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WATER QUALITY OF SEAWEED CULTIVATION (*Eucheuma cottonii*) LOCATION IN OLD TAKALAR, MAPPAKASUNGGU DISTRICT, TAKALAR REGENCY

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ABSTRACT

This study was aimed to determine the water quality and seaweed growth and the relationship between oceanographic parameters and the growth of seaweed *Eucheuma cottonii*. This research was carried out from June-July 2021 at a seaweed cultivation location in Old Takalar, Mappakasunggu District, Takalar Regency. The seaweed cultivation method used is the longline method placed at three cultivation sites. Oceanographic parameters of physicochemical waters measured were temperature, salinity, pH, brightness, depth, current velocity, tides, nitrate, phosphate and dissolved oxygen. For the measurement of the growth of *E. cottonii* seaweed, the absolute growth was measured using One Way Anova analysis to determine differences in seaweed growth at each station of E. cottonii cultivation location. The correlation between oceanographic parameters and the growth of *E. cottonii* seaweed was analyzed using a correlation test. The results showed that the water quality at the cultivation site was within a reasonable range for seaweed cultivation in Old Takalar. The results of One Way Anova showed that there were significant differences in seaweed growth at each station where *E. cottonii* was cultivated. The results of the correlation test showed that the oceanographic parameters of the waters were very strongly correlated with the growth of *E. cottonii* seaweed, namely temperature, brightness, and depth.

Keywords: *E. cottonii*, Oceanographic parameters and seaweed growth

INTRODUCTION

Seaweed cultivation is a marine cultivation activity as an alternative to environmentally friendly and productive activities for communities in coastal areas. Seaweed cultivation has several advantages requiring only simple technology, it can produce products that have high economic value with low production costs, so it has the potential to empower coastal communities (Susilowati., et al, 2012).

One species of seaweed that has high economic value as an export commodity and also for domestic consumption is *Eucheuma cottonii* which is widely used for cultivation activities in various Asia Pacific countries including Indonesia. *Euchema* produces carrageenan that widely used in the food industry, cosmetics, medicine, textiles, paints and as a base material for aromatic diffusers (Marseno., et al, 2010).

E. cottonii seaweed cultivation has been practised in a number of locations, but not all locations have suitable waters as cultivation locations. One of the key to the success of a seaweed cultivation business is the selection of the right seaweed cultivation location. This is because the production and quality of seaweed are influenced by oceanographic factors. The oceanographic factor of the waters will determine the sustainability of seaweed cultivation activities. If the cultivation activity exceeds the carrying capacity of the area, there will be a degradation of water quality. This condition in the end is no longer able to meet the needs of seaweed to grow. In addition, if an error occurs in the selection of seaweed cultivation locations, seaweed production will decrease (Burdames and Ngagi, 2014).

Determining the location of seaweed cultivation experiences many obstacles. Production failure is thought to be caused by the low nutrient content in the waters. These plants live by absorbing nutrients from the waters and carrying out photosynthesis, so they require physical and chemical factors in the water such as currents, temperature, salt content (salinity), nitrates, and phosphates as well as sunlight. Nutrients needed by seaweed can be directly obtained from sea water through the movement of water currents. The water movement plays a role in maintaining the circulation of nutrients that are useful for growth (Agustina, et al, 2017).

Mappakasunggu District is part of the Takalar Regency area is a coastal area with an area of about 45.27 Km2. The capital city of Mappakasunggu District is located in Takalar Village. Takalar Village, precisely in the Old Takalar neighborhood, has a pier as a port. In addition, there is also a river estuary that is connected to sea waters so that most of the people are engaged in fisheries (Central Bureau of Statistics of Takalar Regency, 2018). This geographical advantage makes Takalar the best alternative for investment. This is able to support the management of potential in the marine sector, especially seaweed cultivation in the Old Takalar environment which since 2000 has been the livelihood of the local population. However, the results of seaweed cultivation produced have differences at each cultivation location.

Based on this description, in order to improve the quality of seaweed cultivation in takalar regency, especially in the old takalar environment. This research was conducted to examine water quality and seaweed growth and the relationship between oceanographic parameters and the growth of cultivated seaweed in terms of cultivation location.

