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OBSERVATION OF WATER QUALITY FOR THE CULTIVATION OF CANTANG GROUPER IN PULO PANJANG, SERANG BANTEN

Pengamatan Kualitas Air untuk Budidaya Ikan Kerapu Cantang di Pulo Panjang, Serang Banten

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ABSTRACT

Water is a cultivation medium that serves as a habitat for cultivated organisms. Information regarding its quality standards is necessary for the feasibility of fish culture. Cultivated organisms will experience changes, either directly or indirectly, if the aquatic environment they inhabit is unstable. This study aims to determine the suitability of Pulo Panjang waters for Cantang grouper cultivation based on its water quality standards. In this study, a purposive sampling method was used to determine the observation stations. The research parameters observed in situ were dissolved oxygen using the Winkler method, water depth using measuring tape, water transparency using a Secchi disk, salinity using a refractometer, pH using a pH meter, temperature using a thermometer, and current velocity using the Langrangian method. Moreover, the parameters observed ex situ were nitrate using the APHA method for nitrate measurement and phosphate using the APHA method for phosphate measurement. Observations of the research parameters were carried out three times every two weeks. The results of the parameter measurements obtained were then scored and compared with those of the water suitability class. Observations show that station 1 falls into the marginally suitable category (S3) with a score of 68%, station 2 falls into the marginally suitable category (S3) with a score of 68%, and station 3 falls into the unsuitable category (N) with a score of 64%. These findings indicate that the water quality at stations 1 and 2 is suitable, and station 3 is not suitable for use in Cantang grouper cultivation activity.

Keywords: Cantang Grouper, Pulo Panjang, Water Quality

ABSTRAK

Air adalah media budidaya yang berfungsi sebagai tempat hidup organisme budidaya. Mengingat pentingnya peran air sebagai media budidaya, dibutuhkan informasi mengenai status perairannya untuk kelayakan usaha budidaya yang dilakukan. Organisme budidaya akan mengalami perubahan baik secara langsung atau tidak langsung jika lingkungan perairan sebagai tempat hidupnya memiliki kualitas yang tidak stabil. Penelitian ini bertujuan untuk menentukan kesesuaian kualitas perairan Pulo Panjang untuk budidaya ikan kerapu cantang

berdasarkan standar baku mutunya. Penelitian ini menggunakan metode *purposive sampling* dalam menentukan stasiun pengamatannya. Parameter penelitian yang diamati *in situ* adalah oksigen terlarut dengan menggunakan metode Winkler, kedalaman menggunakan meteran, kecerahan menggunakan secchi disk, salinitas menggunakan refraktometer, pH menggunakan pH meter, suhu menggunakan thermometer dan kecepatan arus menggunakan metode langrangian. Sedangkan parameter yang diamati *ex situ* adalah nitrat dengan menggunakan metode APHA untuk pengukuran nitrat dan fosfat menggunakan metode APHA untuk pengukuran fosfat. Pengamatan parameter penelitian dilakukan sebanyak tiga kali setiap dua minggu sekali. Hasil pengukuran parameter yang didapatkan kemudian dilakukan skoring dan dibandingkan dengan kelas kesesuaian perairannya. Hasil pengamatan menunjukkan stasiun 1 masuk kategori sesuai marginal S3 dengan nilai skoring 68%, stasiun 2 masuk kategori sesuai marginal S3 dengan nilai 68%, dan stasiun 3 masuk kategori tidak sesuai dengan nilai 64%. Hal ini memperlihatkan bahwa kualitas air pada stasiun 1 dan stasiun 2 sesuai untuk digunakan dalam kegiatan budidaya ikan kerapu cantang. Sementara itu, stasiun 3 tidak sesuai untuk digunakan dalam kegiatan budidaya ikan tersebut.

