Maritime Technology and Research

https://so04.tci-thaijo.org/index.php/MTR

Research Article

The influence of traditional bottom set gill net dimension with the daily catches of Rastrelliger Faughni at the Karangantu Archipelago Fisheries Port, Banten Province, Indonesia

Dewi Susiloningtyas[1,2,*], Andini Dwi Khairunnisa Daulay[1], Muhammad Yusuf Ridho[2] and Bintang Mahakarya Sembahen[1]

[1]*Department of Geography, Faculty of Mathematics and Natural Sciences, University of Indonesia, West Java, Indonesia*
[2]*Department of Marine Science, Faculty of Mathematics and Natural Sciences, University of Indonesia, West Java, Indonesia*

Article information

Received: May 11, 2023
1st Revision: July 14, 2023
2nd Revision: August 10, 2023
Accepted: September 5, 2023

Keywords
Influence,
Dimension,
Fishing Gear,
Catch Result,
Karangantu Archipelago Fisheries Port

Abstract

The Karangantu Archipelago Fisheries Port has a central role in provincial fisheries in Banten Province, Indonesia. This role shows that fisher catches are necessary to support regional needs, so that the fishing process up to the dimensions of fishing also helps the catch potential. The measurements of the fishing gear refer to the type of fishing gear, the type of vessel (GT), the number of boxes, and the number of fishers who act as crew members (ABK) during the fishing process. This study aims to measure the influence of the dimensions of fishing gear on the catches obtained by fishers at the Karangantu Archipelago Fisheries Port. The research method uses quantitative methods, based on the results of linear regression of the dependent and independent variables, and interviews in data collection. The results show that the variables of ship weight, number of boxes, and number of crew members had a common effect, 0.35 or 35 %, on fish catches. The low coefficient indicates the influence of the dimensions of the fishing gear is not always the primary determinant. There are 65 % physical and production variables to maximize the dimensions of the fishing gear to support increased catches. Based on this influence analysis, it can be used as a reference for maximizing the dimensions of fisher fishing gear to support increased catches, given the role of Karangantu Archipelago Fisheries Port as a supplier of fish at the provincial level.

1. Introduction

In accordance with Indonesia Law No. 45 of 2009 (Undang-undang Republik Indonesia Nomor 45 Tahun 2009, 2023), “fisheries”, as defined by the Ministry of Maritime Affairs and Fisheries, encompass the management and utilization of fish resources and the surrounding environment. This process spans pre-production, production, and processing, and encompasses marketing, within the fisheries industry. The term “help” pertains to the potential for harvesting fish species within a given aquatic region (Saksono, 2013). Given Indonesia’s status as the world’s largest

[*]*Corresponding author: Department of Geography, Faculty of Mathematics and Natural Sciences, University of Indonesia, West Java, Indonesia*
E-mail address: dewi.susiloningtyas@sci.ui.ac.id

archipelagic nation, the fisheries sector holds a pivotal role in achieving national development (Pratama, 2023). With a significant portion of its territory composed of water bodies, approximately two-thirds of Indonesia's landmass, totaling 5.1 million km², Indonesia's vast aquatic resources underscore the necessity for a robust development and management strategy. This strategy is essential to benefit the human resources reliant on these waters, particularly fishers.

Banten Province, one of Indonesia's provinces situated to the west of Java Island, is synonymous with a strategically important area for fisheries (Alam et al., 2017). The Banten region is bordered by three open seas: the Java Sea to the north, the Sunda Strait to the west, and the Indian Ocean to the south. These waters hold significant potential and importance for the fisheries sector. Specifically, in Karangantu, a region within Banten Province, the label of a strategic fisheries area signifies a collection of advantageous characteristics that render it highly valuable for fishing activities and the comprehensive development of the fisheries sector.

Karangantu Archipelago Fisheries Port, categorized as a Type B fishing port, holds a central role within Banten Province's fisheries landscape. Functioning as a hub for fish landing, processing, and distribution activities, the port facilitates the sorting, storage, and preparation of catches for further processing or transportation to markets. Its infrastructure and facilities are tailored to cater to the needs of the local fishing community, supporting economic activities and fostering the growth of the fisheries sector within the region (Diniah et al., 2012; Nature et al., 2017).