MATERIALS AND METHODS

This research was conducted in June-July 2021 at Old Takalar, Mappakasunggu District, Takalar Regency (Figure 1). Parameter analysis of nitrate, phosphate, pH and salinity was carried out at the Chemical Oceanography Laboratory of the Department of Marine Science, Faculty of Marine Sciences and Fisheries, Hasanuddin University.

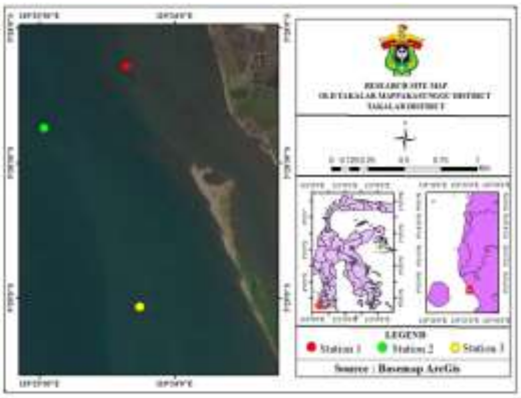

Figure 1. Research Site Map

The equipments used in this research were drift float to measure the velocity of currents, Pole scale/ measuring tub to measure tides, Digital refractometer to measure salinity, 300 ml oxygen bottle as a container of water samples measured in the laboratory, Scale thermometer to measure temperature , Secchi disk as a brightness measurement tool, Stopwatch to measure time, DREL 2800 Spectrophotometer to measure nitrate and phosphate, Measuring Glass as a container for mixed solutions, Dropper drops to take the solution, Test tube to accommodate the solution, Erlenmeyer to mix the solution, Stationery to record all observations, Cameras for documentation of research activities, Cool boxes for storing tools, materials, and seawater samples to be analyzed in the Laboratory, Boats for transportation, Meters for measuring rope lengths, pH Meters for measuring pH, Scales for weighing samples seaweed and Pumpkin Spray to accommodate the aquades.

The materials used in this research were seawater as the material to be measured in the laboratory, $MnSO_4$, H_2SO_4, Alkali-iodide, Na-thiosulfate solution, amylum indicator to analyze dissolved oxygen levels, Brucine solution + sulfanylic acid ($C_{23}H_{26}N_2O_4$ + $C_6H_7NO_{35}$), H_2SO_4 to analyze nitrate levels, H2SO4 solution, ascorbic acid, boric acid and ammonium heptamolybdate to analyze phosphate levels, Whatmann Filter Paper no. 42 for filtering seawater samples, Labels for naming solutions and sample bottles and Aquades for sterilizing tools.

At each station, measurements of oceanographic parameters were carried out three times, i.e., at the beginning, in the middle and at the end of seaweed cultivation. The oceanographic parameters measured were temperature, depth, current velocity, tides, brightness, salinity, pH, dissolved oxygen, nitrate, and phosphate. Temperature measurement was done using a thermometer. Depth measurements were carried out using a scale pole. Current velocity measurements were carried out using a drift float. Tidal measurements were obtained through the installation of tidal signs that were plugged in to the bottom of the waters at the location at the highest tide and lowest tide the tide signs were still inundated with water. Tidal measurements were carried out for 39 hours continuously with time intervals of every 1 hour of observation. The observation data was analyzed using the Doodson method to eliminate the mean sea level (MSL). Brightness measurements were carried out using a secchi disk. Salinity measurements were carried out using a digital refractometer. The measurement of the degree of acidity was carried out using a pH meter. Dissolved oxygen measurement using Winkler titration method. Measurement of nitrate (NO3) using the Brucine method. Phosphate measurement using the DREL 2800 Spectrophotometer.

