Asian Journal of Social Science and Management Technology
ISSN : 2313-7410
Volume 6, Issue 2, March-April, 2024
Available at www.ajssmt.com

PHYSICAL AND CHEMICAL ANALYSIS OF THE WATER ENVIRONMENT (*Panilurus* SP) FOR SUSTAINABLE DEVELOPMENT OF BARONG SHRIMP (Panilurus, SP) CULTIVATION BUSINESSES

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ABSTRACT:
Primary data includes physical and chemical parameters of the marine water environment. Secondary data collected from reports and related documents includes coastal and marine resource potential, climatological characteristics, bathymetry, substrate types, and related policies.
From the results of the area analysis of the suitability value of water locations for the development of Barong shrimp mariculture in the waters of Barrang Caddi Island, it was found that it was 3.31 ha and 0.60 ha unsuitable. The results of the physical and chemical parameters of the waters are; (a) Physical parameters consist of: depth 4.10 m – 20.5 m, brightness 6.00 m - 8.20 m, current speed 0.14 m / sec - 0.39 m / sec (b). Chemical parameters consist of water temperature ranging from 27.0 ºC - 29.00 ºC, water salinity of 31.50 ppt - 35.20 ppt, (e). pH is 7.32 - 8.50. Evaluation results of the suitability value of waters for the development of Barong shrimp mariculture in Barrang Caddi Island waters covering an area of 3.31 Ha.

Keywords: Barong shrimp, marine cultivation, water physics and chemistry.

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1. INTRODUCTION

Barong shrimp or lobster (*Panilurus* sp) is a fishery commodity that has high economic value. However, until now barong shrimp is still mostly carried out by fishing activities alone. Domestic market demand and exports to Hong Kong, Taiwan, Singapore, Japan and China for barong shrimp continue to increase (Ministry of Maritime Affairs and Fisheries, 2011). Apart from that, lobster fishing is often carried out using methods and tools or materials that are not environmentally friendly, causing damage to the lobster habitat and the environment. If this condition persists, the sustainability of the barong shrimp population in nature will be increasingly threatened. However, until now the business of rearing barong shrimp/lobsters for cultivation is still very limited (Setyono, 2015). There is concern that if this activity continues to be carried out with high frequency, the barong shrimp resources in this marine ecosystem will decrease day by day and overfishing could even occur and damage the marine resource ecosystem as a place for barong shrimp to live. To overcome the problem of declining barong shrimp populations in nature and damage to their habitat, it is necessary to carry out efforts to cultivate and conserve the environment of barong shrimp. The initial step in the barong shrimp cultivation business requires

data on the physical biological characteristics and chemistry of the marine environment to determine the feasibility of the barong shrimp cultivation business for the development of the barong shrimp cultivation business and environmental conservation.

To ensure sustainable cultivation business activities, an analysis of the biophysical and chemical characteristics of the barong shrimp (*Panilurus* sp) environment is needed to diversify the potential for sustainable marine cultivation. This is also reflected in UMI's superior research strategic plan which is related to the stages of superior research in the field of Food and Maritime (marine), namely technology for cultivating marine biota and environmental conservation, in the superior stage of basic research (research department), namely data bases on the potential of marine ecosystems and development. mariculture technology based on the data base obtained. The outputs expected in this research include (1) identification of the physical and chemical characteristics of the barong shrimp environment for cultivation, (2) availability of suitable land for barong shrimp cultivation.

This study has a contribution to the development of science, especially the use of marine resources for technology activities for cultivating marine biota, environmental conservation of marine resources. Barong shrimp or lobster (*Panilurus* sp) is a fishery commodity that has high economic value. However, until now barong shrimp is still mostly carried out by fishing activities alone. Apart from that, lobster fishing is often carried out using methods and tools or materials that are not environmentally friendly, causing damage to the lobster habitat and the environment. If this condition continues continuously, the sustainability of the barong shrimp population in nature will be increasingly threatened. However, until now the business of rearing barong shrimp/lobsters for cultivation is still very limited (Setyono, 2015). There is concern that if this activity continues to be carried out with high frequency, the barong shrimp resources in this marine ecosystem will decrease day by day and overfishing could even occur and damage the marine resource ecosystem as a place for barong shrimp to live.

