



## MACROALGAL ABUNDANCE IN INTERTIDAL ZONE OF SARANGAN BEACH, GUNUNGKIDUL, DIY

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### ABSTRACT

Sarangan beach has high biodiversity of macroalgae. Macroalgae has an important role as primary producer for herbivorous marine animals, potentially as biomonitoring, and pollutant bioremediation. As benthic organisms, macroalgae grows attached rocky or reef substrate in intertidal zone. These research aimed to study the macroalgal abundance in Sarangan Beach and influence factors of it. This study is important for local government as a reference to manage and develop the coastal areas of Gunungkidul. Sampling was conducted in 2012-2013 start from determination of the sampling point with line transect then collect data using quadrat plots 100 x 100 cm<sup>2</sup> size, seawater nutrient analysis, species identification, and data calculation. The results showed that there were 14 species of Chlorophyta, 4 species of Phaeophyta, and 17 species of Rhodophyta. *Enteromorpha intestinalis* has a highest abundance, then *Ulva fasciata*, and *Cladophora catenata*. Analysis of correlation and regression showed that nutrient levels doesn't affect the macroalgal abundance in Sarangan Beach. Based on result, the limiting factor of macroalgal abundance in Sarangan Beach is substrate.

Key words: Abundance, Macroalgae, Sarangan Beach, Substrate

### INTRODUCTION

Macroalgae or seaweeds are an ecologically and economically important component of marine ecosystems worldwide. They are primary producers, shelter, nursery grounds and food sources for marine organisms. In addition, they are used around the world as foods and fertilizer, and for the extraction of valuable commercial product. Moreover, due to their habitats and biology, macroalgae are relatively easy to observe, manipulate and measure (Prathep, 2005). These organisms belong to three different divisions: Rhodophyta (red algae), Phaeophyta (brown algae) and Chlorophyta (green algae). Most of the macroalgae are growing in the intertidal zone throughout the world (Wong *et al.*, 2011).

The distribution and abundance of macroalgae communities in particular intertidal rocky shores are affected by various abiotic variables such as tidal regimes, wave action, nutrient levels, substrate stability, desiccation, and sedimentation. These factors can also affect algal distribution indirectly, by influencing the outcome of competitive and grazing interactions (Prathep, 2005; Wong *et al.*, 2011). In the intertidal zone at low tide, a continuous and heterogenous mosaic of environments (platforms, blocks, small pools, small ridges, crevices, overhangs) are colonized by the most competitive assemblages of species of flora and fauna in response to a combination various factors of physical (substrates), chemical (nutrients) and biological factors (competence) (Juanes *et al.*, 2008).

Rocky substrates are very abundant on many coastal areas all along the coast of Gunungkidul including Sarangan Beach. This condition making possible the development of a great variety of benthic communities that are dominated, in most case by different species

of macroalgae. The livelihood of macroalgae in this site received less attention and thus the information concerning the diversity of these communities is still limited. These research aimed to study the macroalgal abundance in Sarangan Beach and influence factors of it. The results is important for local government as a reference to manage and develop the coastal areas of Gunungkidul needed for the ecological assessment of sustainability of these habitats.

## MATERIALS AND METHODS

The study site was at the intertidal zone of Sarangan Beach, Gunungkidul, DIY, Indonesia (Figure 1.). Sampling was conducted in 2012-2013 start from determination of the sampling point with line transects then collect data using quadrat plots 100 x 100 cm<sup>2</sup> size. In this work, the macroalgae populations were inventoried and quantified in 21 transects based on stratified random sampling method (Abraham, 2009). The study was carried out during low tide when macroalgae were exposed. Macroalgae were collected and taken to the laboratory for identification to species various taxonomical keys. Percentage cover of macroalgae were estimates visually. Nutrients in water were analyzed in the laboratory and were also data calculated.