To see the condition of the oceanographic parameters of the waters of the seaweed cultivation locations, the standard matrix of the suitability of the waters for the seaweed cultivation locations is used in Table 1

Table 1. Physicochemical parameter suitability matrix for seaweed cultivation *Eucheuma* spp. (Adipu,*et al*,2018)

	Water Suitability Level		
Oceanographic Parameters	Very Suitable	Quite Appropriate	Not Suitable
Current velocity (m/sec)	0.20 - 0.30	0.10<0.20:>30≤0.40	<0.10:>0.40
Depth (m)	2-10	1-<2:>10-≤30	<1:>30
Brightness(%)	80-100	60-≤80	<60
Tidal (m)	1 – 3	0.5-0.9:3-3.5	<0.5:>3.5
Temperature (0C)	28 – 30	25-<28:>30-<33	<25>33
Salinity (ppt)	28 – 34	25-<28:>34-≤35	<25:>33
Acidity degree	7 - 8.5	6.5-<7. 0	<6.5:>8.5
Dissolved oxygen (mg/L)	>4, 0	2. 0-<4. 0	<2. 0
Nitrate (mg/L)	0.9 - 3. 0	0.1-< 0.9:3.0-3.5	<0.01 >3.5
Phosphate (mg/L)	0.02 – 1,00	0. 01-<0.02:>1.00-2.00	<0. 01:>2

Table 2. The average value of oceanographic parameters for seaweed cultivation locations in Old Takalar

Number	Oceanographic Parameters		Station 1	Station 2	Station3
1	Acidity degree	H0	7.67 ± 0.01	7.65 ± 0.01	7.64 ± 0.01
		H15	7.75 ± 0.03	7.72 ± 0.01	7.7 ± 0.01
		H30	7.64 ± 4.41	7.6 ± 0.01	7.61 ± 0.00
2	Temperature (%)	H0	30 ± 0.00	29 ± 1.15	28 ± 1.00
		H15	30 ± 0.00	29 ± 0.00	28 ± 0.00
		H30	30 ± 0.00	29 ± 0.00	28 ± 0.00
3	Salinity (ppt)	H0	32 ± 0.58	33 ± 0.58	32 ± 0.58
		H15	33 ± 0.00	33 ± 0.58	33 ± 0.00
		H30	34 ± 0.58	34 ± 0.00	34 ± 0.00
4	Brightness (%)	H0	55 ± 0.01	72 ± 0.01	72 ± 0.01
		H15	52 ± 0.02	70 ± 0.01	70 ± 0.01
		H30	58 ± 0.00	75 ± 0.01	75 ± 0.00
5	Current velocity (m/sec)	H0	0.09 ± 0.01	0.2 ± 0.00	0.08 ± 0.02
		H15	0.05 ± 0.01	0.02 ± 0.02	0.06 ± 0.01
		H30	0.03 ± 0.01	0.04 ± 0.01	0.03 ± 0.00
6	Nitrate (mg/L)	H0	0.25 ± 0.01	0.32 ± 0.04	0.26 ± 0.03
		H15	0.24 ± 0.01	0.24 ± 0.01	0.23 ± 0.01
		H30	0.26 ± 0.01	0.27 ± 0.03	0.28 ± 0.04
7	Phosphate (mg/L)	H0	0.05 ± 0.01	0.06 ± 0.01	0.05 ± 0.03
		H15	0.06 ± 0.01	0.04 ± 0.01	0.04 ± 0.01
		H30	0.02 ± 0.00	0.02 ± 0.00	0.02 ± 0.00
8	Dissolved oxygen (mg/L)	H0	4.77 ± 0.15	5.83 ± 0.06	5.73 ± 0.96
		H15	4.97 ± 0.21	4.1 ± 0.00	4 ± 0.17
		H30	5.3 ± 0.26	4.93 ± 0.35	5.1 ± 0.20

Seaweed Culture

Seaweed cultivation was carried out using the longline method. This method is the most popular method for seaweed farmers because besides being flexible in site selection, the costs incurred are relatively cheap. This method has advantages compared to the off-bottom method and the raft method, namely the plants receive enough sunlight, are resistant to changes in water quality, are free from pests that usually attack from the bottom of the water, grow faster, work easier, lower costs and quality better seaweed. The species of seaweed seed cultivated is *Eucheuma cottonii*. Seedlings of *E. cottonii* weighing 60 grams were tied to a ris rope that was stretched with a length of 15 meters at intervals of 15 cm between seaweeds. Each stretch is given a buoy in the form of mineral water bottles in several parts of the stretch so that the stretch of *E. cottonii* seeds remains on the sea surface. This cultivation was carried out for 30 days at each measurement station.