Research purposes; (1) Analyze the physical and chemical characteristics of sea waters and suitability of land for barong shrimp cultivation activities, (3) Determine the suitable location/land for barong shrimp cultivation. The benefit of the results of this research is to determine the feasibility of barong shrimp cultivation based on the physical and chemical characteristics of the marine environment, so that barong shrimp cultivation can be sustainable.

2. MATERIALS AND METHODS

Research sites

This research was carried out in the sea waters of Barrang Caddi Island in Makassar City, South Sulawesi in 2018.

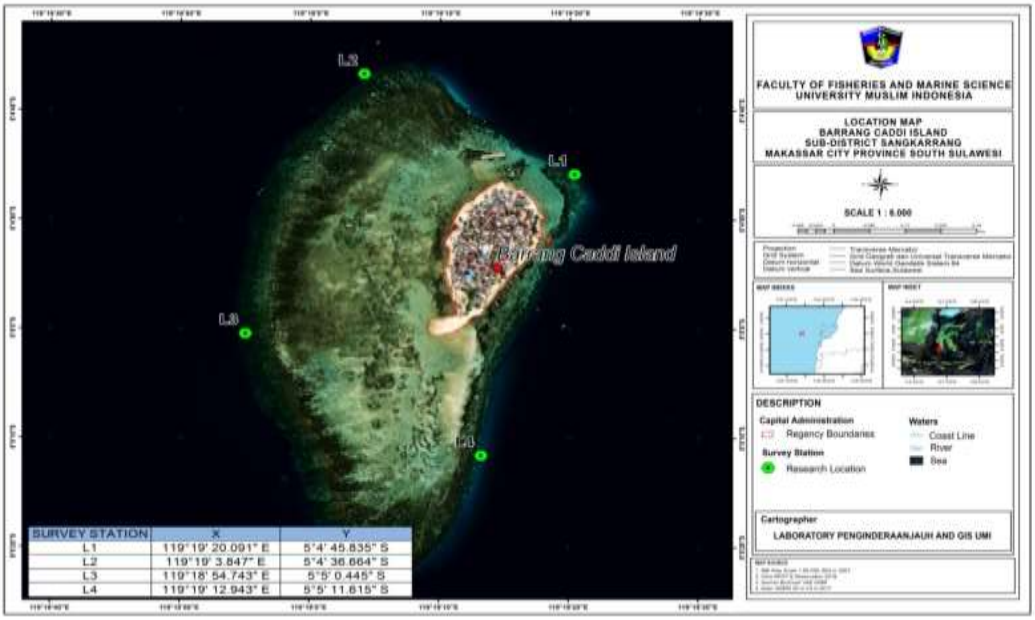

Figure 1. Research location on Barrang Caddi Island, Makassar City

Materials and tools

The materials used in this research consisted of water quality chemicals, preservatives (4% formalin), label paper, and tissue paper. The tools used in this research include: scale stick, paralon pipe, compass, GPS, counter, refractometer, cool box, pH meter, electronic balance scale model ER-120A, oven, mercury thermometer, sample bottle, plastic bucket, bag plastic, filter paper, measuring tape, questionnaires, and stationery.

Research methods

Determination of Research Stations

The physical and chemical data collection stations for marine waters were taken from 10 stations divided into four locations, namely: (1) the northern part of the island (2) the eastern part, (3) the western part and 4) the southern part of the island.

Types, Sources and Implementation Procedures

The data used in this research consists of primary and secondary data. Primary data was collected through direct observation and interviews at the research location and secondary data was collected through searching various documents and literature in various government and private agencies related to this research. Primary data observed in this research include: Physical and Chemical Parameter Characteristics of Marine Waters. Data collection on fission, chemical and biological parameters of observed waters, Tools, methods and places of measurement can be seen in Table 1 below.

