Engineering and Technology Journal e-ISSN: 2456-3358

Volume 09 Issue 12 December-2024, Page No.- 5784-5792

DOI: 10.47191/etj/v9i12.29, I.F. – 8.227

Strategy for the Increase of the Catch Landed in the Fishing Port of Sibolga Nusantara, Indonesia

Linda Laura Nainggolan[1], Iin Solihin[2], Tri Wiji Nurani[3], Darmawan[4]

[1]Marine Fisheries Technology Study Program, IPB Postgraduate School, IPB University, Bogor, Indonesia

[2,3,4] Department of Fisheries Resources Utilization, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia.

ABSTRACT: The Sibolga Islands Fishing Port (PPN) has experienced a decrease in the level of operations, as indicated by a decrease in the number of vessel visits, fishing logbook reports, and the amount of fish production landed. Based on the annual report for the period 2019-2023, the number of fishing vessels that submitted logbooks decreased from 5,677 vessels in 2019 to 3,902 vessels in 2022, a significant decrease of 1,775 vessels over the period. This decrease is consistent with the decrease in the number of vessel visits, from 16,795 in 2019 to 13,346 in 2022, or a decrease of 20.54%. The amount of fish landed also decreases significantly, from 29,332 metric tons in 2019 to 20,428 metric tons in 2022 or by 30.35%. This decrease is due to the fact that the catch of the fleet based in Sibolga VAT is not entirely landed in this port, but elsewhere in the catchment area. This condition is an indication that the Sibolga VAT has not fully fulfilled its function as the main port. This research aims to. The research was conducted in Sibolga VAT and around Tangkahan, Sibolga City, North Sumatra Province. The method used is survey method, the type of data collected consists of primary data and secondary data. For primary data, data collection is done through observation, interviews and questionnaires that have been determined based on the research objectives. The results of this study indicate that Sibolga VAT, as a fishing port, has more competent facilities and manpower compared to private ports (tanks). The facilities available in PPN Sibolga, including spacious docks, cold storage, fish auction, and modern loading and unloading equipment, support the efficiency and effectiveness of port operations. In addition, the staff of Sibolga VAT is equipped with better skills and knowledge in managing port operations.

KEYWORDS: PPN Sibolga, Tangkahan , Facilites, Fishing Port.

I. INTRODUCTION

The Sibolga Archipelago Fishing Port (PPN) was established on October 18, 1993 (Decree of the Minister of Agriculture No. 684/KPTS/OT 210/10/1993). PPN Sibolga is a capture fisheries center in the Fisheries Management Area of the Republic of Indonesia (WPP-RI) 572, which is expected to be able to facilitate capture fisheries activities in this area (PPN Sibolga). PPN Sibolga has a strategic role in fisheries and marine development, namely as a center for marine fisheries activities. PPN Sibolga also acts as a link between fishermen and users of their catch, both direct and indirect users such as: traders, processing factories, restaurants, etc., as well as a place to accommodate production, processing and marketing activities, as well as coaching fishermen. Services for fishing vessels as production facilities include: providing a base for fishing fleets, ensuring smooth unloading of caught fish, providing logistical supplies for fishing vessels such as fresh water, fuel oil, ice for supplies and so on. In addition, PPN Sibolga plays an important role in the implementation of the fishery business system supported by the government, such as a place for vessels to berth, dock and/or load and unload fish, and is equipped with various fishery support facilities and activities [1].

Sibolga PPN, like other fishing ports, has two main functions, namely government function and business function. Based on Government Regulation No. 27 of 2021 on the Implementation of the Maritime and Fisheries Sector, CHAPTER VIII Fishing Ports, Article 184 paragraph (4), government functions can be in the form of Mooring and anchoring services for fishing vessels, coaching and quality control services for fishing activities; Collection of catch and fishery product data; Implementation of operational activities for fishing vessels, which includes regulating the departure, arrival and activities of fishing vessels in the fishing port; Implementation of operational safety and security for fishing vessels and assistance in controlling fish resources; Implementation of environmental control in the fishing port, which includes cleanliness, safety, order, beauty and work safety; Implementation of publication of fishing port operations, results of mooring and anchoring services for fishing vessels and fisheries surveillance vessels; Implementation of coastal area monitoring and marine tourism; Facilitation of sites for implementation of fish

