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ANALYSIS OF CULTIVATION WATER QUALITY FROM PHYSICAL TERMS OF WATERS IN SANGIA WAMBULU DISTRICT, CENTRAL BUTTON DISTRICT

Analisis Kualitas Air Budidaya Dari Tindakan Fisik Air di Kecamatan Sangia Wambulu Kabupaten Button Tengah

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ABSTRACT

The aim of this research is to demonstrate the feasibility of cultivating fish and seaweed in the waters around Sangia Wambulu District, in terms of water physics aspects. The research was carried out from April to May 2021 in the waters of Sangia Wambulu District, Central Buton Regency. The tools used in the research were: Seichidisk, thermometer, refractometer, boat, flashlight, flow kite, raffia rope, stopwatch and water pass. The material used in the research is water samples taken from spots whose locations have been determined. The method used in this research is the analytical descriptive method. The analytical descriptive method can be interpreted as a research procedure that attempts to describe a symptom, event or occurrence, describing variable by variable and collecting information based on facts that are visible or as they are, then analyzed (Hasan, 2002). The sampling technique used was Purposive Sampling. Purposive sampling is sampling based on research needs, meaning that each unit or individual taken from the population is chosen deliberately based on certain considerations (Purwanto and Dyah, 2007). Based on the results of observations and discussions that have been carried out, it is important to draw several conclusions, namely: Physical parameters, namely water temperature ranging from 26 to 28º C, salinity 29 - 31 ppt, brightness 5 to 7.3 m, and current speed 7.01 - 11.38 cm/sec. In general, the existence of physical water quality; temperature and brightness are still in relatively good condition. Basically, the waters of Sangia Wambulu District, namely around the villages of Baruta Analalaki, Baruta Doda and Tolandona, can still be used for cultivation.

ABSTRAK

Penelitian ini bertujuan untuk mengetahui kelayakan budidaya ikan dan rumput laut di perairan sekitar Kecamatan Sangia Wambulu ditinjau dari aspek fisika perairan. Penelitian dilaksanakan pada bulan April hingga Mei 2021 di perairan Kecamatan Sangia Wambulu Kabupaten Buton Tengah. Alat-alat yang digunakan dalam penelitian adalah: Seichidisk, termometer, refraktometer, perahu, senter, layang-layang arus, tali rafia, stopwatch dan water pass. Bahan yang digunakan dalam penelitian adalah sampel air yang diambil dari spot-

spot yang sudah ditentukan lokasinya. Metode yang digunakan dalam penelitian ini adalah metode deskriptif analitis. Metode deskriptif analitis dapat diartikan sebagai suatu prosedur penelitian yang berupaya menggambarkan suatu gejala, peristiwa atau kejadian, mendeskripsikan variabel demi variabel dan mengumpulkan informasi berdasarkan fakta yang tampak atau apa adanya, kemudian dianalisis (Hasan, 2002). Teknik pengambilan sampel yang digunakan adalah Purposive Sampling. Purposive sampling adalah pengambilan sampel berdasarkan kebutuhan penelitian, artinya setiap unit atau individu yang diambil dari populasi dipilih secara sengaja berdasarkan pertimbangan tertentu (Purwanto dan Dyah, 2007). Berdasarkan hasil pengamatan dan pembahasan yang telah dilakukan, maka perlu diambil beberapa kesimpulan yaitu: Parameter fisika yaitu suhu air berkisar antara 26 – 28º C, salinitas 29 – 31 ppt, kecerahan 5 – 7,3 m, dan kecepatan arus 7,01 - 11,38 cm/detik. Secara umum keberadaan kualitas fisik air; suhu dan kecerahan masih dalam kondisi relatif baik. Pada dasarnya perairan Kecamatan Sangia Wambulu yakni di sekitar Desa Baruta Analalaki, Baruta Doda, dan Tolandona masih bisa dimanfaatkan untuk bercocok tanam.

