Asian Journal of Social Science and Management Technology
ISSN: 2313-7410
Volume 4, Issue 3, May-June, 2022
Available at www.ajssmt.com

Using GIS Applications for Identification of the Compatibility of Lobster Cultivation Land with KJA Method Based on Water Quality Parameters in Kayeli Bay, Namlea District, Buru Regency, Maluku Province

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ABSTRACT: Lobster (*Panulirus* sp) is a type of marine biota that has important economic value. To find the ideal location for lobster cultivation, it is necessary to conduct a site survey using Geographic Information System (GIS) technology. From August to September 2020, data collection of water quality parameters includes temperature, salinity, pH, DO, current velocity, depth, brightness and water sampling for analysis of suspended solids in the laboratory. The bathymetry map shows that the water depth is 2.30-20.00 m, temperature 28.00-32.00°C, salinity 29.00-32.00 UPS, dissolved oxygen 6.11-7.52 mg/l, pH 8.18-8.38, brightness 1.80-5.11, The suspended solids load 2.90-3.20 mg/l, current 0.10-0.30 m/s. The results of the overlay using the Geographic Information System (GIS) application show that Kayeli Bay is suitable for lobster cultivation using the KJA.

Keywords: Satellite, Mapping, environment, floating net cages, Lobster (*Panulirus* sp.)

1. INTRODUCTION

Kayeli Bay, Namlea District, Buru Regency, Maluku Province is a potential area for the cultivation of sea lobster (*Panulirus* sp.) in floating net cages. This area is a good location because it is protected and has calm waters for lobster cultivation. Lobster (*Panulirus* sp.) is one type of marine biota that has important economic value (Williams, 2007). Indonesian fisheries statistics in 2012 show that lobster ranks as the fourth highest export commodity after Penaeus shrimp (WWF, 2015). One of the export destinations for Indonesian lobster seeds is Vietnam, where the export volume of lobster seeds to Vietnam in 2012 was recorded at 45 kg or US$ 680 (Hilal & Fachri, 2016). When viewed from the number of lobster catches in the world, the lobsters caught are dominated by lobsters from the Nephropidae family (61%), the Paniluridae family (31%) and Scyllaridae (1%) (FAO, 2011). To meet the high market demand for lobster, especially in Asia, Europe and America, lobster cultivation activities have been carried out in several countries including Indonesia (Phillips, 2011). Most lobster cultivation activities are rearing activities by catching seeds (puerulus) from nature. This is due to the unavailability of lobster seeds from cultivation activities (Williams, 2007). To get the ideal lobster cultivation location, it is necessary to conduct a site survey using Geographic Information System (GIS) technology. According to (Prahasta, 2002) that Geographic Information System is a new technology which is currently a very important tool in storing, manipulating, analyzing and displaying natural conditions with the help of

attribute and spatial data. The use of GIS technology can help the analysis to determine the right location for the placement of KJA based on the measurement results of physical, chemical parameters in waters, this method has been widely used to determine the suitability of marine aquaculture lands (Affan, 2012). The purpose of this study was to determine the level of suitability of lobster cultivation land based on water parameters and to map the location of suitability for the placement of floating net cages (KJA). The results of this study can be used as information for lobster cultivators in Kayeli Bay, Namlea District, Buru Regency, Maluku Province.

2. MATERIALS AND METHODS

Study site: This research was conducted from August to September 2020 in Kayeli Bay, Namlea District, Buru Regency, Maluku Province (Fig.1)

Water quality parameter data collection includes temperature, salinity, pH, DO, current velocity, depth, brightness and water sampling for analysis of suspended solids in the laboratory using sample bottles. The results of the water quality analysis are presented in Table 1.

Spatial analysis using the overlay method according to the instructions ((Handayani et al., 2005) (2005) (Fig. 2). Then proceed with the classification process using the matching method based on the concept of the class below beating the class above it, meaning that if one of the parameters is not suitable (N) then the result is N and so on (Ambarwulan & Aris, 2013). Each of these parameters is totaled so that it can be seen the meaning of the suitability level of lobster culture waters in the KJA. The meaning of each level of suitability of KJA aquaculture waters, namely Very suitable (S1), potential area; Appropriate (S2), areas that meet the minimum requirements; In accordance with conditional (S3), areas that have limiting factors and need special treatment; Not suitable (N), areas that are not potential to be developed.

3. RESULTS

The results obtained from this study are as follows. Water Conditions. Kayeli Bay, Namlea District, Buru Regency, Maluku Province is a center for lobster breeding or cultivation with an area of about a thousand hectares but has not been used optimally. The results of water quality measurements at the research site are presented in Table 2.