resource monitoring and control; Facilitation of sites for implementation of fishing community outreach and development; Facilitation of sites for implementation of fish quarantine functions; Facilitation of sites for publication of marine and fishery research results; Facilitation of sites for implementation of health functions; Facilitation of site for implementation of customs functions; and/or Facilitation of site for implementation of immigration functions. Processing services of fishery products; marketing and distribution of fishery products; use and utilization of facilities in fishing ports; docking and fishing shipyard services; logistics and provisioning services for fishing vessel crews and fishing vessels; organization of marine tourism; facilitation of service locations of financial institutions; and/or provision and/or other service services in accordance with the provisions of laws and regulations.

However, in its development, the operational level of this port has decreased, including the number of vessel visits and the volume of fish production landed. According to the latest annual report data (2019-2022), the number of fishing vessels that returned fishing logbook sheets in the Sibolga PPN area in 2019 was 5,677 units, in 2020 as many as 2312 units, in 2021 as many as 3421 units, in 2022 as many as 3,902 units, and in 2023 as many as 3798 units (Sibolga PPN Annual Report, 2023). The data shows a significant tendency to decrease in logbook reporting from 2019 to 2022 as many as 1,775 units. The data on the number of vessels also affects the data on ship visits, which in 2022 reached 13,346 times, while in 2019 there were 16,795 times. This proves that the number of ship visits has also decreased by 3,449 times or 20.54% compared to 2019. The decrease in the number of ship visits and logbook reports is also followed by the data of fish production landed. It reached 29,332 tons in 2019, but only 20,428 tons in 2022 (a decrease of 8,904 tons or 30.35%). The amount of catch landed is one of the 15 Key Performance Indicators (KPI) for the Sibolga PPN. Therefore, the decrease in the number of catches landed means that the KPI value of Sibolga PPN is not meeting the target.

In the period 2021 and 2022, there are Key Performance Indicators (KPI) that have not been met or have not reached the set target. In 2021, out of 15 Key Performance Indicators (KPIs), there were 14 KPIs that met and exceeded the set target, while 1 KPI, namely the amount of catch production at PPN Sibolga, did not meet the target. The target for the amount of catch landed in 2021 was 6,300 tons with an achievement of 4,753 tons or 75.44 percent. Similarly, in 2022, the average target for the amount of catch landed was 20,600 tons, while the realization only reached 99.17% or only 20,428 tons [4]. The failure to achieve the target for the amount of fish landed has reportedly been occurring for the last 10 years. One assumption is that the catch of the fishing fleet based in PPN Sibolga is not all landed in PPN Sibolga, but in the catchment areas around the port. If this situation continues, it will be an indicator of the failure of PPN Sibolga to carry out its government and business functions. In fact, PPN Sibolga, as part of the fisheries infrastructure network in the region, is expected to be able to support the development of fisheries businesses.

Therefore, this study will identify the root cause of the decline in the number of landed catches and provide solutions to increase the production of landed catches at PPN Sibolga and strengthen competitiveness with surrounding catches. The hypothesis or assumption of this study is that the number of catches at PPN Sibolga will increase along with increasing competitiveness due to improvements in the implementation of government functions and port management functions. The final result of the study is a set of proposals, suggestions or strategies to increase the competitiveness of PPN Sibolga.

This research uses a field observation approach and in-depth interviews with various stakeholders, both at PPN Sibolga and in the surrounding catchments.

II. MATERIALS AND METHODS

A. Time and Place

This research was conducted for two months, namely in April-June 2024. The research was conducted in Sibolga Archipelago Fisheries (PPN Sibolga) and the catchment areas around PPN Sibolga, North Sumatra Province. (figure1).