Kata Kunci: Ikan Kerapu Cantang, Kualitas Air, Pulo Panjang

INTRODUCTION

Mariculture is an activity that transforms coastal natural resources into high-value economic resources. Mariculture also refers to coastal activities characterized by the presence of cages, shellfish rafts, seaweed, or marine biota within a limited area (Mustafa et al., 2017). Indonesia has the potential to develop marine aquaculture, but the utilization of Indonesian waters is relatively low. Only 65% of Indonesia's marine fish resources, or approximately 4.8 million tons per year, are utilized out of a potential 6.4 million tons of fish resources (Directorate General of Capture Fisheries 2018). One of Indonesia's marine resources is grouper. High levels of grouper fishing have reduced the potential population of grouper in Indonesia (Setiawan et al., 2019). The increase in fishing intensity is driven by market demand and high economic prices. According to Marpaung et al. (2017), marine fish resources will recover despite challenges. The Cantang Grouper is a type of grouper that is a cross between the tiger grouper and the kertang grouper. According to Chaniago (2020), the cantang grouper has the advantage of growing twice as fast as the tiger grouper.

Site selection for fish farming is a crucial strategy for developing aquaculture (Harianto & Efendi, 2017). Minimal knowledge of the quality of the aquaculture environment is a key factor in developing aquaculture, and water quality plays a crucial role in site selection (Yunus et al., 2019). Water plays a crucial role in aquaculture. Therefore, water quality must be constantly monitored to ensure stable fish farming production (Ariadi et al., 2019). This is because water quality is dynamic and changes throughout the aquaculture process (Ariadi et al., 2019). Poor water quality poses a health risk to humans and other living organisms (Hua, 2017). Aquatic animals experience changes directly or indirectly if the aquatic environment they inhabit is unstable (Braga et al., 2017).

Selecting a suitable location for aquaculture activities is crucial. Aquatic environments that do not meet quality standards for fish farming activities are a mistake in selecting a cultivation site. Water quality can be analyzed using physical and chemical parameters to determine its quality (Pratama et al., 2016). Determining a suitable location for aquaculture activities requires analyzing water quality parameters (Purnawan et al., 2015). The waters of Banten Bay are a potential area for fish farming activities. The Pulo Panjang coastal area is utilized by local residents for floating cage farming (Soejarwo & Fitriyanny, 2016). Pulo Panjang is an island located in Banten Bay, Serang Regency, Banten. Pulo Panjang covers an area of 820 hectares with a total population of 2,609 people and is home to six villages: Peres,

Pukarela, Sukadiri, Kebalen, Kampung Baru, and Pasar Putih (BPS, 2020).

Based on the above description, research is needed to determine the water conditions that meet the suitability values for fish farming activities on the Pulo Panjang coast. This is necessary to avoid mistakes in selecting mariculture locations, which could have fatal consequences for the activity. The suitability of waters for aquaculture can be determined by analyzing their chemical and physical parameters. Knowing the quality of a water body will make it easier for marine aquaculture operators to minimize losses during the cultivation process.

RESEARCH METHODS

The research was conducted in September – October 2024 on the coast of Pulo Panjang, Serang Regency, Banten. The sampling method was carried out using a purposive sampling technique with the location of water sampling at station 1 at coordinates 5°56'35.50" South Latitude and 106° 9'37.67" East Longitude northeast of Peres Village Harbor, Station 2 is located at coordinates 5°56'42.44" South Latitude and 106° 9' 3.06" East Longitude west of Peres Village Harbor, and Station 3 is located at coordinates 5°56'23.91" South Latitude and 106° 8'25.44" East Longitude in the waters of Kelapa Enom Beach (figure 1). Sampling was carried out three times with intervals of once every two weeks. The tools used in the research include a winkler bottle, meter, Langrangian tool, secchi disk, thermometer, refractometer, pH meter, sample bottle and boat. The materials used include NaOH KI, $MNSO_4$, $Na_2S_2O_3$, starch, distilled water, and tissue.