Suitability Based on Water Quality. Kayeli Bay is a fishing resource center in Namlea District, Buru Regency. The suitability map based on water parameters is presented in Fig. 3.

4. DISCUSSION

The bathymetry map shows that the depth of the waters in the study area ranges from 2.30-20.00 m. The protection of the location is an important parameter, so far the protection of the location can be identified directly in the field by making visual observations based on factors of a location such as the estimation of wave effects (Sulma, S et al., 2005). This is also reinforced by Adipura et al. (2013) which states that the protection of the location (sheltering area) where the cultivation location is assessed from the extent to which the influence of waves can harm the floating net cage location in the event of sea waves. Visually, the protection of the research site for lobster cultivation with KJA is entirely feasible. Water parameter measurements were carried out in situ and showed temperatures ranging from 28.00-32.00°C with an average temperature of 29.73°C, salinity ranged from 29.00-32.00 UPS with an average salinity of 30.25 UPS, Dissolved oxygen ranged from 6.11-7.52 mg/l with an average oxygen of 7.52 mg/l, pH ranged from 8.18-8.38 with an average pH of 8.24, brightness in the field shows a range of values from 1.80-5.11 m with an average brightness of 2.95 m. suspended solids load ranged from 2.90-3.20 mg/l with an average of 2.93 mg/l. current velocity at the research site shows the current velocity varies with the range of 0.10-0.30 m/s with an average current speed of 0.25 m/s.

Analysis of the Suitability of Lobster Cultivation System KJA in Kayeli Bay, Namlea District, Buru Regency, Maluku Province. Of the 12 research stations, most of which are located in the Kayeli Bay area (stations 1, 2, 3, 4, 5, 7, 8) qualified for the placement of floating net cages as a container for lobster cultivation (*Pannulirsu* sp) except for station 6 because it is directly opposite the sea is free so that it gets the influence of the action of

waves and strong currents as well as the shipping lanes for motorized ships entering and leaving the port of Namlea city. Likewise, stations 9, 10, 11, 12 get a greater influence of wave action and currents because they are directly related to the open sea.

Based on the results of the spatial analysis with GIS and the results of the field survey conducted in Teluk Kayeli, then all locations are suitable for lobster cultivation using the KJA system. Optimal water quality for crayfish growth includes temperatures ranging from 28°C-29°C, salinity 33-34 UPS, dissolved oxygen > 5 ppm, ammonia < 0.6 ppm, nitrite < 0.17 ppm (Pratiwi, 2019).

5. CONCLUSION

Based on the results of research that has been carried out in Kayeli Bay, Namlea District, Buru Regency, Maluku Province, it was concluded that the suitability of the floating net cage cultivation location at the research location based on overlay results using a Geographic Information System (GIS) application was feasible for lobster cultivation with the KJA system.

6. REFERENCES

1. Adipura, Y., Lumenta, C., Kaligis, E., & Sinjal, H. . (2013). The suitability of marine cultivation land in the waters of South Bolaang Mongondow Regency, North Sulawesi. *J. Trop. Fish. Mar. Affairs*, *9*(1), 19–26.
2. Affan, J. M. (2012). Identification of locations for the development of floating net cages (KJA) based on environmental factors and water quality in the waters of the east coast of Central Bangka. *Depik Journal*, *1*.
3. Ambarwulan, W., & Aris, S. (2013). *Vector-Based Spatial Analysis: Advanced GIS Training Center for Geospatial Education and Training. Indonesia, BIG.*
4. FAO. (2011). *Yearbook of fishery and aquaculture statistics. Food and agriculture organization of the United Nation. Rome,*.
5. Handayani, U. N. D., Soelistijadi, R., & Sunardi. (2005). Utilization of spatial analysis for spatial data processing of geographic information systems. *J. Dynamic Inf. Technol*, *9*(2), 108–116.
6. Hilal, K., & Fachri, Y. (2016). (2016). Indonesia's interests prohibit the export of lobster seeds to Vietnam in 2015. JOM FISIP, 3(2), 1-15 . *JOM FISIP*, *3*(2), 1–15.
7. Phillips, B. and H. M. (2011). A global review of spiny lobster aquaculture. In *A global review of spiny lobster aquaculture* (pp. 22–84). Blackwell Publishing Ltd., UK.
8. Prahasta, E. (2002). *Basic Concepts of Geographic Information Systems*.
9. Sulma, S, Hasyim, B, Susanto, A., & Budiono, A. (2005). Utilization of Remote Sensing for Determining the Suitability of Marine Cultivation Locations in the Thousand Islands. *Utilization of Remote Sensing for Determining the Suitability of Marine Cultivation Locations in the Thousand Islands.*
10. Williams, K. C. (2007). Williams, K. C. (2007). Nutritional requirements and feeds development for post-larval spiny lobster: A review. Aquaculture 263(1-4), 1-14. https://doi.org/10.1016/j.aquaculture.2006.10.019. *J.Aquaculture*, *263*(1–4), 1–14. https://doi.org/10.1016/j.aquaculture.2006.10.019.
11. WWF. (2015). *Small-scale fishing guide series marine lobster fisheries fishing and handling guidelines*.