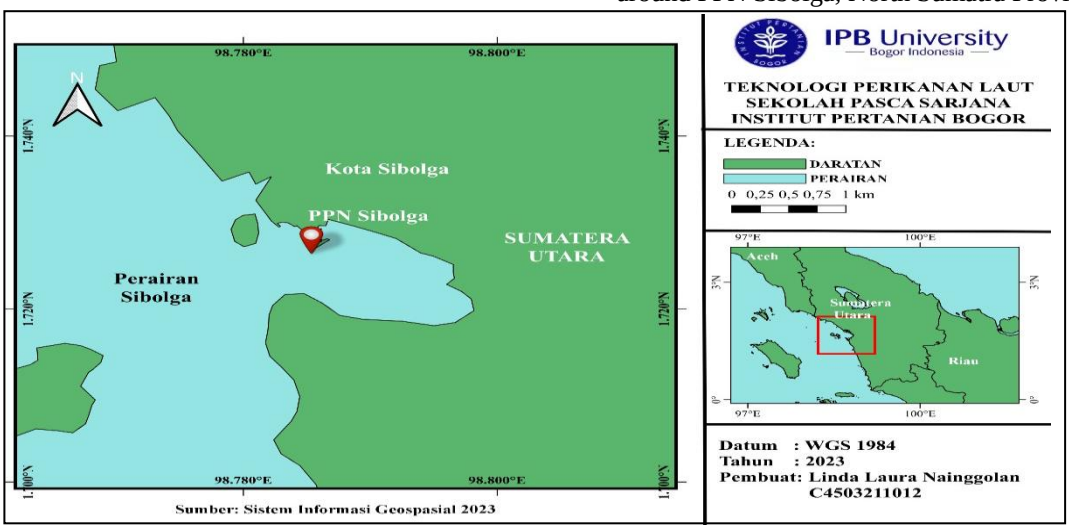

Figure 1. Map of the Research Location.

B. Tools and Materials

The equipment used in this study includes a camera to record and document research activities, stationery to record research activities, Qqis to create research maps, Microsoft Excel to process data, and Microsoft Word to write reports. In addition, questionnaires will be used to collect primary data.

C. Data collection and analysis methods

The data collection method uses a survey method. The type of data collected consists of primary data and secondary data. For primary data, data collection was done through observation, interviews and questionnaires which were determined based on the research objectives. Secondary data was obtained from literature, which came from fishery statistics books, scientific journals, research results, activity reports and case studies relevant to fishery development activities. Interviews were conducted with the criteria that the interviewees had a direct or indirect interest in the management of PPN Sibolga and Tangkahan, had an understanding of Tangkahan management and were directly involved in the fishing business, were able to provide the required information, were good communicators, and were willing to act as resource persons. Data on catch leakage conditions in PPN Sibolga and Tangkahan were obtained through direct observation. The required information data consisted of reporting facilities at PPN Sibolga and Tangkahan, exchange mechanisms, supply services, and vessel supply services. The data were then analyzed using a comparative description by comparing the leakage conditions of the catch at PPN Sibolga and the surrounding tangkahans.

III. RESULTS AND DISCUSSION

Conditions for landing of catches in PPN Sibolga and Tangkahan

Sibolga City is located on the west coast of North Sumatra, 344 km from Medan City to the south. Sibolga City is located on the coast of Tapian Nauli Bay facing the Indian Ocean. Geographically, this city is between 010.42'-010.46' N and 980.44'-980.48' E. The city of Sibolga has a diverse topography, consisting of coastal plains, slopes and mountains at an altitude of 0-150 meters above sea level. The total administrative area of the city of Sibolga is 3,536 ha (35.36 km2), consisting of land on the island of Sumatra 1,126.67 ha, islands 238.32 ha, sea 2,171.01 ha. Sibolga has a long and winding coastline, several bays and small islands with a beach length of about 2.5 km [3].

The fishing sector is one of the most important sectors in the development of the city of Sibolga. There is one fishing port in the city of Sibolga, namely the Sibolga Archipelago Fishing Port. The water conditions are quite calm because it is protected by a group of islands (Murshala, Situngkus, etc.). The geographical location of PPN Sibolga is very strategic because it is located on the west coast of Sumatra Island, close to fishing areas. This makes PPN Sibolga one of the most important fishing ports in North Sumatra province. Sibolga Archipelago Fisheries Port (PPN) plays an important role in supporting and developing the fisheries sector in the North Sumatra region, especially in Sibolga city and its surroundings. PPN Sibolga is the main landing point for fish caught by fishermen in the North Sumatra region. The fish landing capacity of PPN Sibolga reaches 50 tons per day. The development of production volume and production value of marine fisheries from 2018 to 2023 at PPN Sibolga is 161,323 tons [2].