Several studies, including works by Hilborn (2007), Daw (2008), Fadlullah et al. (2021), emphasize the significance of understanding the spatial behavior of fishers to effectively manage fish populations. This aspect is particularly relevant in small-scale trap fishing practices, where the location and success of fishing endeavors are intricately linked to water conditions, as highlighted by Alves et al. (2019). Furthermore, fishing practices in Indonesia are influenced by monsoon wind patterns, resulting in distinct west and east monsoon seasons. These seasonal characteristics exert a considerable influence on catching and fishing activities, as observed by Susiloningtyas et al. (2014).

The importance of fisher catches in supporting regional needs is a testament to the crucial role they play. Consequently, effective fishing practices, spanning the catch process and extending to fishing dimensions, contribute significantly to catch potential. Through a field survey conducted at Karangantu Archipelago Fisheries Port, it was identified that fish species predominantly caught by fishers belong to the Rastrelliger sp. genus, commonly referred to as Mackerel Fish. The act of catching fish encompasses activities involving the collection of fish from natural waters, rather than through cultivation. These catches are typically obtained using vessels to transport, store, cool, handle, process, and preserve them.

Catching fish by fishers is intricately linked to implements denoted as Fishing Auxiliary Equipment, which serve as tools for collecting and obtaining fish (in accordance with Indonesia Law No. 45 of 2009 concerning Fisheries). Fishing Auxiliary Equipment encompasses the various dimensions of fishing gear utilized to secure fish catches (Ministerial Regulation of the Ministry of Maritime Affairs and Fisheries, 2023).

Based on field survey findings, it is evident that the dominant type of fishing gear employed by fishers is the Traditional Bottom Gillnet, or "rampus nets", utilized in waters with a depth of 35 - 40 meters, and employed twice daily. Rampus nets, a traditional fishing net constructed from durable materials like nylon or polyethylene, are extensively used in Indonesian coastal areas. Equipped with a wide mouth, these nets are attached to a set of poles or floats to ensure buoyancy in the water.

The dimensions of fishing gear encompass various aspects, including the type of gear, vessel specifications based on gross tonnage (GT), the quantity of fishing boxes, and the count of crew members participating in fishing activities. These dimensions are assumed to significantly impact fish catch weight. Essentially, well-suited fishing gear dimensions can enhance fishing performance, resulting in increased total catch weight. Hence, the current study is designed to evaluate the influence of fishers' fishing gear dimensions on the catches acquired at the Karangantu Archipelago Fisheries Port.

This research aims to bridge the knowledge gap concerning the interrelation between fishing gear dimensions and fish catches, with a specific focus on the traditional bottom gillnets, or "rampus nets", utilized by fishers at the Karangantu Archipelago Fisheries Port in Banten Province, Indonesia. By examining the influence of fishing gear dimensions, vessel specifications, and crew members on fish weight, the study seeks to determine optimal gear dimensions that can augment fishing performance and elevate overall fish yield. In addressing these objectives, this research strives to fill the existing knowledge void regarding the correlation between fishing gear dimensions and fish catches. The insights gained from this study hold valuable implications for the sustainable management of fisheries, aiding in the development of effective strategies, regulations, and guidelines tailored to the Karangantu Archipelago Fisheries Port and the broader fisheries sector. Ultimately, this research endeavors to ensure the long-term sustainability of fish resources and the livelihoods of fishers. Through informed decision-making and management approaches, the study aims to optimize fish catch performance, thereby supporting the attainment of these overarching goals.