Seaweed Growth

Measurement of seaweed growth was carried out by weighing samples of *E. cottonii* seaweed at the beginning and end of cultivation during the study.

To determine the absolute growth of seaweed used the formula from Takanpromise., et al (2018):

$W = Wt - W0$

Where:
W = Absolute growth (grams)
W_0= Average wet weight of seaweed at the beginning of cultivation (grams)
W_t = Average wet weight of seaweed at the end of cultivation (grams)

Data Analysis

Water quality measurement results are displayed descriptively, graphs and tables. To find out the differences in the growth of each station for *Eucheuma cottonii* seaweed cultivation, it was analyzed using one-way analysis of variance with the support of SPSS version 22 software analysis.

RESULTS AND DISCUSSION

The results of the measurement of the average value of oceanographic parameters obtained during the study are presented in (Table 2 and Table 3).Tabel 2. The average value of oceanographic parameters for seaweed cultivation locations in Old Takalar

Table 3. The average value of the depth parameters for seaweed cultivation locations in Old Takalar

Station	Time	Depth (d_t)	Tidal (h_t)	Mean Sea Level	Δd	Average depth (m)
1	10.10	2.2	1.07	0.73	1.86	1.89
		2.3	1.07	0.73	1.96	
		2.2	1.07	0.73	1.86	
2	14:15	4.3	1.07	0.73	3.96	3.86
		4.2	1.07	0.73	3.86	
		4.2	1.07	0.73	3.86	
3	9:02	6.3	1.16	0.73	5.87	5.80
		6.2	1.16	0.73	5.77	
		6.2	1.16	0.73	5.77	

Based on the measurement results of the average oceanographic parameters obtained during the study (Tables 2 and 3), it shows that the oceanographic parameters of these waters are still within a reasonable range to be used as a location for *Eucheuma cottonii* seaweed cultivation. The pH at the cultivation site is included in the very suitable range for seaweed cultivation as stated by Adipu et al (2013) that the pH range value that is very suitable for *Eucheuma cottonii* seaweed is 7-8.5 in the suitability matrix of the waters of the *E. cottonii* (Table 1). The same thing is also explained by Yanti (2016) that the ideal pH value for the life of seawater organisms generally ranges from 7 to 8.5. Water conditions that are very acidic or very alkaline will disrupt the survival of organisms because it will cause disturbances in metabolic and respiratory processes. Changes in pH above neutral will increase the concentration of ammonia which is very toxic to organisms.

The temperature at the cultivation location is still within a reasonable range for seaweed cultivation as stated by Adipu et al (2013) that the temperature range value that is very suitable for *Eucheuma cottonii* seaweed is 28-30oC in the suitability matrix of the waters of the *E. cottonii* cultivation location. (Table 1). It is also explained by Hutagalung (1988) that the temperature threshold for the growth of green, brown and red algae is 34.5°C. Temperature greatly affects the ability of seaweed to carry out photosynthesis and indirectly affects the solubility of oxygen used for respiration of marine organisms. The increase in temperature can cause the seaweed thallus to turn pale yellow (Khasanah, et al, 2016).

The salinity at the cultivation site is included in the range that is very suitable for seaweed cultivation as stated by Adipu et al (2013) that the salinity range value that is very suitable for seaweed *E. cottonii* is 28-34 ppt in the suitability matrix of the waters of the seaweed cultivation location. *E. cottonii* (Table 1). The Ditjenkanbud (2005) also explained that the good salinity range for *E. cottonii* seaweed is 28 – 35 ppt. Extreme changes in salinity can cause ice-ice disease. This is because salinity has an effect on aquatic plants including algae, salinity affects the synthesis of chlorophyll, the process of photosynthesis, respiration and growth (Syamsuddin, 2014).