Kata kunci	*Kualitas Air, Suhu, Salinitas, Kecerahan dan Kecepatan Arus*
Keywords	*Water Quality, Temperature, Salinity, Brightness and Current Speed*
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INTRODUCTION

Indonesia is one of the largest archipelagic countries in the world, with more than 17,000 islands. Indonesia is a country near the equator with 17,508 islands and a coastline of around 81,407 kilometers (Prasetya, 2013). Although oceans cover two-thirds of the land area, the country has huge water supplies. In Indonesian waters, such as those near Baruta Lalaki Village in Sangia Wambulu Regency, the development of marine resources is very possible. There are two villages in the waters around Baruta Lalaki Village in Sangia Wambulu District, namely Baruta Doda Village and Tolandona Village. The majority of community activities in the two villages are farmers, fishermen and seaweed cultivators.

As a result of land use practices for agriculture and settlement in the two villages, the water quality in the waters of Baruta Lalaki Village, Sangia Wambulu District, has decreased. Sedimentation from wastewater and waste disposal from settlements will increase marine pollution in the ecosystem around the study area, causing increased sea turbidity and decreased water quality, all of which will have an impact on the habitat of aquatic organisms (Rangga et al, 2018). According to Effendi (2003), good water quality is an absolute requirement for fish production.

As a consequence, it is important to ensure water quality standards that limit the forms of aquatic biota that can be cultivated in various water bodies. Considering the importance of water quality, research is needed on the physical parameters of water quality in the waters of Sangia Wambulu District, which can then be used as an indicator of the sustainability of fish and seaweed cultivation.

RESEARCH METHOD

This research was carried out from April to May 2021 in the waters of Sangia Wambulu District, Central Buton Regency. The tools used in the research were: Seichidisk, thermometer, refractometer, boat, flashlight, flow kite, raffia rope, stopwatch and water pass. The material used in the research is water samples taken from spots whose locations have been determined.

The sampling method used was Purposive Sampling. Purposive sampling is sampling based on research needs, meaning that each unit or individual taken from the population is chosen deliberately based on certain considerations (Purwanto and Dyah, 2007).

Determining the sampling points is divided into 3 spots where location observations are previously carried out to get a general idea of the locations which will later be used as sampling points in the waters of Sangia Wambulu sub-district, Kapuntori sub-district. The pickup position is recorded with the help of the Global Positioning System (GPS).

Sampling at each spot was carried out 3 times. The sampling spots are:

- Location 1 is located in the waters of Baruta Analalaki Village, there are 3 sampling points, namely Spot 1, 2 and 3. The distance between each Spot is ± 100 meters.
- Location 2 is located in the waters of Baruta Doda Village (between locations 1 and 3), there are 3 sampling points, namely Spots 4.5 and 6. The distance between each Spot is ± 100 meters.
- Location 3 is located in the waters of Tolandona Village, there are sampling points, namely Spots 7, 8 and 9. The distance between each Spot is ± 100 meters.

Work procedures

- Temperature. The temperature of the research sample water was taken using a thermometer, then placed into sea water slowly, then the thermometer showed the temperature and the value was recorded. Water samples are taken 3 times a week, namely on Sunday, Tuesday and Thursday with an interval of 4 hours.
- Salinity. The sample water contained in the aqua bottle is dropped onto the objective glass of the Hand Refractometer, then face the Hand Refractometer to a bright area then look at the scale which shows the salinity value and then record it.
- Wind or current kite. A wind kite tied to a string of several meters (as needed) is then placed on the surface of the water and then allowed to run until the length of the string tied to it is stretched, followed by time and then recorded at a number of meters per unit time.
- Brightness. The Seichidisk plate is inserted into the water until the white bottom cannot be seen, then slowly pulled until the white bottom color is visible and then marked to measure the brightness several meters.
- Ups and down. Prepare the tool that will be used, namely the tide staff, then take it to the coastal waters and then stick it in the bottom of the water. The initial height of the sea surface is measured and recorded, after that it is left for approximately 4 hours then the sea surface height is recorded then the tidal value is calculated using the formula: Tides = (t1-t□)/T, where t1 is the final scale on the tide staff, t0 is the initial scale on the tide staff and T is the measurement time interval.
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Data Analysis

From the results of observations of water physical parameters such as temperature, salinity, brightness, current speed, descriptive analysis is presented in the form of tables and figures to explain the feasibility of water quality observation spots for the development of seaweed and fish cultivation activities.