2. Materials and methods

The research was conducted in the northern part of Serang City, specifically the Karangantu Archipelago Fisheries Port, located in Banten Village, Kaseman District, Serang City, Banten Province, Indonesia. Karangantu Harbor is located at 06º 02' South Latitude (LS) - 106º 09' East Longitude (BT). At first, the Karangantu Archipelago Fisheries Port began with a residential group that inhabited land in the Cibanten Estuary, which continued to develop into suppliers of regional fish needs so that in, 1976 the Karangantu Coastal Fishery Port (PPP) type C was established. Furthermore, with Fisheries of the Republic of Indonesia Number: PER.29/MEN/2010 dated 30 December 2010, the Karangantu Archipelago Fishery Port was ratified, with an increase in type to B (Direktorat, 2023). In Indonesia, fishing ports are classified into different types based on their characteristics and capabilities. These classifications help determine the level of infrastructure, facilities, and services available at each port. Two commonly known types of fishing ports are Type B and Type C ports. Type B fishing ports are intermediate-level ports that provide essential facilities for fishing activities. They typically have berthing facilities to accommodate fishing vessels, storage areas for fish catches, and basic processing and packaging facilities. These ports play a crucial role in supporting local fishing communities by serving as centers for fish landing, processing, and distribution within their respective regions. On the other hand, Type C fishing ports are more advanced and offer a higher level of infrastructure and services. They have larger berthing facilities capable of accommodating a greater number of fishing vessels. Type C ports often feature improved storage and handling facilities, including cold storage and advanced processing facilities. These ports act as major hubs for fish landing, processing, and distribution, playing a significant role in regional and national fisheries trade. An increase in the type of port is, of course, accompanied by an increase in the responsibility of the port to supply the fish needs of the community, not only within the province but also outside the region. A map showing the research area follows in **Figure 1**.

The data used in this research were primary data and secondary data. Secondary data in this study were obtained through related agencies. The primary data was collected through field surveys in 2022 with observations and interviews. We observed 15 ships to obtain information on the ship's name, owner, number of crew members, ship weight (GT), number of fish storage boxes, fishing gear used, fishing area determination, fishing grounds depth, number of days/trips, total fish catch, fish quantity, fish species, fish length, and fish weight.

Interviews were conducted with respondents who were stakeholders, including fishers with various workplaces, to enrich research data. The research method used quantitative methods based on linear regression results, a statistical technique in the magnitude of the relationship between the independent variable (X) and the dependent variable (Y) (**Figure 2**). In the analysis process through regression techniques, a value known as R square, or the coefficient of determination, applies, which explains how far the dependent data can be explained by the independent data, with a value range of

0 - 1. The greater the value of R square and the closer to number 1, the better the effect obtained. To complement the result, a descriptive analysis was carried out on the correlation test results related to the relationship between the dimensions of fishers fishing gear and the fish catches of fishers at the Karangantu Archipelago Fisheries Port. The independent variables in this study include the number of crew members, the weight of the ship, and the number of boxes. Meanwhile, the dependent variable refers to the catches of fishers. The use of research data includes primary and secondary, where the dominance of the data used was of the primary type collected through field surveys at port locations and interviews with informants and fishers. The data collection table in this study is as follows (**Table 1**).