The brightness of the cultivation location at station 1 is not suitable for seaweed cultivation but for station 2 and station 3 it shows that the brightness at the cultivation location is still in the range that is quite suitable for seaweed cultivation as stated by Adipu et al (2013) that the value of the brightness range is not suitable for seaweed *Eucheuma cottonii* ranged from <60% and quite suitable ranged from 60-≤80% in the suitability matrix of the waters of *E. cottonii* cultivation sites (Table 1). It is also explained by Mustafa, et al. (2017) that the brightness of the waters in a suitable location for seaweed cultivation is more than 2 m. The higher the brightness level, the more effective the photosynthesis process is, to increase the number of cell masses that make up the seaweed thallus.

The current velocity of the seaweed cultivation location is not suitable for seaweed cultivation as mentioned by Adipu et al (2013) that the value of the range of current velocity that is not suitable for *Eucheuma cottonii* seaweed ranges from <0.10:>40 m/s in the suitability matrix of the waters of the grass cultivation location. marine *E. cottonii* (Table 1). The same thing was explained by Prasetyo (2007) that seaweed should be planted in waters where there are strong currents in the range of 20-40 cm/sec. The movement of the water mass is strong enough to keep the seaweed clean of sediment so that all parts of the thallus can function to carry out photosynthesis. The faster the current, the more inorganic nutrients are carried by the water and absorbed by plants through the diffusion process.

The nitrate content at the cultivation location is included in the range that is quite suitable for seaweed cultivation as stated by Adipu et al (2013) that the value of the range of nitrate content that is quite suitable for seaweed *E. cottonii* is 0.1-< 0.9 mg/L in the suitability matrix. the waters of the *E. cottonii* cultivation location (Table 1). The same thing was also stated according to Boyd (1982) that the lowest nitrate tolerance limit for algae growth was 0.1 ppm while the highest limit was 3 ppm. If the nitrate level is below 0.1 or above 3 ppm nitrate is a limiting factor. Nitrates are essential nutrients for plants, but in excess they can cause significant water quality problems. Excess nitrate will accelerate eutrophication and cause an increase in the growth of aquatic plants so that it affects dissolved oxygen levels, temperature, and other parameters (Patricia, et al, 2018).

The phosphate content at the cultivation location is in the very suitable range for seaweed cultivation as stated by Adipu et al (2013) that the value of the range of phosphate content that is very suitable for *Eucheuma cottonii* is 0.02 – 1.00 mg/L in the suitability matrix. the waters of the *E. cottonii* cultivation location (Table 1). The same thing was also stated by Erlangga (2007) that waters with good fertility levels have a phosphate content of 0.015-1.00 ppm. Aquatic biota needs phosphate levels for life, but if in excessive concentrations it will have a dangerous impact. High amounts of phosphate will result in very large algae growth and result in less sunlight entering the waters. When algae die, bacteria will break it down using dissolved oxygen in the water (Patricia et al, 2018).

Dissolved oxygen at the cultivation site is included in the very suitable range for seaweed cultivation as stated by Adipu et al (2013) that the value of the dissolved oxygen range which is very suitable for E. cottonii seaweed is >4 mg/L in the water suitability matrix of the location. cultivation of E. cottonii seaweed (Table 1). It is also explained by Indriani and Sumiarsih (1991) that for the growth of the type of seaweed *E. cottoni* required the amount of dissolved oxygen in the waters as much as 2-4 ppm, but growth is better if the dissolved oxygen is above 4 ppm. In seawater, oxygen is utilized by aquatic organisms for the process of respiration and to decompose organic substances by microorganisms. The absence of oxygen in the waters will cause organisms in these waters to be unable to live for a long time (Hutagalung, et al, 1985).

The depth at station 1 cultivation is in a fairly suitable range, while for stations 2 and 3 it is in a very suitable range for seaweed cultivation (Table 3). As mentioned by Adipu et al (2013) that the depth range value that is very suitable for seaweed *E. cottonii* is 2-10 m while 1-<2 m for the depth range that is quite suitable in the suitability matrix of the waters of *E. cottonii* cultivation locations. (Table 1). The same thing was conveyed by Aris and Muchdar (2020) that good depth conditions for seaweed growth ranged from 2-15 m. Planting seaweed that is too deep will cause difficulties in its maintenance, while if it is too shallow it will cause the seaweed to be exposed to direct sunlight, besides that it also causes the waters to be easily cloudy (Serdiati and Widiastuti, 2010).

