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Efficiency of Unloading Time of Fish Catches at Nusantara Sibolga Fishery Port, North Sumatra

Efisiensi Waktu Pembongkaran Hasil Tangkapan Ikan di Pelabuhan Perikanan Nusantara Sibolga, Sumatera Utara

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Abstract

Unloading efficiency is the optimal outcome of well-executed, quick unloading activities that avoid wasted time. This research aims to determine the efficiency of unloading fish catches and the factors that influence it at the Sibolga Archipelago Fisheries Port (PPN). This research was carried out at the Archipelago Fisheries Port (PPN) Sibolga, Central Tapanuli Regency, North Sumatra Province, from 19 January to 20 February 2024. The method used in this research was a survey. Then, the sample determination method uses purposive sampling, namely, samples selected according to predetermined criteria; 50 samples were collected using data analysis of demolition time efficiency and multiple linear regression. The variables observed were the ship's size, the number of catches, the number of unloaders, the number of sorters, and the amount of wasted time. The results of this research show that time efficiency is 76%. Then the R-squared value is 0.72, and the multiple R value is 0.84. Furthermore, the calculated F value was 22.665, and the F table was 3.545. It can be concluded that the unloading efficiency at the Sibolga Archipelago Fisheries Port (PPN) is 76%, which is considered efficient.

Keywords: Unloading time efficiency, Catch yield, Purse seine

Abstrak

Efisiensi waktu pembongkaran adalah hasil optimal dari kegiatan pembongkaran ikan dengan yang dilakukan dengan baik dan waktu yang cepat tanpa menyianyiakan waktu. Penelitian ini bertujuan untuk mengetahui efisiensi waktu pembongkaran hasil tangkapan ikan dan faktor-faktor yang mempengaruhi efisiensi waktu pembongkaran hasil tangkapan ikan di Pelabuhan Perikanan Nusantara (PPN) Sibolga. Penelitian ini dilaksanakan di Pelabuhan Perikanan Nusantara (PPN) Sibolga, Kabupaten Tapanuli Tengah, Provinsi Sumatera Utara pada 19 Januari -20 Februari 2024. Metode yang digunakan dalam penelitian ini adalah metode survei. Kemudian metode penentuan sampel dengan menggunakan *purposive sampling* yaitu menggunakan sampel yang sudah ditentukan kriterianya, sampel yang terkumpul sebanyak 50 sampel dengan menggunakan analisis data efisiensi waktu pembongkaran dan regresi linear berganda. Variabel yang diamati yaitu ukuran kapal, jumlah hasil tangkapan, jumlah tukang bongkar, jumlah tukang sortir, dan waktu terbuang. Hasil penelitian ini menunjukkan bahwa efisiensi waktu sebesar 76%. Kemudian nilai R^2 sebesar 0,72 dan nilai multiple R sebesar 0,84. Selanjutnya diperoleh nilai F hitung sebesar 22,665 dan

F tabel diperoleh sebesar 3,545. Hal ini dapat disimpulkan bahwa efisiensi waktu pembongkaran hasil tangkapan di Pelabuhan Perikanan Nusantara (PPN) Sibolga memiliki tingkat efisiensi sebesar 76% yang tergolong efisien.

Kata kunci: Efisiensi waktu Pembongkaran, Hasil tangkapan, *Purse seine*

1. Introduction

The Nusantara Fisheries Port (PPN) Sibolga is located on Jenderal Gatot Subroto Street, Pondok Batu, Sarudik District, Central Tapanuli Regency, North Sumatra Province. This Type B or Class II fisheries port is situated at coordinates 01°02′015″ S and 100°23′034″ E (Ranto et al., 2021). Located on the west coast of Sumatra Island, PPN Sibolga occupies a highly strategic position for capture fisheries activities. PPN Sibolga produces fish catches from fishing vessels using various fishing gears, including purse seines, handlines, boat lift nets, and trawl nets; however, fishermen at PPN Sibolga predominantly use purse seines. The purse seine operated in Sibolga is an industrial-scale fishing gear that utilizes vessels with a capacity of more than 50 GT (Bancin et al., 2020).