RESULT AND DISCUSSION

Temperatur

The results of temperature measurements at the research location are presented in table 2 and figure 2 below.

Table 2. Average water temperature from April to May 2021.

Place	Spot	Parameters Temperatur (°C)	April 2021			May 2021		
			Pagi	Siang	Sore	Pagi	Siang	Sore
I	**1**	Range	27	28	27	26-28	28-29	27-28
Baruta	**2**	Range	27	28	27	26-28	28-29	27-28
Analalaki	**3**	Range	27	28	27	26-28	28-29	27-28
Average			**27**	**28**	**27**	**26.75**	**28.25**	**27.25**
II	**4**	Range	27	28	27	26-28	28-29	27-28
Baruta	**5**	Range	27	28	27	26-28	28-29	27-28
Doda	**6**	Range	27	28	27	26-28	28-29	27-28
Average			**27**	**28**	**27**	**26.75**	**28.25**	**27.25**
III Tolandona	**7**	Range	27	28	27	26-28	28-29	27-28
	8	Range	27	28	27	26-28	28-29	27-28
	9	Range	27	27-28	27	26-28	28-29	27-28
Average			**27**	**27.5**	**27**	**26.75**	**28.25**	**27.25**

The results of observations of the water temperature at the research location show that the temperature range in April 2021, in the morning and evening, is around 27ºC, while during the day the water temperature is around 28ºC. In May 2021, in the morning and evening it will be around 26-28ºC, while during the day the water temperature will be around 28-29ºC.

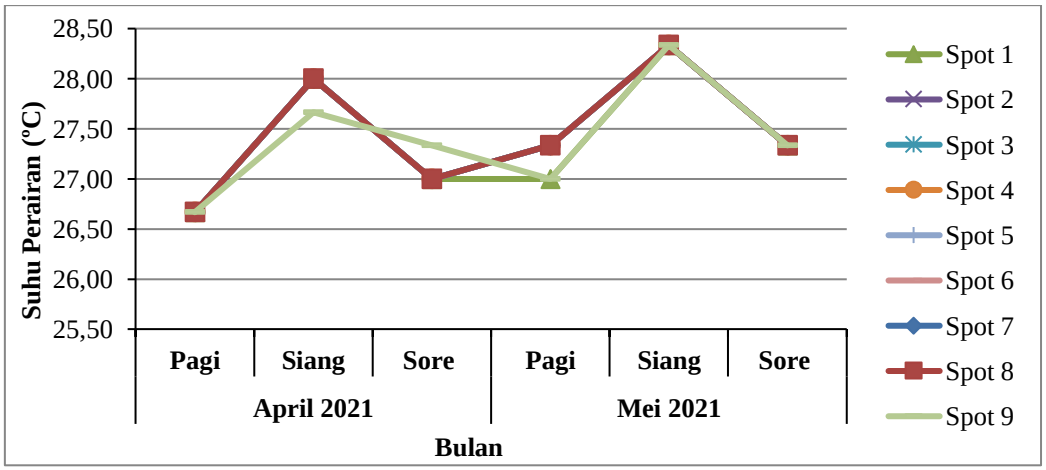

Figure 2. Water temperature graph at 9 different observation spots

Observation results show that the lowest sea water temperature was on May 17 at each spot, namely around 26 ºC. This is because during the research the weather in May experienced climate change, namely it was cloudy so the sun was covered by clouds. Meanwhile, the highest sea water temperature occurs during the day, ranging from 29 ºC with an average of 28.50 occurring on May 31 at each spot. This is because during the day the sun's position is directly vertical to the earth, so the light intensity increases, which ultimately increases the water temperature. The temperature of a body of water is influenced by solar radiation, position of the sun, geographical location, season, cloud conditions, as well as interaction processes between water and air, evaporation and wind

