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The Parameters Analysis of Physics, Chemistry and Biology in Selayar Marine For Feasibility Seaweed Cultivation *Euchema cottonii*

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Abstract

The research was analyzed parameter of physics, chemistry, and biology for seaweed (*Euchema cottonii*) cultivation feasibility in Selayar marine, South Sulawesi, Indonesia. It used as information science about the appropriateness of marine area using to feasible seaweed. The research was done on July to September 2015. The variable observed were phsics; Depth (m), Speed Flow (m), temperature (oC), Salinity (ppt), Brightness (m) observed every week, Chemical parameters; (water pH and dissolved oxygen) and Biology parameter (Diversity, uniformity and dominance of index plankton). The results obtained by the current speed (20-26 m / sec), wave (0.22 to 0.28 m), temperature (25-28 ° C), the degree of acidity (8.0 to 8.4) and depth (4, 0 to 8.4 m) each are very suitable for development of seaweed cultivation Euchema cottonii and salinity (32-36 ppt), brightness (3 - 4m) and DO (4,2 - 6,6). Diversity tiny phytoplankton and zooplankton communities, while stability is low. Value uniformity of phytoplankton and zooplankton in the waters of a screen is low. Dominance index value of phytoplankton and zooplankton in the waters of a screen at all stations showed low values (good) meaning not happen dominance of certain species in these waters. Bottom waters to the location near the beach (station III) did not meet the requirements for seaweed cultivation. While each different sampling sites predatory animals are obtained.

Keywords: parameters of physics, chemistry and biology, *Euchema cottonii* seaweed.

INTRODUCTION

The coastal area is a region which very productive when viewed from a wide variety of its designation by the resources (Dahuri 2001). The development activities are carried out in coastal areas, among others; residential, industrial, oil refining, recreation and tourism, aquaculture and fisheries and coastal resources and small islands covering biological resources, non-biological resources, artificial resources, and environmental services; biological resources consist of a variety of fish, coral reefs, seagrass beds, mangroves and other marine biota (Bengen 2005).

Seaweed cultivation in Selayar regency has a higher potential to develop than other marine in South Sulawesi. It needs to consider feasibility waters for seaweed cultivation, because during this time the farmers had not yet shown the feasibility of water for the cultivation of seaweed, so the production is not maximized.

Cottoni Euchema seaweed is seaweed that has been developed in the Selayar marine because the type of seaweed Euchema cottoni much needed and has its own advantages. Macro algae seaweed as a low level, absorb nutrients from the surrounding waters through tallus to live and grow well. Therefore, land for cultivation of seaweed waters should contain a source of food, both macro and micro nutrients such as nitrogen and phosphorus of N and P in waters will affect the growth and content of that seaweed (Anonymous, 2007).

Based on the the some issues which have explain befor, it is necessary to do research on the analysis of parameters of physico-chemical and biological in Coastal Waters of Selayar for seaweed cultivation suitability Euchema cottoni.

RESEARCH METHOD

Research was conducted from July to September 2015 in the Selayar Islands Regency, South Sulawesi Province, Indonesia. Sampling areas was on the location of seaweed cultivation (station I), excluding the farming location (station II) and areas near the coast (Station III), by measuring the parameters of physics, chemistry and biology, among others: the depth, tides, waves, currents, brightness, salinity, temperature, DO, acidity (pH), Diversity, uniformity and dominance index of plankton.

Land suitability analysis Selayar coastal waters devoted to the allotment of land suitability for cultivation of seaweed *Euchema cottoni* through the analysis of physical and chemical environmental conditions. Parameter marine environment is a limiting factor and be the primary consideration in determining the level of suitability of land for cultivation of seaweed. as shown in Table 1 below.

Table 1. Matrix of suitability land for cultivation of seaweed.

Parameters	Suitable Criteria			Resources
	Unsuitable	Suitable	Strongly Suitable	
Speed flow (cm/Sc)	< 10 or > 40	10-20 or 30-40	20-30	Sulistijo (1996)
Salinity (ppt)	< 28 or > 37	34-37	28-34	Aslan (1998)
Wave (cm)	0,10 - >0.40	0.10 - < 0.20; >0.30 - ≤ 0.40	0.20-0.30	Sulistijo (1996)
Temperature (^{0}C)	< 20 or > 30	20 – 24	24 – 28	Atmadja (1988)
Clarity (m)	< 3	3 -5	> 5	Sulistijo (1996)
pH	< 6,5 or > 8,5	6,5 - < 7,5	7,5 – 8,5	Aslan (1998)
Depth (m)	< 2 or > 15	1 – 2	2 – 15	Dinjenkan (2004)
Do (mg/L)	< 4 or > 7	6,1 – 7	4 – 6	Dinjenkan (2004)

Quantitative analyzes of plankton biology index calculation includes diversity, uniformity and dominance using Shannon-Wiener analysis (Odum, 1971 in Exterminate, 2000).