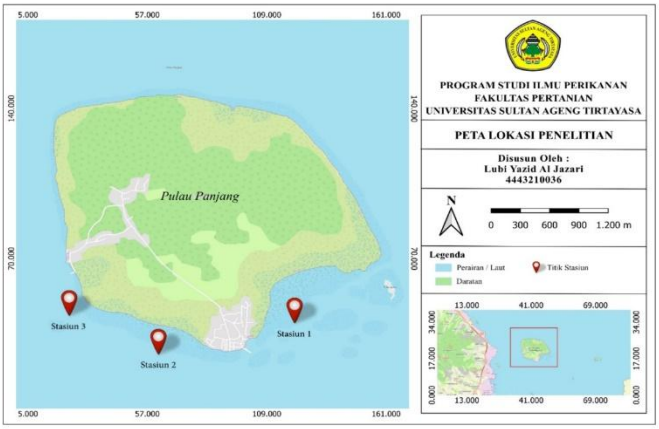

Figure 1. Research Location in the Waters of Pulo Panjang

The parameters observed in this study were dissolved oxygen (DO), measured using the Winkler method and referring to SNI 06-6989.14.2004; water depth referring to SNI 8995:2021; current referring to SNI 03-2414-24-1991 Rev-2004; clarity using a Secchi disk referring to SNI 8995:2021; temperature using a thermometer referring to SNI 06-6989.23-2005; salinity using a refractometer referring to SNI 6964-8-2015; pH using a pH meter referring to SNI 6898-11:2019; nitrate using the APHA 4500-NO3-E method; and phosphate referring to the APHA 4500-P-E method.

Data analysis was conducted in accordance with Valentino et al. (2018) by weighting each class (Table 1).

Table 1. Water Quality Parameter Assessment

Parameter	Class	Number (A)	Weight (B)	Score (A) x (B)
Dissolved oxygen (mg/l)	≥ 5.0	5	3	15
	≥ 4.0 – 4.9	3		
	≤ 3.9	1		
Depth (meter)	15.0 – 24.9	5	3	15
	5.0-14.9 and 25-34.9	3		
	≤ 4.9 and ≥ 35	1		
Current speed (cm/sec)	20.0 - 49.9	5	3	15
	0.0-19.9 and 50-69.9	3		
	≥ 75	1		
Brightness (meter)	≥ 5.0	5	3	15
	≥ 3 – 4.9	3		
	≤ 2.9	1		
Temperature (°C)	27.0 – 30.9	5	2	10
	25.0-28.9 and 31.9	3		
	< 24.9 and ≥ 32	1		
Salinity (ppt)	30.0 – 32.9	5	2	10
	20.0 – 29.0	3		
	≤ 19.9 and ≤ 33	1		
pH	8.0 – 8.20	5	2	10
	4.0-7.9 and 8.20-8.9	3		
	≤ 3.90 and ≥ 9.0	1		
Phosphate (mg/l)	≥ 0.2 - ≤ 0.5	5	1	5
	≥ 0.1-0.19 and 0.49-0.6	3		
	<0.01 and > 0.6	1		
Nitrate (mg/l)	0.90 – 3.19	5	1	5
	0.02-0.89 and 3.2-3.39	3		
	≤ 0.01 and ≥ 3.4	1		
Total scoring				100

The calculation results were then grouped based on their suitability class for fisheries activities (Table 2). The data obtained were then analyzed descriptively to illustrate the results obtained in this study.

Table 2. Water Suitability Analysis Values

Class	Description	Score
S1	Highly Appropriate	86-100%
S2	Moderately Appropriate	76-85%
S3	Marginally Appropriate	66-75%
N	Not Appropriate	0-65%

RESULT

The results of water quality observations in the Pulo Panjang waters are presented in Table 3. In general, the physical and chemical parameters obtained at each station have a range of values that are not significantly different for each parameter observed. A striking difference is the shallower depth at Station 3 compared to the other two stations. Furthermore, there is a tendency for higher temperature values and higher phosphate levels at Station 3 compared to

Stations 1 and 2.

Table 3. Water Quality in Pulo Panjang Waters at Each Observation Station

Parameter	Station		
	1	2	3
Dissolved oxygen (mg/l)	7.2 – 8	7.2 – 8	7.2 – 8
Depth (m)	7 – 9.2	7.7 – 9	4.7 – 6.7
Current speed (cm/sec)	4 – 16.6	1.9 – 7.7	10 – 12.5
Brightness (m)	1.4 – 2.4	1.45 – 1.6	1.45 – 1.85
Temperature (°C)	30.6 – 31.3	30.29 – 31.3	30.9 – 31.6
Salinity (ppt)	24 – 29	25 – 30	24 – 30
pH	7.95 – 7.99	7.93 – 7.99	7.84 – 8.7
Phosphate (mg/l)	0.049 – 0.286	0.067 – 0.186	0.021 – 0.167
Nitrate (mg/l)	0.037 – 0.059	0.053 – 0.09	0.044 – 0.066

The results of the weighting and scoring conducted at each station are presented in Table 4. Stations 1 and 2 indicate water conditions that are marginally suitable for aquaculture activities. Meanwhile, water conditions at Station 3 are unsuitable for aquaculture activities.