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How to cite this article: ***Muhammad Ikhsan Wamnebo, Abdul Rauf, Jayadi, Kamil Yusuf, Using GIS Applications for Identification of the Compatibility of Lobster Cultivation Land with KJA Method Based on Water Quality Parameters in Kayeli Bay, Namlea District, Buru Regency, Maluku Province, Asian. Jour. Social. Scie. Mgmt. Tech.2022; 4(3): 147-152.***

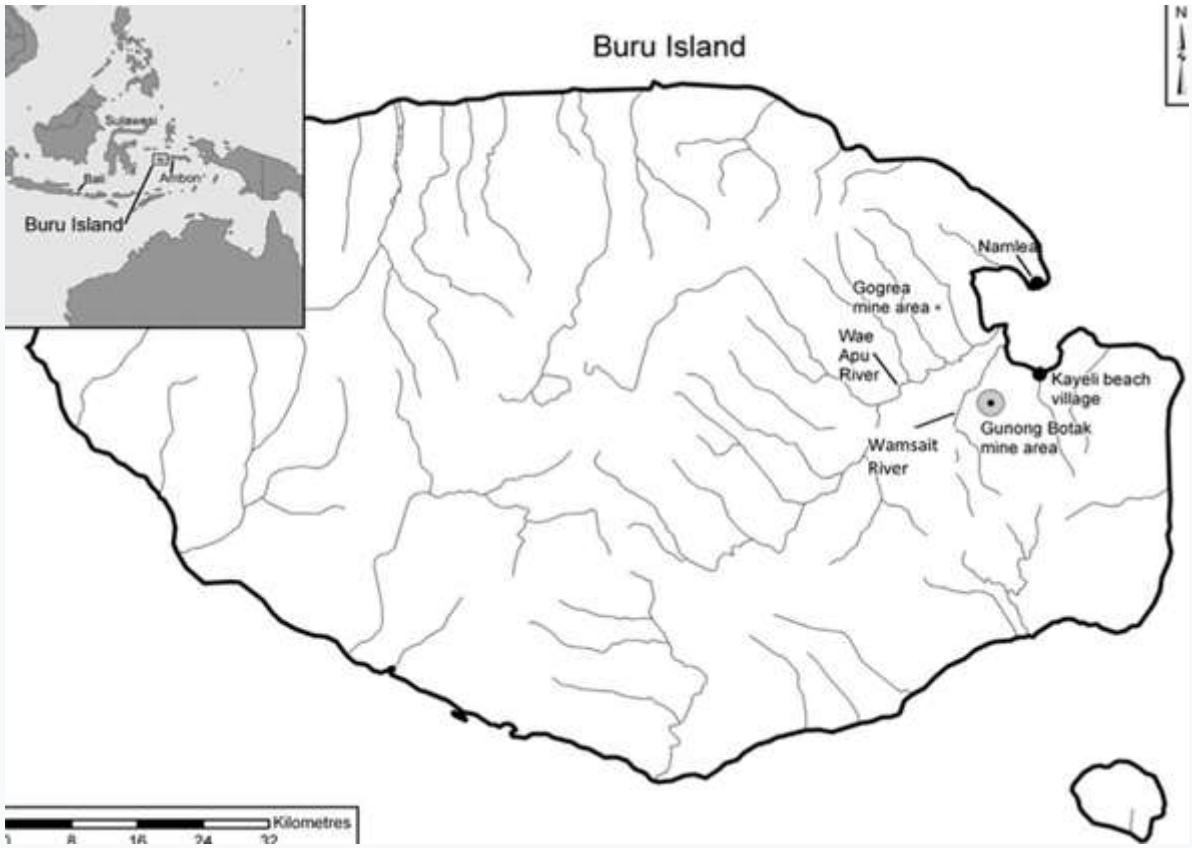

Fig. 1. Location of the study within Kayeli Bay (Ubicación del estudio dentro de la bahía de Kayeli)