Facilities at the Sibolga National Fishing Port and surrounding Tangkahan

1. Sibolga VAT facility

The operational success of a fishing port cannot be separated from the existing supporting infrastructure factors, one of which is the availability of facilities at the fishing port [5]. In carrying out its duties and functions, PPN Sibolga is equipped with various facilities that support fish landing activities, such as a large pier, cold storage, fish auction site (TPI), and fish processing facilities. Good infrastructure conditions are very important to maintain the quality of the catch and to ensure a smooth distribution process. The basic facilities consist of land, breakwater, dock, jetty, port basin, shipping channel, complex roads and drainage. Functional facilities consist of an administrative office, fish marketing area, cold storage, ice plant, dock/slip water, and clean water supply. Support facilities consist of a guard post, toilet, prayer room, cooperative, fishermen's canteen, official residence, mess, warehouse, hall, and workshop building. For more information, see Table 1.

Table 1: Facilities at PPN Sibolga

NO	Facility Type	Installed Size
	Basic Facilities	
1	Land	14,9 Ha
2	Dock	347 m
3	Jetty	300 x 10 m
4	Retaining Walls	142 x 2 m
5	Harbor Pool	7,5 Ha Depth 3-7 m

NO	Facility Type	Installed Size
6	Breakwaters	
7	Sailing Flow	
8	Complex Road	21.461 m2
9	Main road	900 x 8 m
10	Industrial Area Road	300 x 10 m
Functional Facilities		
1	Administration Office	864 m^2
2	TPI	1.134 m^2
3	Net repair place	800 m^2
4	Cold storage	
5	ES Factory	8300 m^2
6	Dock/Slipwat	152 m^2
7	Drainage	2.575 m
8	SPDN	
	a. PT. Dharma Krida Satria	1 units
	b. KSU Analief	1 units
	c. CV. Pandanta	1 units
9	Assembly Hall	652, 36 m^2
10	Beacon Sign	2 units
11	WWTP	1.996 m2
12	Slipway	1 units
13	Electrical installation	82.5 KVA
14	Clean Water Supply	
15	Harbor Gate	1 units
16	Processed Fish Warehouse	100 m^2
17	Equipment Warehouse	200 m^2
18	Utility building	200 m^2
19	Parker Field	4.500 m^2
20	Perimeter fence	1.842 m^2
21	Waste Pool Fence	125 m
22	Culverts	1 units
23	SSB Radio	1 units
Supporting Facilities		
24	Security posts	1 units
25	Mosque	1 units
26	Garin's house	1 units
27	Fishermen's Shelter	1 units
28	Integrated Services Building	1 units
29	Public toilet	150 m^2
30	Cooperative	
31	Fisherman's Canteen	
32	Official residence	7 Units
33	Fisheries Business Office	463,14 m m^2
	a. Fisherman's Mess	269,86 m^2
	b. Practical Student Mess	148,8 m^2
	c. Operator's Mess	2 units
34	Plaza/Park	750 m^2
35	BAP Kiosk	13 Door
36	Fishermen's Meeting Hall	652, 36 m^2
37	Sports Facilities	1 units
38	Workshops	780 m^2

Source: Sibolga VAT Annual Report 2023

In general, the facilities in PPN Sibolga are good. This condition needs to be socialized to the fishing community in Sibolga City so that the fishing business is centralized in this area and no longer in Tangkahan [4].

2. Tangkahan Facilities

Tangkahan, which functions as a fish landing site in Sibolga and Central Tapanuli (Tapian Nauli Bay), initially grew and developed with the development of government landing activities. According to [5], activities for management of fishing vessels, fish landing sites, marketing and processing of fish, as well as services for fishing needs in Tangkahan had been carried out before the existence of Sibolga PPN, but the existence of these Tangkahan activities was carried out after the establishment of the fish market, fish landing base (PPI), and then the coastal fishing port (PPP) before being developed into PPN Sibolga. In 1993, the number of tangkahan in this bay was 27 units [6] and now there are 42 units [7].