Table 1. Parameters Measured and Tools and Methods Used Based on APHA, 1998)

No.	Parameters	Unit	Tools / Metode Measurement	Place
1	Physical chemistry of water:			
	Physical Parameters:			
	• Temperature	(^{o}C)		
	• Turbidity	(NTU)	Turbidity meter	In situ
	• TSS	(ppm)	Botol sampel dan cool box	Laboratory
	• Tidal	(cm)	Measuring stick	Insitu
	• Current	(m s^{-1})	Curren meter	In situ
	Chemistry Parameters:			
	• PH	-	pH-meter	In situ
	• Salinity	(ppt)	HandRefracto	In situ
	• D O	(ppm)	DO meter	In situ
	• Ammonia	(ppm)	Sample bottle, Spectofotometer	Laboratory
	• Nitrate	(ppm)	Sampel bottle, Spectofotometer	Laboratory
	• Phosphate	(ppm)	Sampel bottle, Spectofotometer	Laboratory

Land Suitability Analysis

Analysis of the suitability of land for barong shrimp cultivation specifically focuses on the suitability of land for maritime cultivation. In carrying out a land suitability analysis in general there are four stages, namely (1) compiling an area map, (2) compiling a land suitability matrix in the marine coastal area, (3) weighting and grading, and (4) spatial analysis to determine land suitability sea from every station in the Barrang Caddi Island area.

Preparation of Land Suitability Map

Compilation of suitability maps is carried out by overlaying various land suitability maps that currently exist in coastal marine areas. Determining suitability map categories is based on the dominant land activities in the

marine area. Types of activities that have similar characteristics are classified into one category and taken into account as one type in determining their dominance.

The preparation of land suitability maps is carried out using a Geographic Information System (GIS), namely by querying GIS data using the regional principles discussed previously, so that spatial information can be known: (1) which land is available for shrimp cultivation development activities barong, or any land designated as a protected area; (2) what land use activities are permitted and what are not permitted; (3) conflicts that occur between: (a) land suitability for its use; (b) land use with its designation; (c) spatial harmony with other surrounding land; (4) the results of preparing a land map that is in accordance with its intended use may be different from the current land use.

Preparation of Land Suitability Matrix

The suitability of coastal land use for barong shrimp cultivation and conservation activities is based on suitability criteria. These criteria are prepared based on the biophysical and chemical parameters of marine waters that are relevant to each activity.

In this research, the suitability class is divided into four classes, namely:

S1 Class (Appropriate). This land has quite serious limitations for certain sustainable uses, these restrictions will reduce the productivity of the land or the profits obtained and increase the input to cultivate the land. This land has very serious barriers, making it impossible to use it for certain sustainable uses.

3. RESULTS AND DISCUSSION

To determine the suitability of the physical and chemical parameters of marine waters for the development of barong shrimp mariculture and other environmental conditions. The results of measuring the quality of physical, chemical and biological parameters of marine waters are presented as follows;

Water Depth

Depth is the main factor in determining the cultivation of baron shrimp/lobsters in a floating net cage system, while Barrang Caddi Island which has the potential for cultivation is found at depths ranging from 5 m – 15 m, at this depth it is very suitable for cultivation. The water depth above shows a range of values that support marine cultivation activities, especially for barong shrimp with a basic net cage system. The distribution of sampling depth is shown in Figure 1.

Tide

The results of tide measurements carried out during the new moon in the Barrang Caddi Island area during 24 hours of observation showed that the lowest tide value was -21 cm and the highest was 27 cm. Tidal graph for the waters of Barrang Caddi Island.

Wave

The results of GIS research and analysis show that the waves around the coastal area of Barrang Caddi Island are 7 - 45 cm. The wave height at the research location is included in the appropriate category. This is supported by the statement of Szuster and Albasri (2010) that the waves are suitable for cultivation. lobsters range from 0.1-12 m.

Water Currents

The results of GIS research and analysis showed that the current pattern and current speed around the Barrang Caddi Island area ranged from 0.15 - 039 m/s, according to Amri et al (2010) the appropriate current speed for cultivating lobsters in the KJA system ranged from 0.15 - 0.35 m/s. Currents are also very important in water circulation, carrying dissolved materials and suspended solids, and can impact the presence of attached organisms. The water current speed for floating net cage cultivation in the sea must not exceed 100 cm/sec and the bottom current speed is 15 cm/sec.