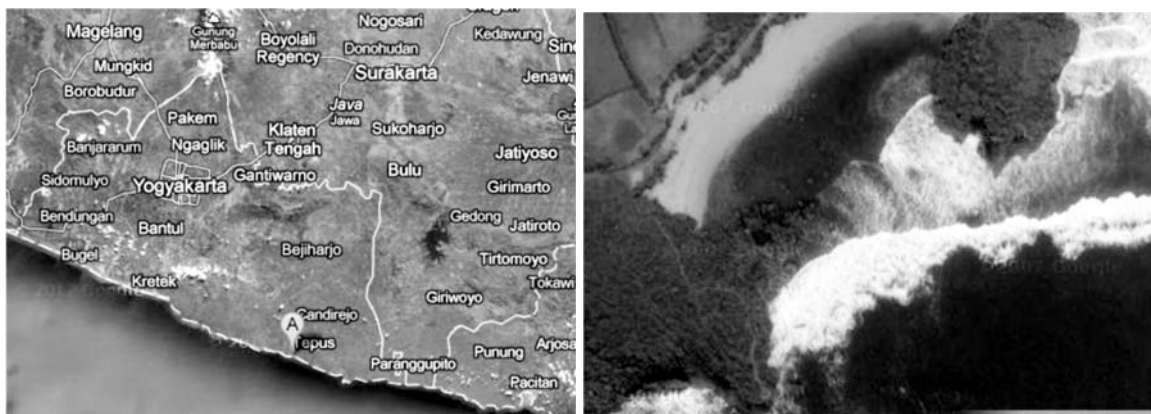


Figure 1. The study site, intertidal zone of Sarangan beach, Gunungkidul

## RESULTS AND DISCUSSION

A total of 35 species of macroalgae there were 14 species of Chlorophyta, 4 species of Phaeophyta and 17 species of Rhodophyta. Rhodophyta showed the highest species diversity at site as they possess multi-cellular rhizoidal holdfasts that serve to attach the thalli to hard substrates. The majority of the macroalga species in the world are red algae (Rhodophyta) with more than 4000 described species (Lee, 1999). Otherwise, Phaeophyta showed the lowest species diversity because the majority are in temperate regions and only a few species are found in tropical regions (Lee, 1999).

Macroalgae dominated by filamentous macroalgal communities like *Enteromorpha* and *Ulva* which is species of Chlorophyta. This is indicated by the results that *E. intestinalis* was the most abundance species (0,30 ind/m<sup>2</sup>), then *U. fasciata* (0,28 ind/m<sup>2</sup>), and *C. catenata* (0,22 ind/m<sup>2</sup>). The filamentous forms of macroalgae are generally stress-tolerant species, able to live on saltwater or freshwater (Wong *et al.*, 2011) and high reproductive capability

(Heo *et al.*, 2011). Species such as *Halimeda* sp. and *Ceramium flaccidum* exhibited the lowest density (0,0001 ind/m<sup>2</sup>) indicate that the species was quite rate.

Table 1. Abundance of macroalgae in intertidal zone of Sarangan Beach, Gunungkidul