As a private fishery business unit integrated into the fishery system at the Sibolga Archipelago Fishery Port (PPN), tangkahan plays a crucial role in the fishery supply chain, especially as a center for landing, auctioning, distribution and marketing of catches. Integrated with PPN Sibolga, the catchment area around PPN Sibolga is equipped with facilities to support all post-fishing stages. Tangkahan around PPN Sibolga is generally equipped with basic infrastructure such as wooden jetties and concrete buildings to support fishing activities. Existing facilities include a dock for fishing boats, fish scales of various capacities, a fish auction site (TPI), and cooling facilities such as cold boxes and cold storage. The availability of clean water supplies and special fish transport facilities also complement Tangkahan's operational needs. Tangkahan has been in operation for more than 20 years.

Availability of facilities in Tangkahan PPN Sibolga can be seen in Table 2.

Facility Type	Installed	Size
Land		
Dock		120 m
Harbor Pool	✓	
Sailing Flow	✓	
Neighborhood Road		-
Drainage		-
Land		
Administration House		1 units
TPI		1 units
Clean water supply	✓	
Electrical installation	✓	
Ice factory		-
Cold storage		1 units
Coldbox		10 units
Transportation Fish carrier		2 units
Guardhouse		-
Fisherman's Canteen		-
MCK		1 units

Source: Linda's research data (tangkahan harapan sari laut) 2024

The facilities and activities at Tangkahan are the same as those of fishing ports, but officially Tangkahan does not meet the requirements of a fishing port. Tangkahan serves the needs of ship owners/fishermen for supplies from sea to land.

Landing of the Catch at PPN Sibolga and Tangkahan

1. Procedure for landing catches at PPN Sibolga

The catch landing process at PPN Sibolga begins with the arrival of a fishing boat at the pier. Port officials then check documents and ensure compliance with regulations. The loading and unloading process involves the crew unloading the fish from the vessel, which are then placed in fish baskets and transported by conveyor belt to the fish auction site (TPI). The fish are then weighed and the catch recorded for administrative and statistical purposes. Fish sales at PPN Sibolga are conducted through an open auction system, with the auctioneer usually being the vessel owner. The auction is attended by traders, buyers and representatives of fish processing companies. Purchased fish can be sold directly to traders or sent to processing plants to be processed into products ready for sale and then distributed to local, regional markets or exported.