gusts (Nirmala 2014; Boyd 1982). According to Effendi (2003), changes in temperature affect the physical, chemical and biological processes of water bodies. In general, the average temperature in the Spot Waters of the Faculty of Fisheries and Marine Sciences in Sangia Wambulu District, Kapuntori District, Buton Regency shows values that are still supportive for fish and seaweed cultivation activities.

Temperature has an important role in the process of seaweed growth. According to Neish (2003) the water temperature suitable for the living needs of Kappaphycus alvarezii seaweed is around 28-32ºC. A high increase in temperature will cause the seaweed thallus to become pale yellowish and unhealthy. Seaweed can grow well at a temperature range of 26-32 oC (DKP, 2006).

According to Kordi (2010) the ideal temperature for the life of rat grouper is 27-32oC. Thus, a temperature in the range of 28 ºC-29 ºC meets the requirements for keeping rat grouper. Water temperature has a very important role in regulating activity, growth, appetite, and influencing the process of digestion of food.

Salinity

The results of salinity measurements at the research location are presented in table 3 and figure 3 below.

Table 3. Average water salinity from April to May 2021

Place	Spot	Parameters	April 2021			May 2021		
		Salinity	Pagi	Siang	Sore	Pagi	Siang	Sore
I Baruta Analalaki	1	Range	28-30	31-34	28-30	29-30	30-33	30-34
		Average	**29**	**32.5**	**29**	**29.75**	**31.75**	**33**
	2	Range	29-30	33-34	30	29-30	30-33	30-34
		Average	**29.5**	**33.5**	**30**	**29.75**	**31.75**	**33**
	3	Range	29-30	33-34	30	30	32-34	30-34
		Average	**29.5**	**33.5**	**30**	**30**	**33**	**32**
II Baruta Doda	4	Range	29-30	33-34	30	30	32-34	30-34
		Average	**29.5**	**33.5**	**30**	**30**	**33.5**	**31**
	5	Range	30	32-34	30-33	30	32-34	30-34
		Average	**30**	**33**	**31.5**	**30**	**32.5**	**33**
	6	Range	30	32-34	30-33	30	32-34	30-34
		Average	**30**	**33**	**31.5**	**30**	**33.5**	**31**
III Tolandona	7	Range	30	32-34	30-33	30	32-34	30-33
		Average	**30**	**33**	**31.5**	**30**	**33.5**	**30.75**
	8	Range	30	34	30	30	32-34	30-33
		Average	**30**	**34**	**30**	**30**	**33.5**	**30.75**
	9	Range	30	34	30	30	32-34	30-34
		Average	**30**	**34**	**30**	**30**	**33.5**	**31**