RESULT

Speed Flow

Measurement of speed flow in observation area showed the table below:

Table 2. Measurement of speed flow in observation stations.

Stations	Speed flow (cm/Sc)	Determination of Compliance
I	23-24	Suitable
II	24-26	Suitable
III	20-23	Suitable

Salinity

Measurement of salinity in the region of Coastal Waters in Selayar during the study showed in the following table:

Tabel 3. Measurement of salinity in every stations.

Stations	Salinity (ppt)	Determination of Compliance
I	32 – 35	Suitable
II	33 – 36	Suitable
III	32 – 35	Suitable

Dissolved oxygen

Measurement of Dissolved oxygen in the region of Coastal Waters in Selayar during the study showed in the following table:

Table 4. Measuremnt of Dissolved oxygen during observation.

Stations	Dissolved oxygen (mg/L)	Determination of Compliance
I	6,1 – 6,6	Suitable
II	6,4 – 6,6	Suitable
III	4,2 – 5,3	Suitable

Potential Hydrogen (pH)

Measurement of potential Hydrogen (pH) in the region of Coastal Waters in Selayar during the study showed in the following table:

Table 5. Measuremnt of water pH during observation.

Stations	potential Hydrogen (pH)	Determination of Compliance
I	8,1 – 8,4	Suitable
II	8,1 – 8,2	Suitable
III	8,0 – 8,1	Suitable

Temperature

The temperature measurements in the region of Coastal Waters in Selayar during the study showed in the following table:

Table 6. The temperature measuremnts during observation.

Stations	Temperature (^oC)	Determination of Compliance
I	26 - 28	Suitable
II	25 - 28	Suitable
III	27 - 28	Suitable

Depth

Measurement of depth in the region of Coastal Waters in Selayar during the study showed in the following table:

Table 7. Measurement of depth in every stations during observation.

Stations	Depth (m)	Determination of Compliance
I	6,0 – 6,6	Suitable
II	8,0 – 8,4	Suitable
III	4,0 – 5,0	Suitable

Brightness

Measurement of brightness in the region of Coastal Waters in Selayar during the study showed in the following table::

Table 8. Measurement of brightness in every statiosn during observation.

Stations	Brightness (%)	Determination of Compliance
I	40 – 60	Suitable
II	40 – 60	Suitable
III	30 – 50	Suitable

Wave

Measurement of wave pada in the region of Coastal Waters in Selayar during the study showed in the following table:

Table 9. Measurement of wave in every statiosn during observation.

Stations	Wave (m)	Determination of Compliance
I	0,23 – 0,25	Suitable
II	0,26 – 0,27	Suitable
III	0,21 – 0,23	Suitable

Diversity, uniformity and dominance index of plankton

Measurement of diversity, uniformity and dominance index plankton phytoplankton in the region of Coastal Waters in Selayar during the study showed in the following table:

Table 10. Number of individuals, diversity index, uniformity and dominance of phytoplankton in the Selayar marine.

Species (ind/L)	Stations		
	I	II	III
Chlorella sp	90	80	45
Tetraselmis sp	70	65	-
Nitschia longissima	-	-	60
Chaetoceros calcitran	50	90	75
Dunaliella salina	-	30	-
Skeletonema costatum	95	42	74
Amphora sp	-	-	20
Oscillatoria sp	-	-	40
Navicula sp	40	50	-
Number of individuals	345	357	314
Diversity	0,0127	0,0116	0,0128
Uniformity	0,00253	0,00194	0,00214
Dominations	0,3820	0,6663	0,5062

Zooplankton

Measurement of diversity, uniformity and dominance index zooplankton in the region of Coastal Waters in Selayar during the study showed in the following table:

Tabel 11. Number of individuals, diversity index, uniformity and dominance of zooplankton in Selayar marine.

