) Equation 2

$$PJ= \frac{ai}{A} \quad ....2$$

PJ= Seagrass cover type-i (% /m^2); ai= Total cover area type-i (%); A= Total area covered of seagrass (m^2)

Statistical analysis

The statistics used in this study are Principal Component Analysis (PCA), Inverse Distance Weighted (IDW) This is done to know the relationship between factors as well as the contribution of each factor to other factors as well as how spread from the values of these variables spatially, in this case, chlorophyll-a, seagrass cover, nitrate and phosphate (Abdi *et al*., 2010).

Figure1. Research Location Map

RESULTS AND DISCUSSION

There are three types of seagrass found in the waters of Teluk Awur, among others: Thalasia Hemprichi, Cymodocea serrulata, Enhalus acoroides. The density and distribution of seagrass type at the research site are presented in table 1. Based on the results of the analysis of the main components indicate that there is a positive correlation between seagrass land density to the concentration of oxygen solubility of DO phosphate and nitrate but correlated to the concentration of chlorophyll-a and depth. The highest chlorophyll-a concentration of 0.381 mg/m3.

Table 1. Seagrass density in Teluk Awur Beach

No	Species	Seagrass density (ind/m^2)			
		Line 1	line 2	line 3	line 4
1	*Thalasia hemprichi*	815	465	117	79
2	*Cymodocea serrulata*	0	63	0	0
3	*Enhalus acoroides*	0	3	5	12

Spatial seagrass distribution map, density map, chlorophyll-a map, nitrate and phosphate, comparison graph chlorophyll-A, nitrate-based & phosphate density

Distribution of phoshate in Teluk Awur beach Jepara scattered unevenly where centered on line 2 and line 3 with a concentration of 0.54 mg/l and increasingly lower when moving away from the mainland (Figure 2). Based on the results of the measurement known that the highest chlorophyll-a concentration is on the line 4 with a value of 0.38 mg/l This is due to the type of seagrass in the form of Enhalus acoroides (Lyons *et al*., 2011).(Figure 4). Seagrass cover in Teluk Awur Beach is scattered uneven between the left side of the port and the right side of the harbor where on the left of the port of seagrass, reached 60% but is derived from the types of Thalasia Hemprichi and Cymodocea *serrulata* while on the right side of the port has a low density of less than 30% which is dominated by seagrass type of Thalasia Hemprichi and Enhalus acoroides so that the closing is low because it has a large morphology (Suryanti *et al*, 2014; Sakey *et al* 2015) (Figure 5.)

Results of PCA statistics of seagrass, chlorophyll-a, nitrate, phosphate and variable water chemistry physics

Based on the PCA chart and the value of eigenvalue more than 2, the relationship seagrass cover with water quality and nutrient then selected PC1 with a value of 2.56 (28.52%) and PC2 with a value of 2.02 (22.51%) So the total value of both 51.03% is able to explain the relationship that occurred (Coremap-Lipi., 2014). Variable DO has a very close relationship to seagrass density and is close to the central axis while other variables positively related to seagrass density are nitrates, phosphate, salinity, pH and temperature together Affects the existence and density of seagrass place in a location while the variable depth and chlorophyll-a has a negative relation to PC2 indicating the value of chlorophyll-a water and depth has no strong influence on The existence and density of seagrass in a location (Mcleod *et al*., 2011).

Based on Figure 7 it appears that stations 1, 4, 5, 7 are on one quadrant describing the proximity of the station distance and its characteristics where the station representing 4 different lines has the same class of the highest density, While stations 2, 8, 9 represent moderate density and 3.6 stations represent rare stations that are on the negative quadrant of PC1 and PC2 and indeed on this station is not found seagrass only sand substrates.