Purse seine nets are used to catch schooling pelagic fish. The components of a purse seine net include the net body, bunt, floats, sinkers, upper ris line, lower ris line, purse line, and rings (Supriadi et al., 2021). According to Rumpa (2019), there are two types of purse seines manufactured in Indonesia: the American- and Japanese-type purse seines. The difference between these two types lies in the position of the bunt. American-type purse seines have the bunt located at the side, while Japanese-type purse seines have the bunt positioned in the center. The purse seine fishing gear used by vessels operating in Sibolga is predominantly the American type, as fishermen operate only a single vessel. The square-shaped design (American type) is easier to operate and resembles a bowl-like form (Mardiah et al., 2020). The increased fish catch obtained from the use of purse seine gear has encouraged fishermen to increase the size of their vessels. The fish species most frequently caught using purse seines at PPN Sibolga include skipjack tuna, tuna, frigate tuna, scad, and other pelagic fish species.

Skipjack tuna and yellowfin tuna landed at PPN Sibolga are leading commodities with relatively high market prices, both for domestic consumption and export purposes (Tumonda et al., 2017). Therefore, proper fish handling is essential to maintain fish quality, one of which is reducing unloading time (Litaay et al., 2020). Unloading time efficiency refers to the optimal outcome of properly conducted fish unloading activities, achieved in a short time without wasted time (Nardi et al., 2013). Improving time efficiency aims to maintain the quality of landed fish and reduce berthing costs for vessel owners.

Factors affecting unloading time efficiency include vessel size, unloading workers, sorting workers, age of unloading workers, age of sorting workers, experience of unloading workers, experience of sorting workers, wasted time, catch volume, unloading duration, fish species, labor wages, weather changes, price discrepancies between buyers and auctioneers, and berthing costs. This is supported by Akmal et al. (2017), who stated that fish species and size, total catch volume, fish unloading methods, number of workers, and vessel size are among the factors influencing the duration of fish unloading. If unloading activities are conducted more efficiently, the berthing costs incurred by fishermen will decrease, and the queue of vessels waiting to land their catch will also be reduced.

Each fisheries port should have an effective standard for unloading time efficiency. However, the unloading efficiency at this port has not yet been determined, leading some workers to prolong the unloading process intentionally. The ideal condition is characterized by minimal wasted time, which indicates higher efficiency; conversely, greater wasted time indicates lower efficiency (Zain, 2015). Based on this background and the identified problems, this study was conducted to analyze the efficiency of fish unloading time at the Nusantara Fisheries Port (PPN) Sibolga and to identify the factors influencing unloading time efficiency, including vessel size, labor characteristics, and catch volume.

2. Material and Method

2.1. Time and Place

This study was conducted at the Nusantara Fisheries Port (PPN) Sibolga, Central Tapanuli Regency, North Sumatra Province, from 19 January to 20 February 2024.

2.2. Methods

The method employed in this study was a survey method. Sample selection was carried out using purposive sampling. The sampling criteria consisted of fishing vessels with a gross tonnage (GT) of 50 to 122 GT and the use of purse seine gear. A total of 50 samples were included in this study.

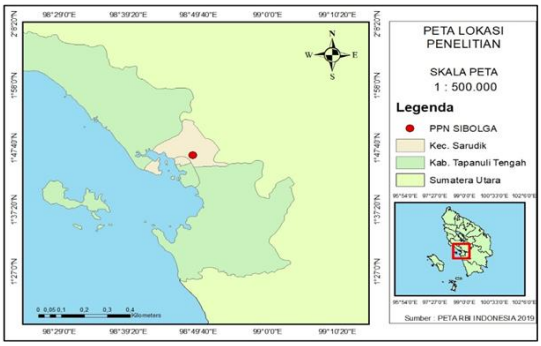

Figure 1. Map of the PPN Sibolga

2.3. Procedures

This study employed a survey method. The working procedure began with the preparation of stationery, a stopwatch, and a mobile phone camera for documentation and research. Time measurement was conducted by activating the stopwatch at the start of the unloading process, beginning from the opening of the hatch cover until the weighing of the fish was completed. During this process, wasted time and time spent unloading fish were recorded. Furthermore, interviews were conducted with unloading and sorting workers using prepared questionnaires to obtain information on factors affecting the efficiency of fish landing time at PPN Sibolga, including vessel size, the number of unloading workers, the number of sorting workers, and the volume of fish catch unloaded. The collected data were then processed in Microsoft Excel.