Spicies (ind/L)	Stations		
	I	II	III
Copipoda	10	85	25
Branchionus sp	20	-	20
Moina sp	9	6	-
Nematoda	-	15	-
Number of individuals	39	106	45
Keanekaragaman	0,0675	0,0382	0,0693
Diversity	0,02251	0,01273	0,03466
Dominations	0,3820	0,6663	0,5062

DISCUSSION

The speed flow measured in Selayar marine showing every stations 20-26 m/second. It indicated based on the results of measurements of speed flow and refers to the determination of the suitability of land for cultivation of seaweed; this was means that every station was very suitable for the cultivation of seaweed. The dynamics of the current speed was different according to the location of the sampling point. The data analysis showed also gathering further location to the sea, the speed flow was higher and otherwise gathering further location to the beach, the speed flow reduce. It caused mileage currents to the coast and submerged by the expanse of seaweed farming (Aslan, 1999).

Sanitations measurements showed the score 32 -36 ppt. It indicated the score appropriate of land for cultivation of seaweed. The lowest salinity was on the beach and location of seaweed. The conclusion resumed gathering further to the sea, sanitation is higher even it has relative small differentiation.

Dissolved oxygen is one of important factor for organisms grow in respiration process. Dissolved oxygen in water is generally of the diffusion of oxygen, current or flow of water through rainwater and photosynthesis. Each station dissolved oxygen content measured during the study range of 4,2-6,6 mg/l, it concluded every stations very appropriate for cultivation of seaweed (Dinjenkan, 2004).

PH measurement resulted on Selayar marine ranged from 8.0 to 8.4. This range is very suitable for the cultivation of seaweed (Sulistijo, 1996). According to Ariana (2006), seaweed can grow in a pH range from 7.1 to 8.5. At the beach area was relatively lower pH than the other sites. This is because generally the beach area has a lower pH due to decomposition of organic materials which normally accumulate on the seafloor.

The results of temperature measurements in Selayar coastal ranged between 25-28. The results of these measurements and refers to the determination of the suitability of land for cultivation of seaweed indicated that this location is very suitable for the cultivation of seaweed (Atmaja, 1998).

The difference temperature between the sampling point did not differ greatly, only about 1-2 ° C. The highest temperatures were found in the area around the beach. The temperatures were not directly related to depth. The more shallow waters tend to be faster then the temperature changes cause the heat source equal magnitude, shallow waters that have a smaller volume of water will heat faster. This phenomenon also occurs in the waters of a screen where the waters near shore shallow depth has a temperature higher than the deeper waters. Nontji (1987), mentions that the water temperature in the archipelago waters ranging between 28-38 ° C and the temperature near the coast is higher than the temperature on the high seas. Further Yulianda et al, (2006) for the seaweed species Euchema cotonii seawater temperature range ranging between 27-30 ° C, while Kadi and Atmadja (1988), that seaweed, especially *K.alvarezii* grow well at temperatures 27-30 ° C.

The measurement resulted depth each sampling location different, located farther towards the sea gets deeper and conversely the more shallow near the shore. According Indriani and Sumarsih (1999), the depth of the seaweed growth is 0.3 to 0.6 meters. Each seaweed cultivation methods require different depth requirements. Off-bottom method requires a depth of 0.3-0.6 m, raft method 0.6-2 m and 2-10 m long line method (Research Center for Oceanography, LIPI 2002).

Condition of research area was high brightness which ranged between 70-80%. The brightness level waters was farther seaward higher. At the sampling point there was turbidity, especially in areas closer to the coast, it can be seen in most low brightness condition just 3 meters. The locations of seaweed cultivation was 4 meters, and off-site cultivation of seaweed brightness 5 meters. This was because it influenced unspoiled condition and the condition of coral still good.

The wave heights obtained from measurements ranged from 0:22 am - 0:28 am. This range is suitable for seaweed cultivation. This is in accordance with Sulistijo (1996), that the wave height that is suitable for cultivation of seaweed is 0:20 to 0:30 am is very appropriate; 0:10 m <0:20 am; > 0:30 am-≤0.40 m appropriate and not appropriate is 0.10 m-> 0:40 am

Based on the results of phytoplankton diversity index calculations showed that the total diversity index obtained at the station I was 0.0127, 0.0116 station II and station III 0.0128. It showed the diversity index was smaller than 2.3026, thus a screen infertile waters. As said by Wilhm and Dorris (1968 in Dianthani 2003), that H '<2.3026: little diversity and community stability was low. The low index of diversity on this station, allegedly because the station does not contains lime and minerals. According Schlan (1979), water containing a lot of lime will grow diatom plankton species.