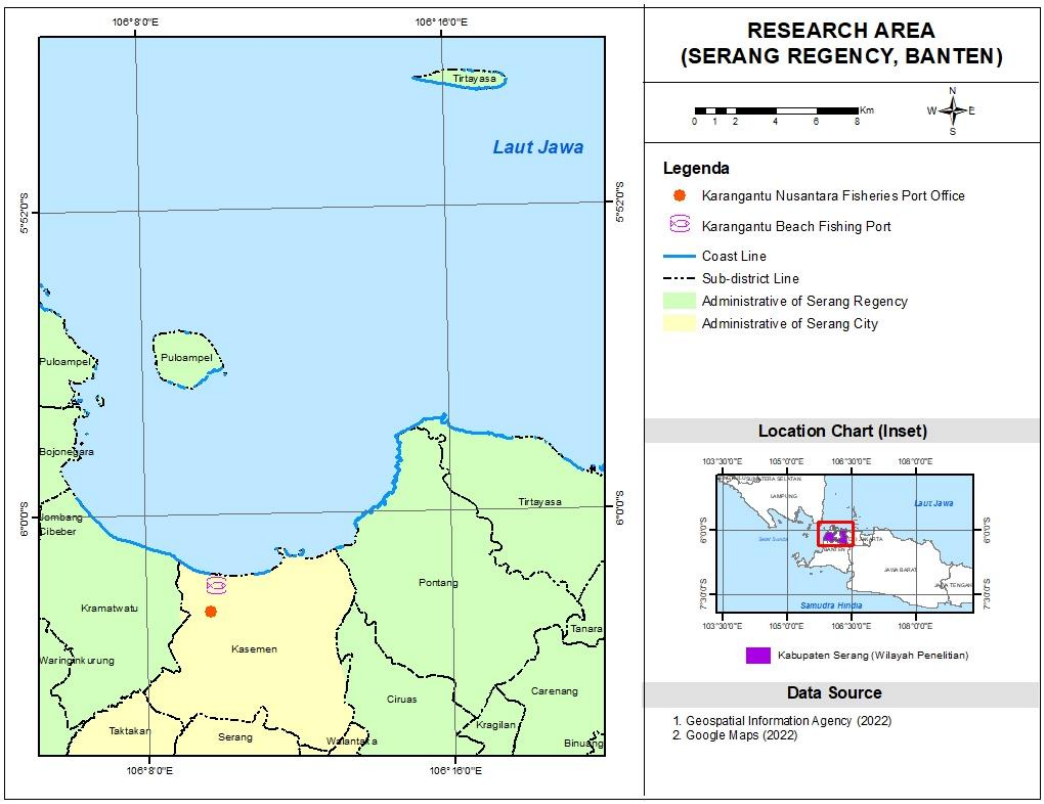

Figure 1 Research area.
Source: Data Processing (2022)

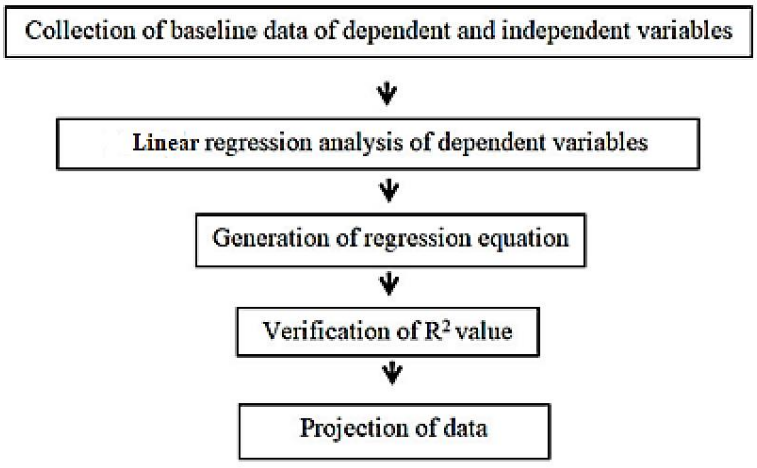

Figure 2 Linear regression process.
Source: Authors (2022)

Table 1 Case studies and used methods.

Data	Year	Source
Number of Crew Members	2022	Field survey
Ship Weight (GT)	2022	Field survey
Number of Boxes on Ship	2022	Field survey
Daily Catch Results	2022	Field survey
Territory and Coastline Administration	2022	Geospatial Information Agency

Table 2 Primary data collection.

Ship	Number of Crew Members (Persons)	Ship Weight (GT)	Minimum Number of Boxes (pc)	Maximum Number of Boxes (pc)	Number/Result of Daily Catch (kg)
Ship 1	5	6	3	5	15
Ship 2	5	5	3	5	10
Ship 3	5	5	3	5	23
Ship 4	5	5	3	5	17
Ship 5	5	2	3	5	13
Ship 6	5	6	3	5	15
Ship 7	5	6	3	5	15
Ship 8	5	6	3	5	24
Ship 9	5	2	3	5	10
Ship 10	5	5	3	5	18
Ship 11	5	5	3	5	18
Ship 12	5	2	3	5	20
Ship 13	5	5	3	5	18
Ship 14	5	5	3	5	14
Ship 15	5	2	3	5	17

Source: Author (2022)

3. Results

Dimensions of fishing gear around Karangantu Harbor

Field surveys were conducted in 2022 at the Karangantu Archipelago Fisheries Port, where primary data collection through informants was urgently needed to complete the required data (**Figures 3 - 6**). The data used in the research were as follows (**Table 2**).

Figure 3 Observation of fishing vessels at Karangantu Archipelago Fisheries Port.
Source: Author Documentation (2022)

Figure 4 Box on a fishing boat.
Source: Author Documentation (2022)

The field survey results showed that there were 15 informants as research samples who came from 4 types of vessels: Sri Maju Ship, Sinar Laut 03, Sinar Laut 01, and Putra Putri 02. Overall, the fishing gear used by all fishers was in the form of rampus nets, with the areas of fishing grounds (DPI) Mujan Island and Tunda Island. The number of crew members on each ship and the minimum and the maximum number of boxes were the same on all ships. Data variations were found in the weight of the vessels, which were in the range of 2 - 6 GT, and daily catch, weighing 10 - 24 kilograms.