No.	No.	Species	Percentage cover (%)				Average	Density (indv/m <sup>2</sup> )	Density relative (%)
			I	II	III	IV			
<b>RHODOPHYTA</b>									
1	1	<i>Ceramium rubrum</i>	79	23,5	154	49	305,5	0,1455	7,93
2	2	<i>Amphiroa rigida</i>	3	2,5	102,5	113,25	221,25	0,1054	5,74
3	3	<i>Amphiroa anceps</i>	122,25	59,25	6	0	187,5	0,0893	4,87
4	4	<i>Gelidiella acerosa</i>	73	68,65	32,35	9,6	183,6	0,0874	4,77
5	5	<i>Hypnea pannosa</i>	121,5	55,6	5,6	0,45	183,15	0,0872	4,75
6	6	<i>Acanthophora spicifera</i>	0	77	66,35	16	159,35	0,0759	4,14
7	7	<i>Laurencia majuscula</i>	0	47,5	33	23	103,5	0,0493	2,69
8	8	<i>Ahnfeltia fastigiata</i>	43,75	1,1	12,1	30,25	87,2	0,0415	2,26
9	9	<i>Laurencia papillosa</i>	15	2,2	33	0	50,2	0,0239	1,30
10	10	<i>Rhodomenia palmata</i>	14,5	5,7	0,5	0	20,7	0,0099	0,54
11	11	<i>Gracilaria salicornia</i>	0	0,5	0	17	17,5	0,0083	0,45
12	12	<i>Hennedya crispa</i>	0	5,95	10	0	15,95	0,0076	0,41
13	13	<i>Gracilaria canaliculata</i>	3	2,2	10,6	0	15,8	0,0075	0,41
14	14	<i>Gelidium pristoides</i>	2	0	0	0	2	0,0010	0,05
15	15	<i>Laurencia brongniartii</i>	0,5	0	0	0	0,5	0,0002	0,01
16	16	<i>Struvea enomotoi</i>	0	0,5	0	0	0,5	0,0002	0,01
17	17	<i>Ceramium flaccidum</i>	0	0,25	0	0	0,25	0,0001	0,01
<b>PHAEOPHYTA</b>									
18	1	<i>Sargassum crassifolium</i>	120,25	45,25	11	10,6	187,1	0,0891	4,86
19	2	<i>Turbinaria ornata</i>	61	44	5,75	3,5	114,25	0,0544	2,97
20	3	<i>Padina australis</i>	0	7,8	5,65	0,45	13,9	0,0066	0,36
21	4	<i>Hydroclathrus clathratus</i>	1	0	0	0	1	0,0005	0,03
<b>CHLOROPHYTA</b>									
22	1	<i>Enteromorpha intestinalis</i>	152,5	335,1	142,2	6	635,8	0,3028	16,50
23	2	<i>Ulva fasciata</i>	304,5	285,1	8,65	0	598,25	0,2849	15,53
24	3	<i>Cladophora catenata</i>	53,5	80	90	247	470,5	0,2240	12,21
25	4	<i>Bryopsis pennata</i>	0	97	0	0,5	97,5	0,0464	2,53
26	5	<i>Chaetomorpha crassa</i>	0,5	24,6	19,1	45,9	90,1	0,0429	2,34
27	6	<i>Valonia aegagropila</i>	8	0	0	20	28	0,0133	0,73
28	7	<i>Cladophora fascicularis</i>	0	0,5	15,1	0	15,6	0,0074	0,40
29	8	<i>Dictyosphaeria cavernosa</i>	0	6,75	5	1	12,75	0,0061	0,33
30	9	<i>Caulerpa racemosa</i>	8	2	0,25	0	10,25	0,0049	0,27
31	10	<i>Lomentaria clavellosa</i>	0	0	8	1,6	9,6	0,0046	0,25
32	11	<i>Bornetella nitida</i>	4	0	3,1	0	7,1	0,0034	0,18
33	12	<i>Codium prostratum</i>	3,5	0	0	0	3,5	0,0017	0,09
34	13	<i>Boergesenia forbesii</i>	0	0	3	0	3	0,0014	0,08
35	14	<i>Halimeda</i> sp.	0	0	0	0,25	0,25	0,0001	0,01
TOTAL								1,8347	100

Nutrients measured in this study is nitrate, phosphate, and calcium. Based on analysis of correlation and regression showed that nutrient levels doesn't affect the macroalgal abundance in Sarangan Beach. This happens because many organisms of nitrogen fixation present in macroalgae community gathering area (Romimohtarto and Juwana, 2005), so that nitrogen is not a limiting factor abundance of macroalgae in this site. As well as phosphate, the breakdown of organic phosphate by bacteria from decaying tissue is relatively simple and common, so the supply of phosphorus in the intertidal zone Sarangan Beach to be absorbed by macroalgae is always there and not limited (Romimohtarto and Juwana, 2005).

This results suggest that in the intertidal zone of Sarangan Beach, abundance of macroalgae are influenced by the substrates and exposure condition. As macrobenthos, substrates are important components that play role in the growth and presence of macroalgae. In addition, this case suggest that macroalgae are influenced by present day water quality conditions and their competition for space.

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