Phytoplankton diversity index of each station was not much different result. This is because the distance between stations are relatively close together so that with the mixing of water masses by the influence of tidal currents allows phytoplankton that are floated and less strong against the flow tends to be more homogeneous. Population changes related to factors changing environmental conditions and predation factors that control the abundance of the population. Thus, the abundance distribution of the population will experience a significant change based on the observation station.

The value uniformity of phytoplankton in Selayar was relatively low but the overall density or the presence of biota including evenly so there was no dominance of species that can support the efforts of productive and sustainable fisheries. This was confirmed Pirzan et al. (2005) which stated that if the uniformity near zero mean uniformity among species in the community is low and vice versa uniformity approaching one can say uniformity between species classified as evenly or equally. Further Wilhm and Dorris (1968 in Dianthani 2003) when the value of approximately 1 individual distribution between genders equally. E value closed to 0 if the individual distribution between types of uneven or there are certain types that dominant.

Dominance index value of phytoplankton in Selayar coastal at all stations showed low values (good). It was meaning not happen dominance of certain species in these waters. If dominance value approached value of 1, it means that in the community there are species that dominated other species, otherwise if approaching a value of 0 means within the community structure there are species that are extremely dominating other species (Exterminate, 2000). The main factors was affect the number of organisms, species diversity and dominance among others, the destruction of natural habitats such as the conversion of mangrove land into ponds or other designation, pollution and organic chemistry, as well as climate change (Widodo, 1997). To maintain the non-occurrence of certain species dominanced in Selayar marine, in addition to conserve coral reefs and seagrass beds, it should also be taken the conservation and rehabilitation of mangrove forest ecosystems.

Results zooplankton diversity index calculations showed that the value earned by each station was very low because it was smaller than H '<2.3026 means diversity index of small and community stability was low. The low index zooplankton diversity, allegedly because the station is far away from residential areas and away from the area of aquaculture. In addition to low zooplankton diversity index, allegedly because of the low influence phytoplankton diversity index each station, so zooplankton is not much that can grow in waters of a screen. This is in accordance with Kovalak (1979 Madinawati, 2010), the prevalence of species abundance that most affect the calculation of the index of diversity.

Uniformity index values showed that zooplankton uneven uniformity. According Wilhm and Dorris (1968 in Dianthani 2003), that the E value close to 0 if the individual distribution between types of uneven or there are certain types that dominant. This uniformity of the results showed that the index was proportional to the uniformity of phytoplankton, which were the lower the uniformity index of smaller phytoplankton phytoplankton uniformity index. The spread of the individual uneven at each station caused by low light intensity and lack of availability of sufficient nutrients. In addition, it is also influenced by winds that cause the buildup somewhere.

The dominance index value of zooplankton in Selayar marine in station I were 0.3820, 0.6663 station II and station III 0.5062. Based on these results indicated that the station I and II did not happen dominance of certain species in these riwaters. While on satasiun III dominanced value close to the value 1. This value indicated that there was a type of zooplankton that dominate. Dominance Index was an index that showed the species that dominated a komonitas zooplankton. Spseies dominant in a community showed the power of the species compared with other species (Odum, 1971), thus there were the types of zooplankton that control the water and would lead to important changes not only in the biotic community itself, but also the physical environment.

CONCLUSSION AND SUGGESTION

Conclussion

1. The speed flow was (20 - 26 m/dtk), wave was (0,22 - 0,28 m), temperature was (25 - 28 ºC), pH was (8,0-8,4) and depth was (4,0-8,4 m) each - one is very suitable for the development of seaweed cultivation and salinity (32-36 ppt), brightness (3 - 4m) and DO (4,2 - 6,6) each - each suitable to the development of seaweed cultivation.
2. The diversity of phytoplankton and zooplankton diversity and community stability is low.
3. The value of the uniformity of phytoplankton and zooplankton in Selayar marine is low.
4. The dominance index of phytoplankton and zooplankton in Selayar marine at all stations showed low values (good), it was meaning not happen dominance of certain species in these waters.
5. Basic water to a location near the beach (station III) does not meet the requirements for seaweed cultivation. While each different sampling sites predatory animals are obtained.

Suggestion

It need to do research on the appropriate methods of cultivation in Selayar marine for increasing the production of *Euchema cottonii* seaweed.

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