Figure 5 Interview with male and female fishers.
Source: Author Documentation (2022)

Figure 6 One of the catch.
Source: Author Documentation (2022)

Table 3 Linear regression of fishing gear and daily catch.

Regression Statistics	
Multiple R	0.592935
R Square	0.351572
Adjusted R Square	0.092201
Standard Error	3.842768
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	80.06464	20.01616	1.355478	0.316141316
Residual	10	147.6687	14.76687		
Total	14	227.7333			

	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95 %***	***Upper 95 %***	***Lower 95.0 %***	***Upper 95.0 %***
Intercept	13.88	3.04	4.57	0.00	7.11	20.64	7.11	20.64
Number of Crew Members (Persons)	0	0	65535	0	0	0	0	0
Ship Weight (GT)	0.58	0.64	0.90	0.00	-0.85	2.01	-0.85	2.01
Minimum Number of Boxes (pc)	0	0	65535	0	0	0	0	0
Maximum Number of Boxes (pc)	0	0	65535	0	0	0	0	0

The regression results show that the influence of the variable ship weight, number of boxes, and crew members has a low effect, 0.35 or 35 % (**Table 3**), on fish catches, with observations made 15 times at a 95 % confidence level. The low coefficient shows that the influence of the dimensions of the fishing gear is not always the primary determinant, where 65 % of other variables can affect the number of fish caught. This condition is different from the study of Susiloningtyas et al. (2014) who conducted a correlation analysis of fishery assets/fishing gear affecting the amount of fish caught in both the east and west monsoons. The significant value found shows that the difference in catch is closely related to the use of fishing gear, where the results of the linear regression of this study show the opposite. Differences in location elements that affect geographical conditions, and objects of catch in the form of squid, have the potential to bring up differences in this research.

4. Discussion

Based on the research by Limbong et al. (2017), related to other factors that affect catch unit yields, it was found that the factors of net length, net height, and boat engine power affected the size of the catch. Meanwhile, Irawan's research (2013) found that the HP of the engine, the captain's experience, the DPI distance, and the amount of fuel affected the fish catch. Physically, other factors affect fish distribution so affecting the catcher's results. In contrast, the factors were temperature, current speed, depth, brightness, turbidity, water fluctuation, pH, alkalinity and ammonia, and even dissolved oxygen (Ismail, 2014). Based on these factors, the small effect obtained through the results of linear regression does not include many factors that are produced or other physical factors that can affect the process and results of the catch. The seasonal element also plays an essential role in the fishing process. According to Assad (2019), the seasonal element is related to monsoon winds which can affect the number of catches, where the dry season has a more excellent value than the rainy season. Time in field surveys is also a concern in research, to avoid habitual results due to the influence of weather differences.

The field survey conducted at the Karangantu Archipelago Fisheries Port in 2022 involved 15 research samples from four types of vessels: Sri Maju Ship, Sinar Laut 03, Sinar Laut 01, and Putra Putri 02. The primary data collection revealed that all fishers used rampus nets as their fishing gear, with fishing grounds located at Mujan Island and Tunda Island. The number of crew members and the minimum and maximum number of boxes were consistent across all ships. However, variations were found in the weight of the vessels, ranging from 2 to 6 GT, and the daily catch weight, ranging from 10 to 24 kilograms.

Linear regression analysis was conducted to examine the relationship between fishing gear dimensions and daily fish catches. The results revealed a low effect, with a coefficient of determination (R-squared) of 0.35 or 35 %. This implies that only 35 % of the variation in fish catches can be explained by the dimensions of the fishing gear, while the remaining 65 % is influenced by other variables. The findings of this study differ from the results reported by Susiloningtyas et al. (2014), who conducted a correlation analysis and found that fishery assets and fishing gear significantly affected the amount of fish caught during both the east and west monsoons. In contrast, the linear regression in this study shows contradictory results, indicating that the dimensions of the fishing gear were not the primary determinant of fish catches. This suggests that there are other factors not accounted for in the analysis that influence the number of fish caught.