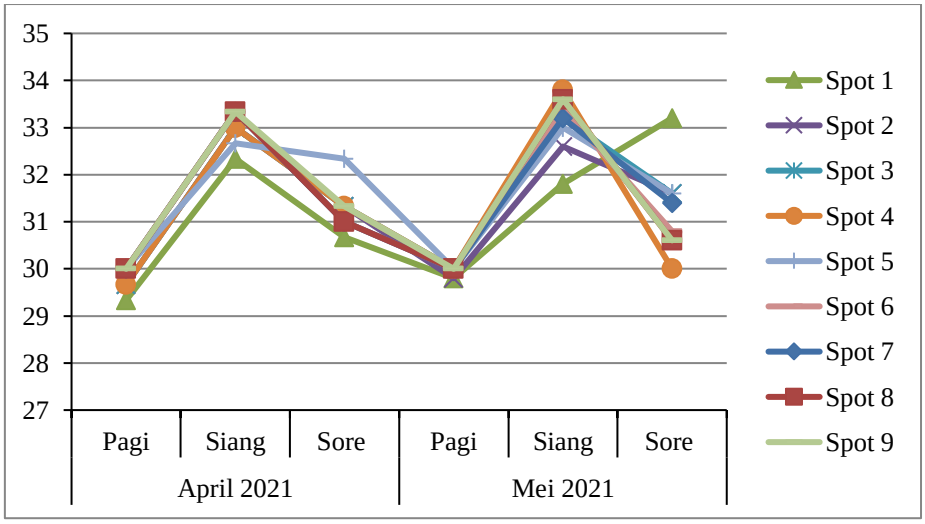

Figure 3. Graph of Water Salinity at 9 Different Observation Spots

The salinity values obtained during the research in the morning and evening on April 19 2021 averaged around the level of 29 ppt at Spot I located in Baruta Analalaki and during the day the average ranged from the level of 32.50 ppt at each Spot . On May 12 2021, in the morning the average level was 29.5-30 in each Spot ppt, in the afternoon 31.75-33.50 ppt on May 19 in each Spot, and in the afternoon the average salinity ranges from 31-33 ppt. Meanwhile, on 24 May 2021 in the morning the average level was 30 ppt, in each spot during the day it was 32-34 ppt and in the afternoon 30-34 ppt on 24 and 31 May each spot.

Salinity is the concentration of all salt solutions obtained in sea water, where the salinity of the water affects the osmotic pressure of the water, the higher the salinity, the greater the osmotic pressure (Gufran and Baso, 2007 in Widiadmoko, 2013).

The salinity value obtained in the morning research in April 2020 averaged around 29 ppt at spot I located in Baruta Analalaki and during the day the average was around 32.50 ppt at each spot. On 3 May 2021 in the morning the average level was 29.5-30 ppt at each spot, in the afternoon 31.75-33.50 ppt on 10 May at each spot, and in the afternoon the average salinity ranges from 31-33 ppt. while on May 24 2021 in the morning the average level was 30 ppt, in the afternoon spot 32-34 ppt and in the afternoon 30-34 ppt on May 24 and 31 at each spot.

This salinity value is not much different from the salinity value of Indonesian waters, where in general the average surface of Indonesian waters ranges between 32-34‰ (Dahuri et al., 1996). Based on sea water quality standards in the Decree of the Minister of Environment No. 51 of 2004, most of the salinity values at observation spots are still in accordance with sea water quality standards for marine biota. Hutabarat and Evans (1984) stated that estuary areas are areas where salinity levels decrease due to the influence of incoming fresh water and also due to the occurrence of tides in the area. Variations in salinity in seawater will affect aquatic living organisms based on their ability to control specific gravity and variations in osmotic pressure.

Brightness

The results of brightness measurements at the research location are presented in table 4 and figure 4 below.

Table 4. Results of brightness measurements from April to May 2021

Place	Spot	Parameter Kecerahan (m)	April 2021 Siang	Mei 2021 Siang
I Baruta Analalaki	1	Range	5,63-6,93	5,61-6,82
		Average	**6.28**	**6.35**
	2	Range	5,57-6,54	5,58-6,74
		Average	**6.06**	**6.22**
	3	Range	5,21-6,13	5,21-6,21
		Average	**5.67**	**5.93**
II Baruta Doda	4	Range	5,58-6,97	5,63-6,79
		Average	**6.28**	**6.44**
	5	Range	5,76-7,06	5,86-7,11
		Average	**6.41**	**6.72**
	6	Range	6,54-7,28	6,81-7,29
		Average	**6.91**	**7.16**
III Tolandona	7	Range	8,08-8,15	8,09-8,15
		Average	**8.12**	**8.12**
	8	Range	8,07-8,18	8,10-8,14
		Average	**8.13**	**8.12**
	9	Range	8,20-8,59	8,12-8,16
		Average	**8.4**	**8.14**