2.3.1. Unloading Time Efficiency of Fish

The efficiency of fish unloading time in relation to vessel berthing time for purse seine fishing gear was calculated using the formula proposed by Zain (2015) as follows:

$$E = \frac{WE}{WT} \times 100\%$$

Note: E = Level of unloading time efficiency (%); WE = Effective time used for fish catch unloading activities (minutes); WT = Fish catch unloading time (minutes)

The criteria for unloading time efficiency are classified into four levels according to Alfin (2013):

Table 1. Criteria for unloading time efficiency

No.	Efficiency Level	Efficiency Value
1.	Efficient	75% - 100%
2.	Less efficient	50% - 74,99%
3.	Inefficient	25% - 49,99%
4.	Extremely inefficient	<25%

2.4. Data Analysis

The collected data, comprising primary and secondary data, were compiled and analyzed using descriptive and statistical approaches to determine the conditions of fish catch unloading activities at PPN Sibolga. Statistical analysis is the analysis of sample data, with the results used to describe the characteristics of a population. The suitability of the unloading process that exceeds normal standards is commonly referred to as unloading time efficiency. To determine the effectiveness of fish catch unloading activities at PPN Sibolga, calculations were performed by comparing the computed results with the observed data.

3. Result and Discussion

3.1. Fish Catch Production

Catch production is one indicator of the level of functionalization of fishing ports or fish bases. Therefore, the production of catches is an important component of fishing ports that must be taken into account. The production of fish catches at the Sibolga VAT over 1 month is shown in Table 2.

Table 2. Fish production from January 19 to February 20, 2024, at the Nusantara Fisheries Port (PPN) Sibolga.

Number of Fish Caught (Month)	Quantity (kg)
19 January - 20 February 2024	612.923

Based on Table 2, at the time of the study, 50 ships unloaded at the Sibolga VAT from January 19 to February 20, 2024, with a total catch of 612,923 kg. The number of catches is in agreement with (Nelwan et al., 2016) states that the catch is very important because it shows how much fishing effort is made to utilize fish resources, as well as how big the catch is determined by the size of the fishing gear and the length of the fishermen's process to get

the catch, therefore the catch will determine how much the catch is in a fishing area. Environmental factors, such as season, can affect catch, as seen in research at the Lempasing PPP in Lampung Bay, where the pelagic fishing season with mini purse seine mainly occurs in May-September, with a peak in June-August. Wind speed, rainfall, and the number of rainy days are shown to have a significant effect on catch.

3.2. Efficiency of Fish Catch Dismantling Time

One way to measure the efficiency of a fish's unloading time is to look at how well they manage their unloading time. At the time of the study, 50 ships landed fish catches at the Sibolga VAT. The ship usually stays in port for 10-15 days. The number of catches is shown in Table 2. The efficiency of the time required to unload fish catches at the Nusantara Fisheries Port (PPN) Sibolga is shown in Table 3. The parameters of wasted time (minutes), effective unloading time (minutes), overall time (minutes), and time efficiency are as follows (Table 3).

Table 3. Efficiency level of fish catch unloading time for 1 month at Sibolga VAT

W. Wasted (minutes)	W. Effective unloading (minutes)	W. overall (minutes)	Efficiency %
133,3	411,2	544,5	76%

Based on Table 3, the efficiency of the time required to unload fish catches at the Sibolga VAT is 76%, which means it is classified as efficient, as it falls within level 1 (75% - 100%) according to the criteria in Table 1. Effective time is the time used solely to unload fish catches at the Nusantara Sibolga Fisheries Port. The effective time, based on 50 types of fishing boats using ring trawling equipment, observed over 1 month of the study, was 411.2 minutes, while the overall dismantling time over 1 month of the study was 544.5 minutes.

Time efficiency at fishing ports has a significant influence on time management; if unloading activities are carried out quickly, it is better. Efficiency at fishing ports greatly affects overall time management, as the faster the dismantling process is carried out, the more effectively existing resources are used. On the other hand, the waiting time for fish at the port will be shorter, thereby better maintaining the quality and freshness of the fish, ultimately improving the selling price and income of fishermen.

3.3. Analysis of Factors Affecting the Efficiency of the Dismantling Time of Fish Catch

This regression analysis aims to find out whether or not there is an influence between independent variables, namely: X1= Ship size (GT), X2= Catch (tons), X3= Number of unloading actors (souls), X4= Number of sorting actors (souls), X5 = Wasted Time (minutes), against the dependent variable Y = Unloading time efficiency (%).