The tidal values obtained during the study show that the lowest low tide is at 23:00 which is 9 cm, and the highest tide is at 12:00 which is 132 cm with an average sea level or MSL of 0.73 m (Figure 2). This shows that the tidal conditions for the seaweed cultivation location are still in the range quite suitable for *Eucheuma cottonii* seaweed as mentioned by Adipu et al (2013) that the tidal range value is quite suitable for *Eucheuma cottonii* seaweed, which is 0.5-0.9 m in depth. Matrix of suitability of waters for *Eucheuma cottoni* cultivation sites (Table 2). This is also explained by Abubakar (2018) in determining the location of seaweed cultivation, the selected location should be at low tide still inundated with water as deep as 30-60 cm. The advantage of standing water is that food absorption can take place continuously and plants are protected from damage from direct sunlight.

Tides are a vertical movement (up and down of sea water regularly and repeatedly) of all seawater mass particles from the surface to the deepest part of the seabed (Surinati, 2007). The waters in the Old Takalar environment show a type of tidal that is classified as a pure double tide (semi diurnal tide), i.e. tides that occur twice and two low tides in a day but different high tides (Azis, 2006).

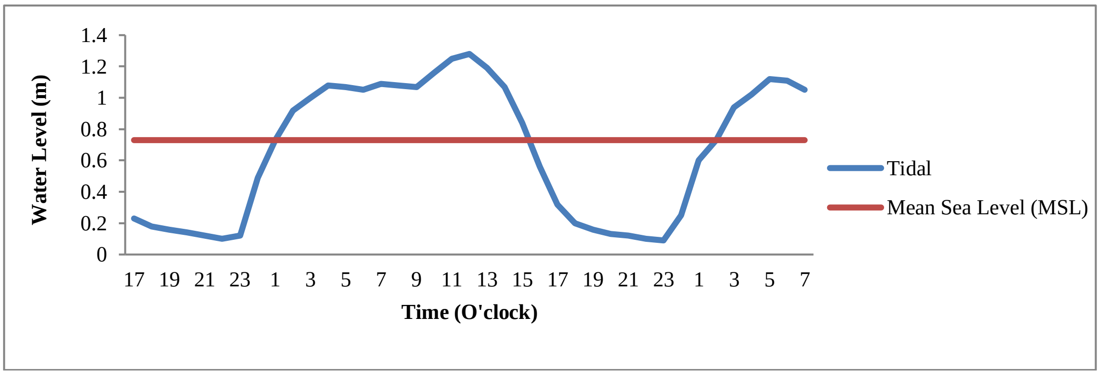

Figure 2. Tidal pattems of the waters of Old Takalar

Growth of Seaweed *Eucheuma cottonii*

Growth is an increase in size, weight, and volume with a change in time (Wibowo, 2019). Seaweed growth is grouped into somatic growth and physiological growth. Somatic growth is growth measured by weight or length gain, while physiological growth is growth measured by growth and colloid content (Hamid, 2009). The results of measuring the growth of *Eucheuma cottonii* seaweed obtained during the study are presented in Table 4.

Tabel 4. Seaweed growth average *Eucheuma cottonii*

Station	Min	Max	Average	Description
A (1)	120	140	131±10.15	bc
B (2)	170	244	202.33±37.87	ac
C (3)	200	254	223±27.87	ab

Based on the measurement results of seaweed growth obtained, it shows that the highest seaweed growth is at station 3 and the lowest is at station 1 (Table 4). This is presumably because *Eucheuma cottonii* cultivated at station 1 has Silt (mud deposits) that stick for a long time on the surface of the thallus which can cause decay and death of the seaweed. According to Mudeng, et al (2015) Silt is a lot of sticking to the body of seaweed due to a decrease in water quality when the season changes, namely in the rainy season and decreasing water salinity. In addition, seaweed cultivated at station 1 also contains epifauna biota (barnacles) attached to the seaweed thallus which can cause damage to seaweed plants. So that the growth of seaweed at station 1 is lower as stated by Apriliani et al (2016) that the attaching organisms attached to the thallus can cover the surface of the seaweed so that it can inhibit the absorption of nutrients and the photosynthesis process for seaweed growth can also cause fractures in the branches. seaweed.