Water Temperature

In general, the temperature of the archipelago's waters has changes in temperature both daily and annually, usually ranging between 27°C – 32ºC and this has no effect on cultivation activities. Water temperature influences shrimp behavioral responses, metabolic processes, reproduction, ammonia excretion and resistance to disease. Boyd and Lichtkoppler (1982) stated that the optimal temperature for the growth of tropical fish is between 25°C – 32ºC. The higher the temperature, the faster the water becomes saturated with oxygen, which encourages the diffusion of oxygen from the water to the air, so that the concentration of dissolved oxygen in the water decreases. The water temperature in the waters of Barrang Caddi Island ranges between 26 ºC to 29 ºC. The temperature difference is due to the difference in in situ measurement time for this variable. Water temperature is related to the ability to be heated by sunlight, time of day and location. This is supported by Basmi (1999) and Hutabarat (2000) who say that water absorbs heat more slowly but will store heat longer than land. The spatial distribution of Barrang Caddi water temperature in the picture is as follows

Total Suspended Solids (TSS)

The results of measurements of the variable load of suspended solids in the coastal waters of Barrang Caddi Island show values of 5 mg/l to 14 mg/l. . The difference in suspended solids is thought to be caused by the composition of the bottom water material and the movement of water masses including tidal activity. Stirring by water masses against the substrate is possible in waters. The suspended solids load from measurements in the waters of the Kupang Bay public use zone shows a high value. However, this range is lower than the value obtained by Tarunamulia et al (2001) in Pare-Pare Bay of 241-947 mg/l. Even though it is lower, this value is in the range that is not recommended for cultivation of various types of cultivars. Dissolved solids under certain conditions can disrupt biota, especially respiratory organs.

Salinity

Salinity is the concentration of ions found in waters. Salinity describes the total solids in water after all carbonates have been converted to oxides, all bromides and iodides have been replaced with chlorides and all organic matter has been oxidized. The salinity of open sea water is in the range of 30-36 ppt. Meanwhile, coastal areas have greater variations in salinity. All organisms in water can live in waters that have small changes in salinity.

Tolerance to salinity depends on the age of the shrimp stage. Salinity affects reproduction, distribution, length of life and migration orientation. Variations in salinity in waters far from the coast will be relatively small compared to variations in salinity. Changes in salinity do not directly affect shrimp behavior or shrimp distribution but on changes in the chemical properties of sea water. The salinity of the waters in the waters of Barrang Caddi Island ranges from 31.50 ppt to 35.20 ppt. Salinity affects the osmotic pressure of the medium, so it is important to maintain a balance in the osmolarity of internal and external fluids. Large fluctuations in salinity cause shrimp to be unable to regulate osmosis of body fluids. In general, the average salinity value of the waters of Barrang Caddi Island shows a range that supports mariculture activities. Spatial distribution of water salinity in the waters of Barrang Caddi Island

Sea Water pH

The degree of acidity shows the activity of hydrogen ions in the solution and is expressed as the concentration of hydrogen ions (mol/l) at a certain temperature or pH = - log (H+). The pH range in natural waters is greatly influenced by the concentration of carbon dioxide, which is an acidic substance. Phytoplankton and vegetation In situ measurements of the pH variable in the waters of Barrang Caddi Island show a value range of 7.32 to 8.50. The difference in pH values in the waters is thought to be caused by differences in measurement times. Changes in pH concentration in waters have a daily cycle. is in the range that supports the life of barong shrimp. Spatial distribution of pH in the waters of Barrang Caddi Island Beach.

Disolved Oxygen

The results of in situ measurements of dissolved oxygen variables in the coastal waters of Barrang Caddi Island show a range of 6.54 ppm and the highest value is 8.94 ppm. The variation in dissolved oxygen content is thought to be due to the movement and mixing of water masses as well as the daily cycle of this variable. Relatively open areas have better movement of water masses, allowing for mixing of water masses. The results of measurements of dissolved oxygen in the waters of Barrang Caddi Island Beach show a reasonable range and support mariculture activities. Spatial distribution of dissolved oxygen in the waters of Barrang Caddi Island Beach