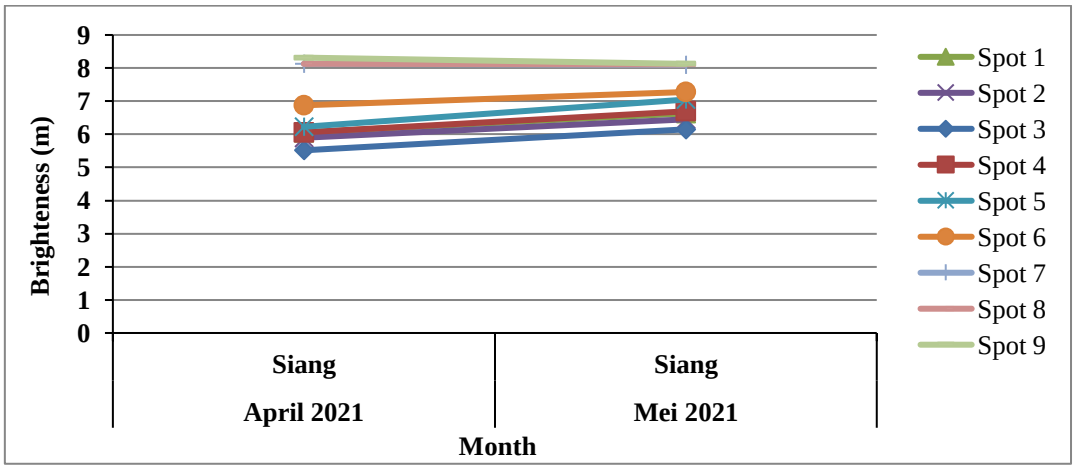

Figure 4. Graph of Water Brightness at 9 Different Observation Spots

The brightness of water depends on its color and turbidity. Brightness is a measure of the transparency of the environment, determined visually using a Secchi disk. Brightness values are expressed in meters. This value is greatly influenced by weather conditions, measurement time, turbidity and suspended solids as well as the accuracy of the person carrying out the measurement (Effendi, 2003).

Based on the results of field measurements, it is known that the water brightness value of the Faculty of Fisheries Research Spot in Sangia Wambulu District is quite varied, namely around 5.21 to 8.16 m. The brightness values obtained in the research are still suitable for seaweed cultivation and fish

cultivation activities. Kordi and Tancung (2005), stated that the appropriateness value for the brightness of a body of water is above 25 cm. If the brightness reaches a depth of less than 25 cm, this means there will be a drastic decrease in dissolved oxygen.

Flow Speed

The results of current speed measurements show that the highest current speed was in May with a range of 9.69-11.38 cm/second with an average value of 10.28 cm/second. Meanwhile, the lowest current speed in April 2021 was 7.17-7.39 cm/second with an average value of 7.28 cm/second.

Table 5. Results of current speed measurements during April - May 2021

Place	Spot	Parameters Flow	April 2021		May 2021	
			Pagi	Siang	Pagi	Siang
I Baruta Analalaki	1	Range	7,25-745	8,11-8,51	8,26-9,23	8,53-9,84
		Average	**7.35**	**8.11**	**8.64**	**9.13**
	2	Range	7,19-7,40	7,74-8,30	8,11-9,16	8,38-9,72
		Average	**7.29**	**8.02**	**8.55**	**9.03**
	3	Range	7,17-7,39	7,72-8,29	7,87-8,98	8,11-9,53
		Average	**7.28**	**8**	**8.28**	**8.9**
II Baruta Doda	4	Range	8,40-8,69	8,35-8,36	7,94-9,17	8,59-10,41
		Average	**8.54**	**8.36**	**8.56**	**9.42**
	5	Range	8,71-8,73	8,36-8,53	8,26-9,23	9,35-10,91
		Average	**8.72**	**8.44**	**8.67**	**9.92**
	6	Range	9,62-9,70	8,39-8,56	8,49-9,40	9,39-11,01
		Average	**9.66**	**8.48**	**8.92**	**10.04**
III Tolandona	7	Range	9,73-9,77	8,43-8,61	8,83-9,75	9,76-11,22
		Average	**9.75**	**8.52**	**9.29**	**10.26**
	8	Range	9,71-9,76	8,43-8,61	8,89-9,77	9,69-11,38
		Average	**9.74**	**8.52**	**9.3**	**10.28**
	9	Range	9,72-8,43	8,44-8,62	8,86-9,76	9,67-11,35
		Average	**9.75**	**8.53**	**9.29**	**10.28**