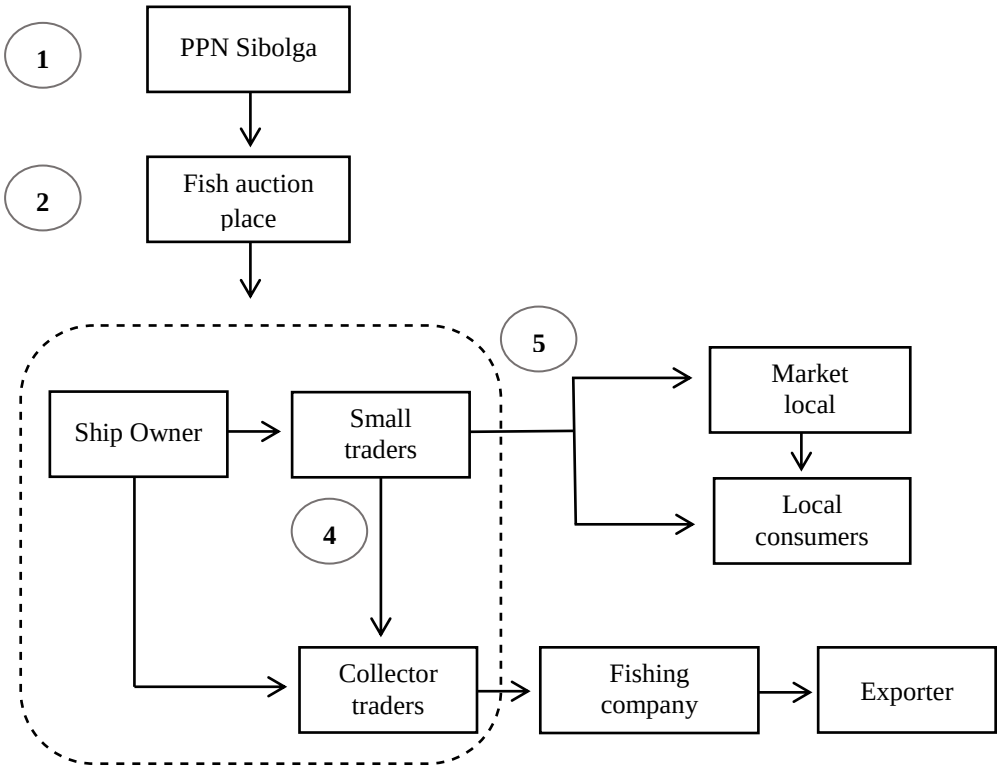

Figure 1 Schematic of catch marketing channels

2. Process of Landing the Catch in Tangkahan Tangkahan is a traditional fish landing site found in various coastal areas, including Sibolga. This place plays an important role in fishing activities as it is a meeting point between fishermen and fish traders. The process of landing catches at Tangkahan around PPN Sibolga is generally almost the same as landing activities at PPN Siboga.

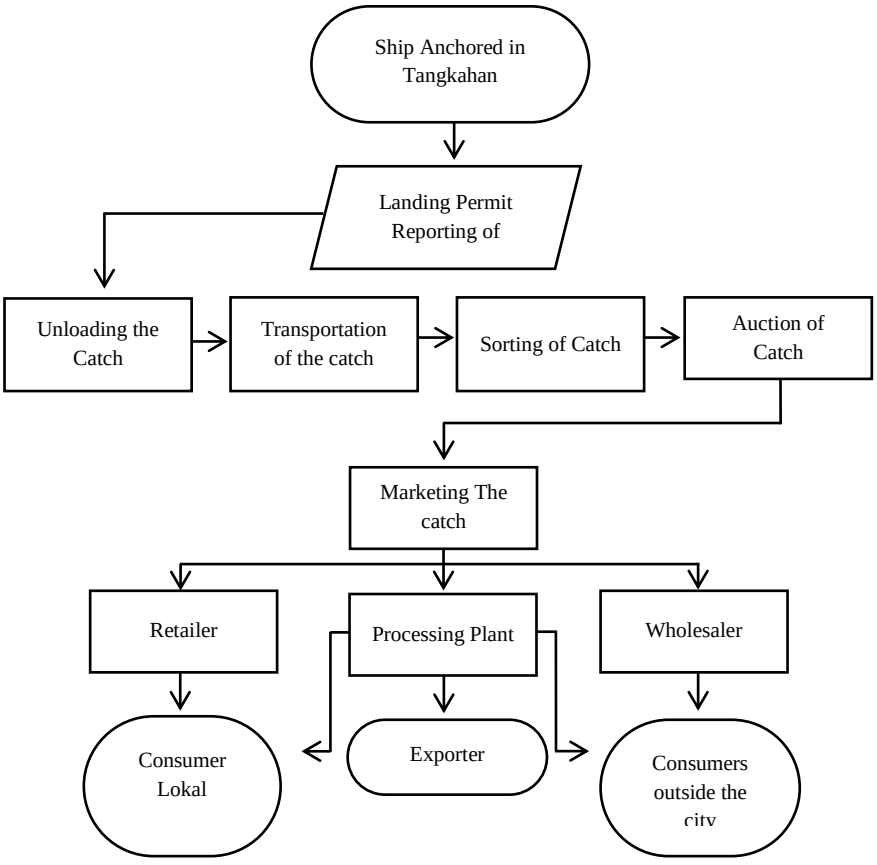

Figure 2 The process of landing the catch in Tangkahan

The town of Sibolga Fishing boats that have finished their voyage drop anchor in Tangkahan. Before the boat is unloaded, the captain reports to the supervisor. The supervisor then gives permission to proceed with the demolition. Unloading begins with the removal of large fish caught in the hold, such as sharks, tuna and rays. The release of these fish is assisted by two to three crew members using nylon/multifilament ropes, while the smaller fish are placed in plastic baskets. The catch is then transported to the dock using a slide ladder or surfboard. Fish that require grading are placed directly on the grading table to be sorted by the grader and then placed in the containers provided by the tangkahan, while large fish are landed directly on the dock floor. All fish are then immediately auctioned by the tangkahan auctioneer. The fish are auctioned at the pier, unlike PPN Sibolga where the fish have to be auctioned at TPI.