Phosphate

Plants in sea water need N and P as PO -4 ions for plants which are called nutrients or macro nutrients. Phosphate content that is higher than the tolerance limit can result in stunted growth. A phosphate content of 0.1011 µg/l - 0.1615 µg/l is a reasonable limit for the normal life of cultivated organisms. (Winanto, 2000). In waters, phosphates are in the form of orthophosphates, organophosphates or organic compounds in the form of protoplasm, and polyphosphates or dissolved organic compounds. Phosphate in solution form is known as orthophosphate and is the form of phosphate used by plants and phytoplancons. Therefore, in connection with The food chain in dissolved orthophosphate waters is very important. Dissolved phosphate is usually produced by input of organic material over land or also from the erosion of phosphorus rocks by water flows and the decomposition of dead organisms. Like oxygen and salinity variables, orthophosphate also has natural values in waters or is a biolimited element. The phosphate content in the waters of Barrang Caddi Island Beach has an unvarying value of 0.01 mg. The absence of this difference is because the source of phosphate in the waters also comes from the process of erosion of rocks on the coast. The phosphate content in the coastal waters of Barrang Caddi Island shows a range that still supports cultivation activities, although it is not within the ideal value. Spatial distribution of phosphate in the coastal waters of Barrang Caddi Island

Nitrate

The measurement results of the nitrate variable show values that vary between 0.03 mg/l to 0.08 mg/l. The nitrate concentration will increase with increasing depth. Normatively, the presence of nitrate in waters is supported by the transport of nitrate to the area, the oxidation of ammonia by microorganisms and the need for primary productivity. Nitrate and phosphate are elements that together influence the growth of phytoplankton. Spatial distribution of nitrate in the waters of Barrang Caddi Island

Determining Locations Suitable for Marine Cultivation of Barong Shrimp

Determining suitability areas for barong shrimp mariculture locations refers to a water suitability matrix which is prepared based on primary variables, secondary variables and tertiary variables. The three variables that make up the suitability matrix are conditional variables, which consist of component variables in physics, chemistry and biology parameters. The relationship between several variable components in physical, chemical and biological parameters with primary, secondary and tertiary variables in the preparation of the suitability matrix can be seen from the large correlation coefficient values formed. The average measurement results of physical, chemical and biological parameters in Table 2 are used as input in the suitability matrix analysis. The score value from this analysis is then evaluated to obtain the suitability class for the type of organism to be developed. The results of this evaluation are a conclusion generally drawn in the waters of Barrang Caddi Island Beach. Meanwhile, to depict the plot of the cultivation development area for barong shrimp, a griding and overlay process is carried out based on the score value of each coordinate, to form a line that has the same value. The total score value using the criteria in Table 2, the average results of measurements of physical, chemical and biological parameters in the waters of Barrang Caddi Island are shown in Table 2.

Table 2. Total Suitability Matrix Score Values for Determining Cultivation Locations in Barrang Caddi Island Waters.

Variabel	Udang Barong
Depth (m)	3
Brightness (m)	6
Current (m s^{-1})	9
Salinity (ppt)	10
Dissolved Oxygen (ppm)	10
pH	3
Temperature (º C)	10
Total Suspended Solids (mg/l)	3
Phosphate (mg/l)	1
Nitrate (mg/l)	3
Phytoplankton Density (cell/l)	15
Basic Aquatic Materials	6
Total Scoring	80
Score Value (%)	61 (in accordance)

Based on the score values in Table 2, an evaluation of the suitability of the waters for the cultivation of Suitable barong shrimp was carried out.

4. CONCLUSIONS

From the results of the analysis of the physical and chemical parameters of marine waters, namely; (a) Physical parameters consist of: depth 4.10 m – 20.5 m, brightness 6.00 m - 8.20 m, current speed 0.14 m / sec - 0.39 m / sec (b). Chemical parameters consist of water temperature ranging from 27.0 ºC - 29.00 ºC, water salinity of 31.50 ppt - 38.20 ppt, (e). A pH of 7.32 - 8.50 is generally still suitable for the survival of barong shrimp. From the results, the suitability value for the location of marine waters for the development of Barong shrimp mariculture in the waters of Barrang Caddi Island was found to be 3.31 ha and 0.60 ha unsuitable.

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How to cite this article: Muhammad Ikhsan Wamnebo, Rustam, PHYSICAL AND CHEMICAL ANALYSIS OF THE WATER ENVIRONMENT (Panilurus SP) FOR SUSTAINABLE DEVELOPMENT OF BARONG SHRIMP (Panilurus, SP) CULTIVATION BUSINESSES. *Asian. Jour. Social. Scie. Mgmt. Tech*. 2024; 6(2): 46-53.