One possible explanation for the discrepancy in results could be the differences in location-specific elements that affect geographical conditions and the targeted species, particularly in relation to squid catches. The specific environmental conditions and variations in catch objects among locations have the potential to introduce differences in research outcomes. It is important to note that factors beyond fishing gear dimensions may play a significant role in fish catches. Physical factors such as temperature, current speed, depth, brightness, turbidity, water fluctuation, pH, alkalinity, ammonia, and dissolved oxygen, as well as seasonal influences such as monsoon winds, were not explicitly considered in this study, but could have contributed to the observed variations.

The results highlight the complexity of factors influencing fish catches and emphasize the need for a more comprehensive understanding of the dynamics involved. Future research should consider incorporating a broader range of variables, including those identified in previous studies, to gain a more complete understanding of their influence on fishing outcomes.

The low coefficient of determination (R-squared) suggests that there are multiple factors, beyond the dimensions of fishing gear, that contribute to variations in fish catches. These factors could include environmental conditions, targeted species, fishing techniques, and other variables not explored in this study. By considering these factors in future research, a more holistic understanding of the factors affecting fish catches can be gained. The findings indicate that managing fish catches requires a multidimensional approach that considers various factors beyond just the dimensions of fishing gear. Strategies aimed at optimizing fish catches should take into account location-specific conditions, environmental variables, seasonal influences, and other factors identified in previous studies. The research results emphasize the need for sustainable and integrated fisheries management approaches that encompass a comprehensive understanding of the factors influencing fish catches. By incorporating the knowledge gained from this study and previous research, stakeholders can develop effective strategies to ensure the long-term health and productivity of fishery resources. It is worth noting that the limitations of this study should be considered when interpreting the results. The small sample size and the focus on a specific geographical location may limit the generalizability of the findings. Future studies should aim to expand the sample size, include a wider range of locations, and consider additional variables to provide a more comprehensive analysis of the factors influencing fish catches. Further research is also needed to explore the influence of other variables, such as environmental factors and fishing techniques, on fish catches. By considering these additional factors, researchers can gain a more comprehensive understanding of the complexities involved in fish catch dynamics and contribute to the development of effective fisheries management strategies.

5. Conclusions

In conclusion, the field survey conducted at the Karangantu Archipelago Fisheries Port in 2022 sheds light on the intricate interplay of factors influencing fish catches. While ship weight was found to exhibit variations among vessels, the linear regression analysis suggests that it is not the sole determinant of fish catch outcomes. The modest coefficient of determination (R-squared) of 0.35 indicates that only a portion of the variability in fish catches can be attributed to the dimensions of the fishing gear, including ship weight. The remaining 65 % of the variation underscores the significant influence of other unexplored variables. This study's findings diverge from prior research, highlighting the complex nature of fish catch dynamics. The influence of location-specific elements, environmental conditions, seasonal effects, and targeted species could be pivotal in explaining the observed differences in catch outcomes. The correlation between ship weight and fish catches is influenced by a multitude of interacting factors beyond the scope of this analysis. The study underscores the necessity for a comprehensive understanding of the intricate dynamics involved in fishery management. Effective strategies for optimizing fish catches must transcend a narrow focus on gear dimensions and embrace a multidimensional approach. Sustainable fisheries management necessitates considering a broad spectrum of variables, encompassing environmental conditions, fishing techniques, seasonal influences, and targeted species. While the study's limitations, such as the small sample size and the specific geographical focus, warrant cautious interpretation, they also provide a foundation for future research. Expanding the sample size, incorporating diverse locations, and investigating additional variables will offer a more nuanced comprehension of the factors shaping fish catch outcomes. In essence, this study serves as a reminder that successful fisheries management requires an integrated and holistic perspective. By considering the intricacies of location-specific conditions and the complex interactions between various influencing factors, stakeholders can develop informed and effective strategies to ensure the long-term sustainability and productivity of fishery resources.

Acknowledgement

This research was financially supported by the University of Indonesia under the International Indexed Publications (PUTI) Post-graduate Program, with a contract number of NKB-278/UN2.RST/HKP.05.00/2022.

References

Alam, A., Sardiyatmo, & Dian, N. N. D. (2017). Feasibility analysis of stick held dip net in Nasional Fishing Port (PPN) Karangantu Serang Banten. *Journal of Fisheries Resources Utilization Management and Technology, 6*(3), 106-114.