Table 3: Comparison of catch landing mechanisms at PPN Sibolga and Tangkahan

No	Landing parameters	PPN Sibolga	Tangkahan
	Catch Landing Mechanism		
1.	Ease of Landing the Catch	✓	✓
2.	There is no fee charged for landing the catch	–	✓
3.	Sorting of caught fish is carried out	✓	✓
4.	Catch results are weighed	✓	✓
5.	Recording and Data Collection of Catch Results	✓	✓
6.	Auction of Catch	✓	✓
7.	Ports Help Distribute Catches	–	✓
8.	Storage of Catches (Coldstorage)	✓	–

Supplies Provision Services at PPN Sibolga

The supply services at the Sibolga Archipelago Fishing Port (PPN) are designed to support efficiency and quality in the entire process, from catching to distribution of fish. In 2023, the materials used in fishing and fish processing activities will include 140,235 tonnes of ice, 26,774 tonnes of diesel fuel and 353,928 M3 of water.

Table 4: Absorption of Supplies Used for Ships and the Fishing Industry in Sibolga PPN in 2023

No	Type of Supplies	In Harbor		Outside Harbor		Total	
		Volume	Mark (Rp)	Volume	Mark (Rp)	Volume	Mark (Rp)
1	Air/Water (M3)	45.556	390.016.416	-	-	45.556	390.016.416
2	Ice (Tons)	28.079	9.546.897.400	3.290	1.118.583.000	31.369	10.665.480.400
3	Diesel (Kilo Liters)	5.841	32.711.750	-	-	5.841	32.711.750

Source: Sibolga National Fishing Port Statistics Report 2023

a. Fuel Provision

Vessels heading out to sea can refuel at the facilities at the Sibolga Archipelago Fishing Port (PPN). The supply of fuel is important to ensure that the vessel is ready for the fishing trip. There are 2 (two) units of public fuel stations for fishermen (SPBU N), namely PT. Dharma Krida Satria (DKS) 1 unit/500 litres, KSU Analief 1 unit/150 litres and SPBU-Kompak 1 unit/1000 litres by CV. Pandanta.

b. Ice Provision

The existence of an ice factory at the Sibolga Archipelago Fishing Port (PPN) plays a very important role in maintaining the quality of the fish caught. The ice produced by this factory acts as a natural refrigerant, which slows down the rotting process of the fish. As a result, the fish stays fresh for longer, increasing its selling value. The demand for ice at the Sibolga Archipelago Fishing Port (PPN) depends on the number and size of the vessels, the fishing distance, the type of fish caught and the frequency of fishing.

c. Providing clean water

PPN Sibolga provides clean water filling facilities for ships at sea. Clean water is needed for the crew's needs and for various purposes on board the ship. In 2012, a clean water facility was built in the village of Sipan Sihaporas and an operational cooperation agreement was signed between Sibolga Nusantara Fisheries Port and PDAM Mual Nauli, Central Tapanuli Regency, the management is done by PDAM Nauli, apart from that, there is also fresh water distribution by PDAM. the city of Sibolga, which is used for industrial purposes and for sailing ships. The capacity of the water storage tank is 150 M3 and the water treatment tank (Water Treatment).

Supplies Provision Service in Tangkahan

The supply services in Sibolga Tangkahan are an important aspect of supporting fishing activities in the area. The tangkahan, which is a place where fishing boats can moor and replenish their supplies, plays a crucial role in ensuring the smooth running of fishing operations. The supply service at Sibolga Tangkahan is also very similar to PPN Sibolga, which is designed to support efficiency and quality in the entire process from catching to distribution of fish.Fishermen operating in the Sibolga PPN catchment area have two options to meet their fuel oil (BBM) needs. They can buy fuel directly from the Fisherman's Diesel Filling Station (SPDN) provided by PPN Sibolga, which offers easy access and time efficiency. Alternatively, fishermen can purchase fuel from the nearest Pertamina through appointed sales agents. These two options allow fishermen to choose the refuelling method that best suits their operational and logistical needs, ensuring that their vessels are always ready to go to sea with sufficient fuel.