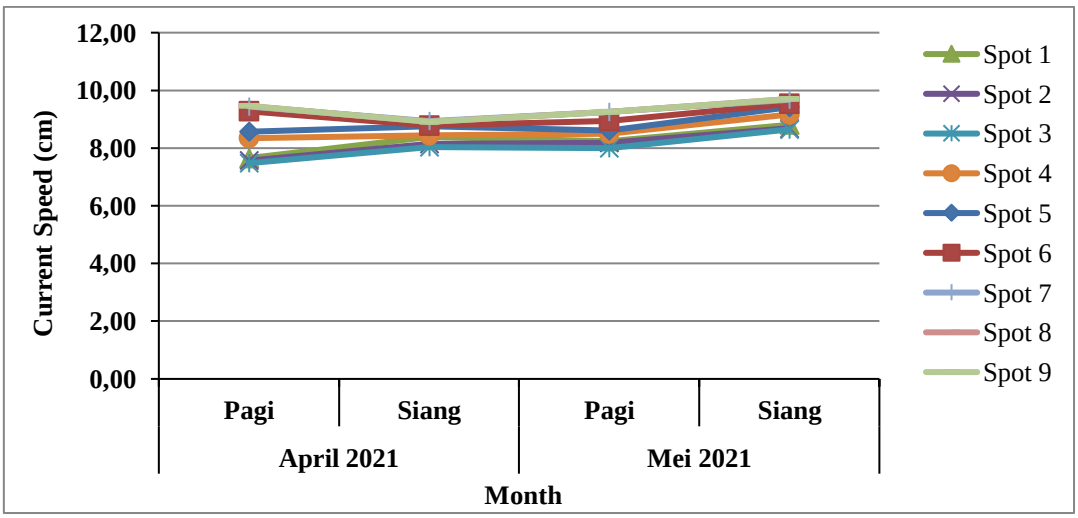

Figure 5. Graph of Water Current Speed at 9 Different Observation Spots

The current speed during observations ranged from 7.01 - 11.38 cm/second. The ideal current speed for seaweed cultivation ranges from an optimum value of 20-40 cm/sec (SNI, 2010). The current is measured at 1 meter from the sea surface. Currents can have both good and bad influences on seaweed cultivation activities. The good effect is that seaweed requires currents to help provide nutrient supplies. Sinaga (1999) stated that the stronger the current in a body of water, the faster the growth of marine algae will be due to the greater diffusion of nutrients into the thallus cells, so that metabolism is accelerated. The bad effect is that if the current is too big it will damage the seaweed. The location for cultivating K. alvarezii must be protected from currents and large waves. If this happens, currents and waves will damage and wash away plants.

According to Wahyuningrum (2001), good water currents will bring nutrients for seaweed to grow and to clean dirt and adhering sediment. Seaweed will grow well because it has the opportunity to absorb nutrients (food) from the water and the photosynthesis process is not disturbed. Current speeds that are too strong cause plants to have difficulty absorbing nutrients (food) that are useful for growth. In general, the direction of currents in the waters of Sangia Wambulu District and Long Island is one direction (unidirectional) which moves from North to South and vice versa. According to Ariyati, et al (2007). The direction of the current needs to be known to determine the general description of the cultivation container so that water circulation remains smooth and controlled.