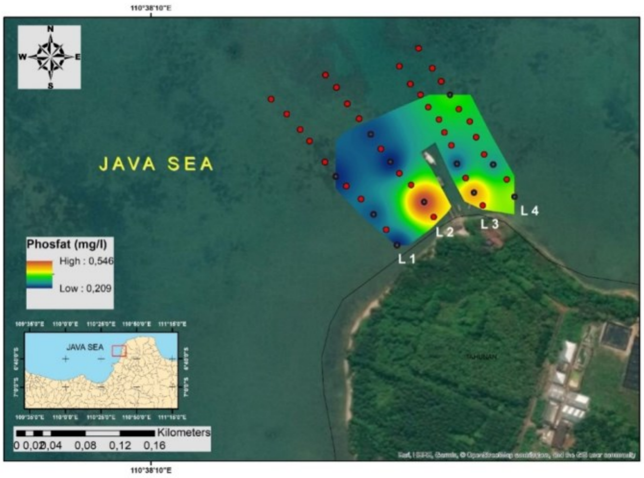


Figure 2. Map of Phosfat distribution of Teluk Awur beach

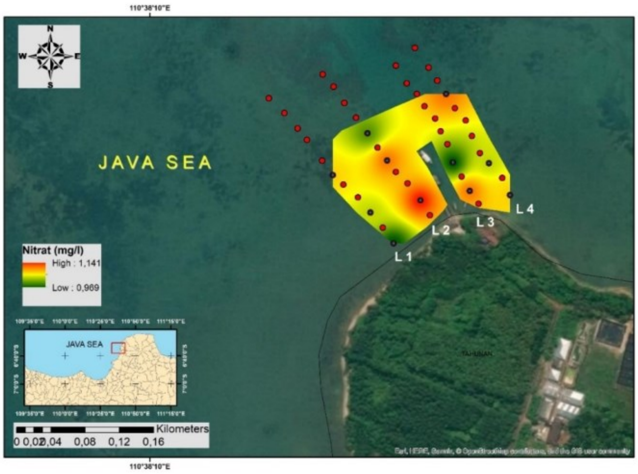


Figure 3. Map of nitrate distribution in Teluk Awur beach

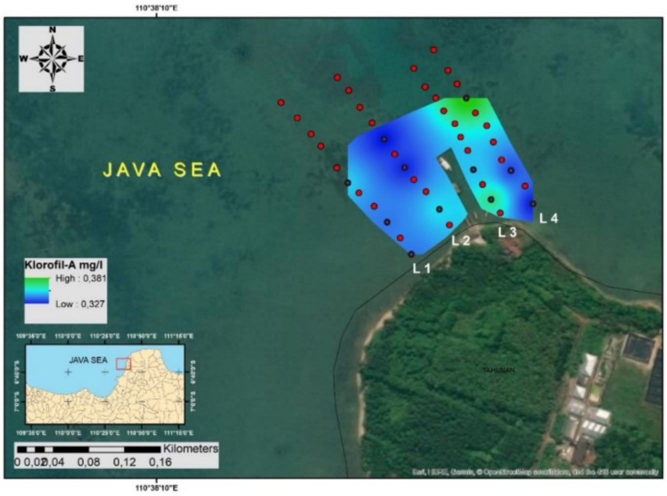


Figure 4. Map of chlorophyll-a distribution in Teluk Awur beach

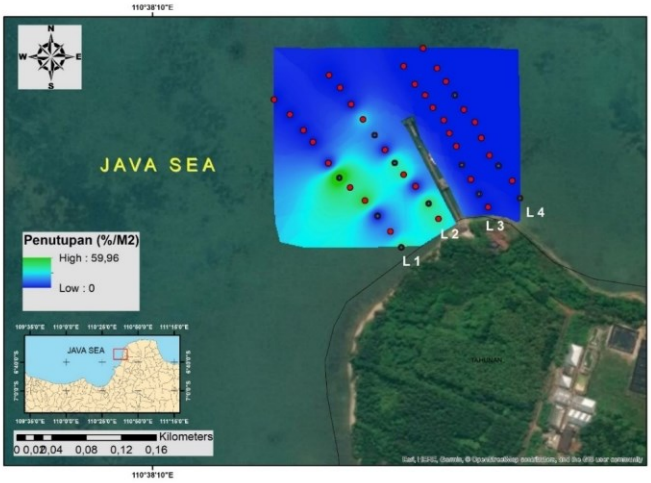


Figure 5. Map of seagrass cover distribution in Teluk Awur beach

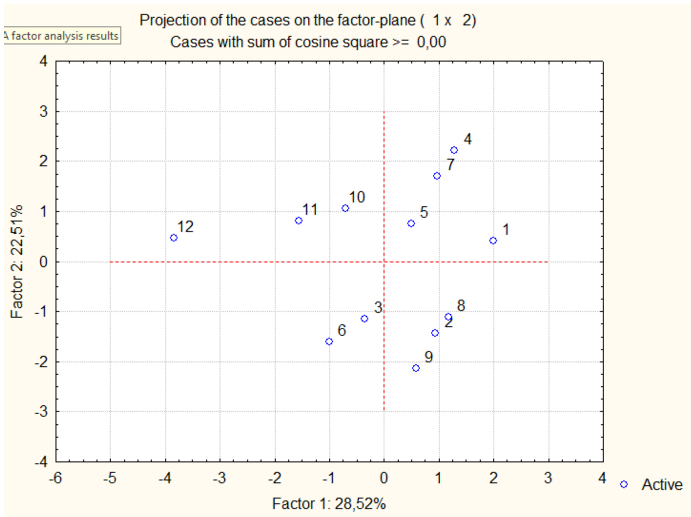
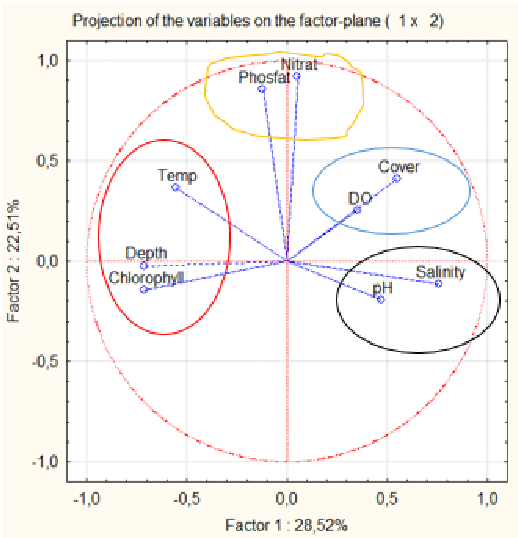
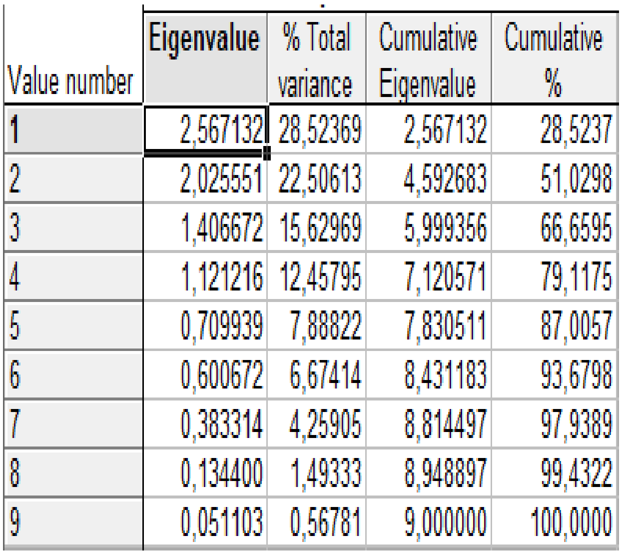


Figure. 7. Data retrieval Station distribution





Value number	Eigenvalue	% Total variance	Cumulative Eigenvalue	Cumulative %
1	2,567132	28,52369	2,567132	28,5237
2	2,025551	22,50613	4,592683	51,0298
3	1,406672	15,62969	5,999356	66,6595
4	1,121216	12,45795	7,120571	79,1175
5	0,709939	7,88822	7,830511	87,0057
6	0,600672	6,67414	8,431183	93,6798
7	0,383314	4,25905	8,814497	97,9389
8	0,134400	1,49333	8,948897	99,4322
9	0,051103	0,56781	9,000000	100,0000

Figure 6. Graphic Principal components analysis and Eigenvalue

CONCLUSION

The existence of the seagrass ecosystem is important to the coastal resources but there has been a degradation of the area and the condition of seagrass so that. The results of the principal analysis of main components indicate the variables of DO, nitrate, and phosphate become key factors of seagrass place on Teluk Awur Beach with a contribution of 51.3%. While the results of spatial analysis are known that the spread of seagrass scattered unevenly with the highest density inline 1.

ACKNOWLEDGMENTS

The author thank Diponegoro University through a research grant with skim RPP No. 474-20/UN7. P 4.3/PP/2019. Thanks also to the laboratory PSDIL FPIK UNDIP, UNDIP Livestock Nutrition Laboratory and UNNES Chemical Laboratory which has been helpful in data analysis.

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