Tangkahan at PPN Sibolga is equipped with an ice factory or block ice and shaved ice production facilities. This ice factory operates to ensure a daily supply of ice to meet the needs of the fishermen. In addition to internal ice production, Tangkahan also works closely with external ice factories to ensure availability of ice, especially during peak fishing seasons when demand for ice increases. Clean water in Sibolga PPN Tangkahan is supplied by the local Regional Drinking Water Company (PDAM), which guarantees water quality that meets health standards. PDAM water is treated and distributed to Tangkahan for the needs of ships and Tangkahan facilities. Some tangkahans also use local water sources, such as drilled wells or springs, which are treated to ensure cleanliness before use.

No	Supply Parameters	PPN Sibolga	Tangkahan
1	Supplies Provision Services (Ice, Water, Fuel)	✓	✓
2	Ice Service Available	✓	✓
3	Clean Water Services Available	✓	✓
4	Fuel Services Available	✓	–

Source: Sibolga National Fishing Port Statistics Report 2023

No	Parameter	PPN Sibolga	Tangkahan
1	Ship and fishing equipment repair services	✓	
2	There are ship repair facilities	✓	–
3	There are fishing gear repair facilities	✓	✓
4	Dock/Slipwat	✓	–
5	Slipway	✓	–

Source: Sibolga National Fishing Port Statistics Report 2023

No	Employment Competency Parameters	PPN Sibolga	Tangkahan
	Human Resources (Number and competency of HR)		
1	Adequate number of human resources	113	250
2	Adequate HR competency	100	200

Source: Sibolga National Fishing Port Statistics Report 2023

CONCLUSIONS

The conclusion of this research shows that PPN Sibolga, as a fishing port, has more competent facilities and staff compared to private ports (Tangkahan). The facilities available at PPN Sibolga, including a spacious dock, cold storage, fish auction area, and modern loading and unloading equipment, support the efficiency and effectiveness of port operations. In addition, the workforce at PPN Sibolga is equipped with better skills and knowledge in managing port operations. Overall, the superior facilities and skills of the workforce at PPN Sibolga make it superior to private ports in supporting sustainable and highly competitive fishing activities.

ACKNOWLEDGEMENTS

The central and regional governments need to make a strong effort to regulate the steps, especially in their operation. There is a need for guidance for fishermen who land their catches at PPN Sibolga so that the landed catches are of higher quality and produce more production as an attraction for this port.

REFERENCES

1. [KKP] Ministry of Maritime Affairs and Fisheries. Year. https://kkp.go.id/djpt/ppnsibolga. [PP] Republic of Indonesia Government Regulation Number 27 of 2021 concerning the Implementation of the Maritime Affairs and Fisheries Sector. 2021.
2. [PPN] Sibolga Archipelago Fishing Port. 2021. Sibolga VAT annual report 2021. PPN Sibolga
3. [PSDKP]. 2007. Annual Report. Central Tapanuli: Marine and Fisheries Resources Monitoring Work Unit (PSDKP) of the Department of Maritime Affairs and Fisheries.
4. Alfons JM, Tupamahu A, Abrahamsz J. 2018. Evaluation of the role and management strategy of the Erie Fish Landing Base in Ambon City. Triton Journal. 14(2) : 66-75.
5. Sibolga City Central Statistics Agency. (2019). Sibolga City in Figures 2019. Central Statistics Agency
6. Ministry of Agriculture of the Republic of Indonesia. 1993. Decree of the Minister of Agriculture Number 684/KPTS/OT.210/10/1993 concerning the Inauguration of the Sibolga Archipelago Fishing Port. Jakarta: Ministry of Agriculture.
7. Najah RA, Lubis E, & Muninggar R. 2012. Existence of Facilities According to Activities at the Lampulo Beach Fishing Port, Banda Aceh. Marine Fisheries: Journal of Marine Fisheries Technology and Management. 3(1): 55-70
8. Zain, J. 2002. Study of Tangkahan Activities and Their Influence on the Operations of the Sibolga Archipelago Fishing Port, North Sumatra [Thesis]. Bogor: Postgraduate, Bogor Agricultural Institute. 208 pages