Tide

The results of observations of tidal conditions during the research are presented in the table below.

Table 6. Results of tidal observations during the study

Place	Spot	Parameters	April 2021			May 2021		
		Tide	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Baruta Analalaki	1	Range	8,92-11,96	8,74-12,19	8,95-12,32	8,85-12,19	8,87-12,10	8,84-12,17
		Average	**10.44**	**10.46**	**10.63**	**10.48**	**10.46**	**10.5**
Baruta Doda	2	Range	8,88-11,86	8,64-12,15	8,90-11,32	8,54-11,89	8,09-12,06	8,57-12,17
		Average	**10.37**	**10.39**	**10.11**	**10.02**	**10.12**	**10.13**
Tolandona	3	Range	8,95-11,76	8,57-12,12	8,91-11,52	8,53-12,12	8,09-12,02	8,56-12,12
		Average	**10.35**	**10.34**	**10.22**	**10.34**	**10.1**	**10.37**

The results show that the highest tide conditions are at Spot 1 and the lowest are at Spots 2 and 3.

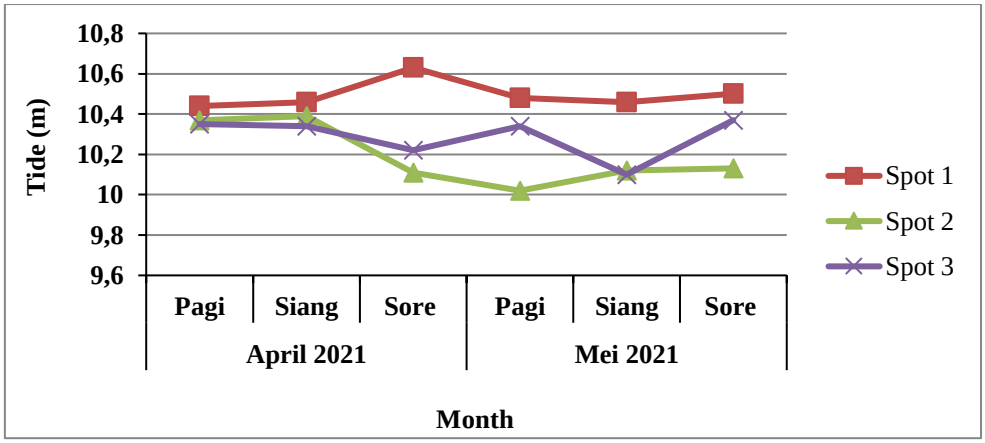

Figure 6. Tide and Tide Graph at 9 Different Observation Spots

The observation results show that tidal conditions are relatively no different between observation spots. The highest tide value is 8.74-12.19 meters, with an average of 10.63 meters occurring in April, while the lowest tide ranges from 8.47-11.27 meters with an average of 9.83 meters occurring in May. These tidal conditions are still suitable for seaweed cultivation and fish cultivation activities. Tides are influenced by the gravitational force of the earth, moon and sun (Hutabarat, 2008).

The sun has a mass 27 million times greater than the mass of the moon, and is very far from the earth (an average of 149.6 million km). while the moon, as a small satellite, is very close to the earth (an average of 381,160 km). In the mechanics of the universe, distance is more important than mass. Therefore, the moon has a greater role than the natural sun in determining tides (Notji 2002).

CONCLUSION

Conclusion

Based on the results of observations and discussions that have been carried out, it is important to draw several conclusions, namely:

1. Physical parameters, namely water temperature ranging from 26 to 28º C, salinity 29 - 31 ppt, brightness 5 to 7.3 m, and current speed 7.01 - 11.38 cm/sec. In general, the existence of physical water quality; temperature and brightness are still in relatively good condition.
2. Basically, the waters of Sangia Wambulu District, namely around the villages of Baruta Analalaki, Baruta Doda and Tolandona, can still be used for cultivation.

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