Table 4. Scoring Results at Each Observation Station

Station	Score (%)	Class	Keterangan
1	68	S3	Marginally Appropriate
2	68	S3	Marginally Appropriate
3	62	N	Not Appropriate

DISCUSSION

In general, the water quality of Pulo Panjang waters can support fish farming activities, especially for dissolved oxygen parameters. Based on observations during the study, dissolved oxygen levels at each station ranged between 7.2 and 8 mg/l. Waters with a minimum dissolved oxygen level of 4 mg/l can support the quality of cultivated cantang grouper (Anita & Dewi, 2020). Meanwhile, oxygen concentrations below 3 ppm can negatively impact marine biota and increase mortality (Adipu et al., 2013). In addition to dissolved oxygen, the pH of Pulo Panjang waters is also considered to be of good quality. Ismi & Asih (2013) stated that good water quality has a pH ranging from 7.5 to 8.3. Observations in Pulo Panjang waters showed a pH value in the range of 7.93 to 8.7. This value is suitable for cantang grouper cultivation. The next parameter with a fairly good value is temperature. With values ranging from 30.29 to 31.6°C, the waters of Pulo Panjang are considered good. Water temperatures between 27 and 33°C are considered very suitable for grouper cultivation (Ngabito & Auliyah, 2018).

Conversely, the water quality at station 3, which is considered unsuitable for cultivation, is the significantly lower average phosphate content compared to the other two stations. With an average phosphate content of 0.076 mg/L at station 3, this value falls far short of the optimal phosphate level for grouper cultivation (>0.2 - <0.5 mg/L). Phosphate plays a crucial role in the growth and metabolism of phytoplankton and other organisms, contributing to water fertility (Hamuna et al., 2018). Furthermore, the average water depth at station 3 is 5.6 m. The other two stations have depths greater than 8 m. Soehadi et al. (2021) stated that shallow waters can result in higher turbidity levels compared to deeper waters. The accumulation of residual feed also more easily affects cultured organisms in shallower waters (Wilmansyah et al., 2019).

Meanwhile, the parameters of current velocity, clarity, salinity, and nitrate were within a range that did not differ significantly among all observation stations. Based on field

observations, the average current velocity was below 20 m/s, which is considered moderate for cantang grouper cultivation (Hastari et al., 2017). Grouper cultivation requires water conditions with currents that are neither too strong nor too weak (Hitijahubessy et al., 2019). Currents that are too weak can cause biofouling, while currents that are too strong can cause deformation of the net codend (Ngabito and Auliyah 2018).

The brightness parameter values obtained at each station were classified as poor, with average velocities below 5 m. Based on seawater quality standards stipulated in the Decree of the Minister of State for the Environment No. 51 of 2004, a good clarity value for marine biota is greater than 5 m (KLH, 2004). Primary productivity will decline in waters with low clarity values due to the limited light penetration that phytoplankton can use to produce organic substances (Nugraheni et al., 2022).

Based on the measurements, the average salinity and nitrate levels at all stations observed in Pulo Panjang waters are classified as moderate for cantang grouper cultivation. Water quality with a salinity of 25–34 ppt supports the growth and survival of grouper (Putra et al., 2020). Meanwhile, waters with nitrate levels between 0.02–0.8 and 3.1–3.3 mg/l are considered moderate for grouper cultivation (Anggraini, 2018). High nitrate levels in waters can be an indicator of pollution caused by human activities and animal waste.

Differences in water conditions based on observed water quality parameters can contribute to differences in the suitability of these waters for aquatic activities. Therefore, based on the results of the research conducted, it is recommended that floating net cages be placed at stations 1 or 2 for cantang grouper cultivation in Pulo Panjang waters. Good water quality parameters can support the success of fish farming.

CONCLUSION

Based on water quality observations in the waters off Pulo Panjang, it can be concluded that stations 1 and 2 can be used for cantang grouper cultivation, with a marginal category. Meanwhile, cultivation is not recommended at station 3, which is categorized as unsuitable for cultivation.

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