Alves, L. D., Beneditto, A. P. M., & Zappes, C. A. (2019). Ethnooceanography of tides in the artisanal fishery in Southeastern Brazil: Use of traditional knowledge on the elaboration of the strategies for artisanal fishery. *Applied Geography, 110*, 102044. https://doi.org/10.1016/j.apgeog.2019.102044

Assad, S. I., & Priyono, M. S. (2019). *Analisis Peran Cuaca dan Iklim Terhadap Hasil Tangkapan Ikan Nelayan di Pesisir Utara Jawa (Pantura) di TPI (Tempat Pelelangan Ikan) Tambak Lorok Kelurahan Tanjung Mas Kecamatan Semarang Utara*. Universitas Muhammadiyah Surakarta.

Daw, T., Maina, J., Cinner, J. E., Robinson, J., Wamukota, A., Gerry, C., Abunge, C., Thoya, P., Abernethy, K. E., Cedras, M., Mwaura, J., & Ndegwa, S. (2011). *The spatial behaviour of artisanal fishers: Implications for fisheries management and development (Fishers in Space)*. Final Report, Working Paper, WIOMSA.

Direktorat, K. P. (2023). *Pelabuhan Perikanan Nusantara (PPN) Karangantu*. Retrieved from https://pipp.kkp.go.id/Ct_menu/profildetailland/127

Fadlullah, M., Susiloningtyas, D., & Handayani, T. (2021). Spatial pattern of fishing activities at Yogyakarta waters (Case study: Fishers at Depok beach, Parangtritis village, Bantul regency). *Journal of Physics: Conference Series. 1943*. 012008. https://doi.org/10.1088/1742-6596/1943/1/012008. 1943 012008

Hilborn, R. (2007). Managing fisheries is managing people: What has been learned? Fish and Fisheries, 8: 285-296. https://doi.org/10.1111/j.1467-2979.2007.00263_2.x

Irawan, B. (2013). *Faktor-Faktor Produksi Yang Mempengaruhi Hasil Tangkapan Pada Alat Tangkap Purse seine Di Pelabuhan Perikanan Pantai Mayangan. Kota Probolinggo* (Sarjana Thesis). Universitas Brawijaya, Indonesia.

Ismail, M. (2014). *The factors causing the declining fish catchees reservat and efforts to improve the function of fresh water fish*. Retrieved from https://ejurnal.balitbangda.kukarkab.go.id/index.php/gerbangetam/article/download/82/60/114#:~:text=Beberapa%20faktor%20fisika%20perairan%20yang.%2C%20pH%2C%20alkalinitas%20dan%20amoniak

Limbong, I., Wiyono, E., & Yusfiandayani, R. (2017). Factor affecting the production of purse seine unit in Fishing Base Sibolga Fishing Port, North Sumatera. *Jurnal Albacore, I*(1), 089-097. https://doi.org/10.29244/core.1.1.89-97

Ministerial Regulation of the Ministry of Maritime Affairs and Fisheries. (2023). *Number 18 of 2021 regarding the placement of fishing equipment and fishing auxiliary equipment in the Indonesian State Fisheries Management Area and High Seas and Arranging Andon Fishing*. Retrieved from https://jdih.kkp.go.id/peraturan/f06f4-permen-kp-18-tahun-2021.pdf

Pratama, O. (2023). *Konservasi Perairan Sebagai Upaya menjaga Potensi Kelautan dan Perikanan Indonesia*. Kementerian Kelautan dan Perikanan RI. Retrieved from https://kkp.go.id/djprl/artikel/21045-konservasi-perairan-sebagai-upaya-menjaga-potensi-kelautan-dan-perikanan-indonesia

Saksono, H. (2013). Ekonomi Biru: Solusi Pembangunan Daerah Berciri Kepulauan. Studi Kasus Kabupaten Kepulauan Anambas. *Jurnal Bina Praja, 5*(1), 1-12. https://doi.org/10.21787/JBP.05.2013.01-12

Susiloningtyas, D., Boer, M., Adrianto, L., & Julianto, F. (2014). The influence of fishing assets and migration time to catch squid fisheries on seasons variability. *Indonesian Journal Geography, 46*(1), 22-29. https://doi.org/10.22146/ijg.4987

Undang-undang Republik Indonesia Nomor 45 Tahun 2009. (2023). *Tentang Perubahan UU No.31 Tahun 2004 Tentang Perikanan*. Retrieved from https://jdih.kkp.go.id/peraturan/uu-2009-45.pdf