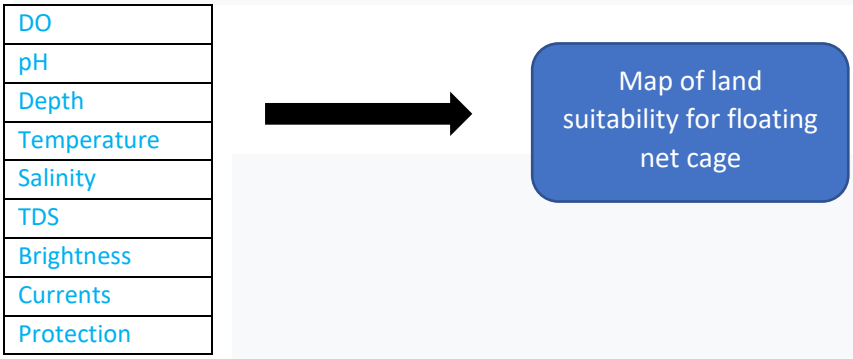

Fig. 2. Overlay process chart (Gráfico de proceso de superposición)

Fig. 3. Map of Stations at the research site (Mapa de estaciones en el sitio de investigación)

Table 1. Parameters used in the suitability of floating net cages (Parámetros utilizados en la idoneidad de las jaulas de redes flotantes)

No	Parameters	Criteria			
		Very Appropriate (S1)	Appropriate (S2)	Conditional (S3)	Not Appropriate (N)
1	Depth (m)	6<S1< 10	10<S2<14	14<S3=6 4<S<6	TS>18 TS< 4
2	Protection	Very protected	Protected	Somewhat Open	Open
3	Temperature (^{o}C)	28<S1<29	29<S2<31 26<S2<20	31<S3<32 24<S3<15	TS>35 TS< 24
4	Salinity (PSU)	20<S1<25	25 <S2 <30 15<S2<20	31<S3<35 10<S3<15	TS>35 TS<10
5	Dissolved oxygen (mg/l)	> 7	5-7	3-5	<3
6	Brightness (m)	5<S1<10	3<S2< 5 10<S2<15	0<S3<3 15<S3<20	TS=0 TS>20
7	TDS (mg/l)	S1<25	25<S2<80	80<S3<400	TS>400

8 pH	6.5<S1<8.5	6<S2<6.5 8.5<S2<9	5<S3<6 S3>9	TS<5	
9 Current (m/s)	0.05-0.15	0.15-0.25	0.25-0.35	< 0.05 & >0.35	

Source: Trisakti (2003) in Agussalim *et al.* (2011); Affan (2012)

Table 2. Results of measurement of chemical and physical parameters at the research site (Resultados de la medición de parámetros químicos y físicos en el sitio de investigación)

X	Y	DO	pH	Depth	Temperature	Salinity	TDS	Brightness	Current	Protection	
127°5'39.464"E	3°16'38.543"S	2.11	8.18	2.30	29.52		30.00	3.10	2.20	0.30	Protection
127°4'17.039"E	3°16'00.126"S	6.52	8.38	9.70	28.30		29.00	3.00	2.30	0.20	Protection
127°2'34.246"E	3°16'29.250"S	7.17	8.37	9.50	28.00		32.00	2.90	2.20	0.30	Protection
127°3'10.224"E	3°19'29.138"S	7.12	8.33	9.20	29.00		29.00	3.20	2.30	0.10	Protection
127°4'20.465"E	3°17'34.352"S	7.51	8.34	12.0	29.50		30.00	3.00	2.00	0.25	Protection
127°5'51.266"E	3°18'42.881"S	7.52	8.12	17.0	30.00		31.00	3.10	2.10	0.27	Unprotection
127°5'15.288"E	3°21'30.776"S	6.11	8.21	8.00	29.50		29.00	2.90	1.80	0.10	Protection
127°7'30.632"E	3°22'60.753"S	6.16	8.21	7.00	30.00		31.00	3.20	2.10	0.17	Protection
127°8'52.866"E	3°19'42.843"S	7.20	8.11	14.0	30.00		31.00	3.00	4.00	0.32	Unprotection
127°9'13.425"E	3°16'25.824"S	7.32	8.17	20.0	32.00		31.00	3.40	5.00	0.36	Unprotection
127°6'51.288"E	3°17'10.367"S	7.17	8.19	14.0	31.00		30.00	3.10	3.50	0.31	Unprotection
127°8'80.323"E	3°18'17.183"S	7.34	8.37	13.0	30.00		30.00	3.30	5.00	0.37	Unprotection