Table 4. Multiple linear regression analysis of factors affecting the time efficiency of dismantling fish catches

Variabel	Coefficients	t Stat	*P-value*
Intercept	92,482	13,293	5,197
Ship size (X1)	-0,040	-0,789	0,434
Catch (x2)	0,001	3,559	0,001
Number of Unloading Perpetrators (X3)	-0,534	-0,953	0,346
Number of Sorters (x4)	0,282	0,358	0,722
Wasted time (x5)	-0,221	-9,601	2,307

Analysis of factors affecting the efficiency of unloading fish catches in the Sibolga VAT, using these free variables, yielded the following equation: Y = 92,482 - 0.040 X1 + 0.001 X2 - 0.534 X3 + 0.282 X4 - 0.221 X5. The result of this equation can be interpreted as the efficiency of the time of unloading fish catch is influenced by 5 factors, namely, the size of the vessel (GT), the catch (tons), the number of unloading actors (people), the number of sorting actors (people), and the time wasted (minutes).

The intercept value (a) of the regression contained in the equation is 92.482, meaning that the 5 variables above have a positive influence on Y. The value of the b2 coefficient of the number of catches (tons) X2 is 3.559, meaning that every increase in the number of fish catches will increase efficiency by 3.559. This means that the amount of catch affects the efficiency of the demolition time. The tendency of the positive value coefficient shows that the more fish caught in the Sibolga PPN, the more efficient the time will be. However, this differs from the research of Novianti et al. (2013), who found a strong correlation between the number of catches and the efficiency of unloading time: the more catches, the longer the unloading time, resulting in wasted time.

The value of the ship size b1 coefficient (X1) of -0.040 means that any increase in ship size will decrease the time efficiency level by 0.040. This means that the size of the vessel affects the efficiency of the fish unloading time. A negative coefficient indicates that the larger the ship, the less time-efficient it is. However, it differs from Akmal et al. (2017), who stated that the relationship between ship size and unloading time efficiency is positive. The larger the ship, the greater the positive effect on efficiency, and vice versa.

The value of the b3 coefficient of the number of unloading actors (X3) is -0.534, meaning that any increase in the number of unloading actors will reduce the efficiency of the fish unloading time by 0.534. This means that the number of unloading perpetrators affects the efficiency of fish unloading time. The coefficient has a negative value, which means that the more perpetrators of unloading, the less efficient the time will be. However, this can

be related to the number of catches, the size of the ship, and the time wasted, where, with the same number of catches and the same ship size, the number of different unloading perpetrators can affect the efficiency of unloading time. In addition, the dismantling process is not confined to one place, so during the dismantling, the perpetrators do not receive full supervision from the ship owner or foreman, which means there may be times that are not intended in the dismantling process. This is different from Akmal et al. (2017), who stated that the greater the number of loading and unloading actors, the more time-efficient.

The value of the b4 coefficient of the number of sorters (X4) is 0.282, which means that every increase in the number of sorters will increase the level of efficiency of the fish unloading time by 0.282. This means that the number of sorters affects the efficiency of the fish unloading time. The coefficient for the number of sorting perpetrators is positive for dismantling time efficiency, so that the greater the number of sorters, the more effective the time used in the dismantling process. Women sort in one place, which improves efficiency.

The value of the wasted time coefficient (X5) of b5 is -0.221, meaning that any increase in wasted time will reduce the efficiency of fish unloading time by 0.221. This means that wasted time reduces the efficiency of fish unloading. The coefficient has a negative value, which means that the more time is wasted, the less efficient the dismantling time will be. The wasted time during the dismantling of the catch at the Sibolga VAT is due to breaks taken by perpetrators, changes in the weather, and other factors. According to Ilyas (2016), wasted time is caused by weather changes, the arrival of the ship when the perpetrator unloads, and the activity of waiting for the unloading car that brings the catch to the fish auction PT, or carrying out other activities that are not related to unloading.

4. Conclusions

Based on the results of the research that has been carried out, it can be concluded that the Efficiency of Time of Dismantling Fish Catches at PPN Sibolga, Sarudik District, Central Tapanuli Regency, North Sumatra Province is as high as 50 ships that carry out unloading. The time-efficiency result is 76%, classified as efficient. Catches and sorters will increase time efficiency, while ship size, the number of unloaders, and time wasted will decrease it.

5. Suggestions

It is necessary to reduce wasted time during the demolition process by adopting more disciplined working hours and more effective supervision. In addition, adjusting the number of unloading and sorting personnel to the volume of catches and improving demolition support facilities at the Sibolga VAT are expected to increase the efficiency of demolition time.

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