The growth of *Eucheuma cottoni* at station 2 and station 3 was expected to be higher because the location was far from the influence of tides so it was not easily cloudy and produced better light intensity for photosynthesis. This is because light penetration is low when there is a high content of suspended particles in the waters, due to tidal activity (Khasanah, et al, 2016). The intensity of light is also directly related to the primary productivity of a waters, the higher the intensity of a light, the higher the primary productivity at a certain limit (Susilowati., e al, 2012). According to Wibowo (2019), growth is an increase in size in terms of length, weight, and volume due to changes in time. Seaweed growth is strongly influenced by the physical and chemical parameters of seawater. Physical-chemical parameters have an important influence on the growth of seaweed because of its function that can affect the metabolism of seaweed in surviving in the waters.

One Way Anova showed that the value was significant ($p<0.05$) so that there was a significant difference in growth at each station of *E. cottonii* seaweed cultivation location. This is presumably because seaweed at each cultivation station has the opportunity to get different sunlight and nutrients so that its growth is also different, some are slow and some are fast. Erbabley and Kelabora (2014) argue that differences in the environment or location of maintenance will cause metabolic disorders caused by changes in water chemical physical factors. This condition can result in most of the energy stored in the seaweed body being used for adaptation to the environment so that it can damage the metabolic system or exchange substances that can interfere with the growth and reproduction of seaweed.

Relationship of Oceanographic Parameters with Seaweed Growth

The analysis of oceanographic parameters using the correlation test found that the Pearson correlation value of temperature is -0.902, brightness is 0.823 and depth is 0.832 so that it is very strongly correlated with seaweed growth which shows that there is a relationship between aquatic oceanographic parameters and seaweed growth. This is in accordance with the explanation of Burdames and Ngagi (2014) that the production and quality of seaweed is influenced by oceanographic factors and water quality parameters. Oceanographic factors and water quality parameters determine the sustainability of seaweed cultivation activities. If the cultivation activity exceeds the carrying capacity of the area, there will be a degradation of water quality. This condition in the end is no longer able to meet the needs of seaweed to grow.

Temperature is very strongly correlated and negatively correlated to the growth of *Euceuma cottonii* seaweed. An increase in temperature can cause the seaweed thallus to turn pale yellow so that it can inhibit the growth of seaweed. Temperature greatly affects the ability of seaweed to carry out photosynthesis and indirectly affects the solubility of oxygen used for respiration of marine organisms. Although the temperature is not lethal, the temperature can inhibit the growth of seaweed (Khasanah, et al, 2016).

Brightness correlated very strongly and positively correlated to the growth of *Eucheuma* cottonii seaweed. The brighter the waters, the better the growth of seaweed. Waters that have low brightness values during normal (clear) weather provide an indication or indication of the number of dissolved and suspended particles in the waters. Light penetration is low when there is a high content of suspended particles in the waters, due to tidal activity and also the level of depth (Kasanah., et al, 2016).

Depth is very strongly correlated and positively correlated to the growth of *E. cottonii* seaweed. The deeper the water, the better the growth of seaweed. The depth of water for seaweed cultivation using the longline method is at least 2 meters at the lowest low tide (sni, 2010). The difference in water depth causes the intensity of sunlight to vary in each water zone, causing differences in thallus growth which is a measure of seaweed growth. The increase in the photosynthesis process will stimulate the metabolic process so as to stimulate the seaweed to absorb more nutrients, absorb more nutrients to support its growth (akmal., et al, 2017).

CONCLUSION

The water quality in the Old Takalar environment is generally still within a reasonable range to be used as a location for the cultivation of *Eucheuma cottonii*. There was a significant difference in growth at each location of *E. cottonii* seaweed cultivation. Oceanographic parameters that were strongly correlated with the growth of *E. cottonii* were temperature, brightness and depth.

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