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TUNA FISHERIES IN NORTH SULAWESI: PORTRAIT OF FRESH TUNA DIRECT EXPORT

Perikanan Tuna di Sulawesi Utara: Potret Ekspor Langsung Tuna Segar

Ronald S A Posundu[1,2*], Tri Wiji Nurani[3], Mulyono S Baskoro[3], Iin Solihin[3], Mustaruddin[3]

[1]*Marine Fisheries Technology Study Program, Faculty of Fisheries and Marine Sciences, Postgraduate Bogor Agricultural University. Kampus IPB,Jl. Raya Dramaga, Babakan, Kec. Dramaga, Kabupaten Bogor, Jawa Barat 16680.*
rposundu@gmail.com
[2]*Marine and Fisheries Agency of North Sulawesi Province. Jln. Jl. A.A. Maramis, Kairagi Dua, Kec. Mapanget, Kota Manado, Sulawesi Utara*
rposundu@gmail.com
[3] *Department of Fisheries Resource Utilization, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University. Kampus IPB,Jl. Raya Dramaga, Babakan, Kec. Dramaga, Kabupaten Bogor, Jawa Barat 16680.*
tri_wiji@apps.ipb.ac.id, baskoro.mul@gmail.com, iin_solihin@apps.ipb.ac.id, us_m03@yahoo.com

**Correspondence*: *rposundu@gmail.com*

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ABSTRACT

The North Sulawesi Regional Government implemented a policy breakthrough to enhance the competitiveness of tuna fisheries by facilitating the direct export of fresh tuna from Manado to Japan. However, export operations have not run optimally, as the cargo quota of 20 tons per trip per week has not been achieved which threatens the continuation of the operation. This study aims to describe the current state of direct export of tuna to Japan and to identify the causes of the failure to meet the cargo quota target for direct export of fresh tuna to Japan. The data used in this study were obtained through in-depth interviews with respondents selected using purposive and accidental sampling, as well as direct observation at the research location. The data were processed qualitatively and quantitatively, and then analyzed descriptively. The results of the study revealed a reduction in the export quota from 20 tons per trip per week to 3 tons per trip per week. In 2023, the export reached the average delivery target was only met in three months: March, April, and December, with 3.35 tons, 3.04 tons, and 7.34 tons, respectively. The cause of the issue is the shortage of high-quality tuna raw materials (grade A), which results from fishermen failing to implement proper fish handling methods during fishing operations. Furthermore, the dependence on tuna supplies from PPS Bitung. The solution is to enhance the ability of fishermen according to good fish-handling standards and to diversify the supply chain of fresh tuna by sourcing from both within and outside the North Sulawesi region.

Keywords: *direct export, fresh tuna, North Sulawesi*

ABSTRAK

Pemerintah Daerah Sulawesi Utara membuat terobosan kebijakan untuk meningkatkan daya saing perikanan tuna, melalui ekspor langsung tuna segar dari Manado tujuan Jepang. Namun, operasional ekspor belum berjalan optimal disebabkan target kuota kargo sebesar 20 ton per trip per minggu belum tercapai, sehingga terancam berhenti beroperasi. Penelitian ini bertujuan mendeskripsikan kondisi terkini ekspor langsung tuna ke Jepang dan menjelaskan penyebab

masalah belum terpenuhinya target kuota kargo ekspor langsung tuna segar ke Jepang. Data yang digunakan bersumber dari wawancara mendalam dengan responden yang ditentukan menggunakan purposive dan accidential sampling, serta pengamatan langsung dilokasi penelitian. Data diolah secara kualitatif dan kuantitatif kemudian dianalisis secara deskriptif. Hasil penelitian diketahui adanya kebijakan penurunan kuota ekspor dari 20 ton per trip per minggu menjadi 3 ton per trip perminggu. Pada tahun 2023, hanya tiga bulan yang mencapai target rata-rata pengiriman yaitu: Maret, April, dan Desember, dengan masing-masing sebesar 3,35 ton, 3,04 ton, dan 7,34 ton. Penyebabnya adalah kekurangan bahan baku tuna berkualitas (grade A), akibat nelayan yang belum menerapkan cara penanganan ikan yang baik selama operasi penangkapan. Selanjutnya, ketergantungan pasokan ikan tuna dari PPS Bitung. Kemudian, solusinya adalah peningkatan kemampuan nelayan sesuai standar penanganan ikan yang baik dan diversifikasi rantai pasok ikan tuna segar yang berasal dari luar dan dalam wilayah Sulawesi Utara.

Kata kunci: Ekspor langsung, tuna segar, Sulawesi Utara.

INTRODUCTION

In 2020, the Regional Government of North Sulawesi (Sulut) made a policy breakthrough to increase the competitiveness of the tuna fisheries sector through the direct export of grade A fresh tuna from Manado to Japan using Garuda Indonesia aircraft. According to Yusuf *et al*. (2017), since 2014, Indonesia has three main markets for tuna exports, which are dominated by the Japanese market at 53 percent, America at 24 percent, and the European Union at 23 percent. Japanese consumers favor fresh tuna by 45 percent, canned tuna by 32 percent, and frozen tuna by 23 percent. The direct export policy is reasonable because North Sulawesi is one of the regions in Indonesia that has abundant tuna resource potential. In the last three years (2020-2022) North Sulawesi has been ranked first as the largest tuna-producing province in Indonesia, followed by Maluku and North Maluku, with average tuna productions of 57,768 ton per year, 41,373 ton per year, and 36,450 ton per year, respectively (BPS 2024).

However, in its implementation, direct exports experienced operational constraints due to the non-fulfillment of the export quota target of 20 ton/trip/week or 80 ton/month (four trips) with the quality required by the export destination country. Referring to the BKIPM Manado report (2023) for the last 3 years, the volume of direct exports to Japan has fluctuated in shipment volume. It was recorded that the volume of direct exports in September-December 2020 averaged 7.62 ton per trip, while in January-December 2021 and 2022 experienced an insignificant increase and there was a sharp decrease of 7.75 ton per trip and 4.84 ton per trip. Nevertheless, the local government continues to maintain direct export activities through efforts to provide subsidies to bear the cost of insufficient shipping cargo differences.

Several factors cause difficulties to meet direct export quotas, including fish processing companies/units (UPI) as exporters have difficulty obtaining fresh tuna with the quality required by the Japanese market in large quantities, even though tuna catches are quite widely available. The results of the Sahara *et al.* (2022) study stated that tuna from Indonesia only around 40 percent has quality and safety levels in accordance with export standards, while 60 percent are not in accordance with standards. In general, the decline in tuna quality leads to defective fish products in terms of texture and color (Chan *et al*. 2019). Furthermore, Chan *et al.* (2019) said that tuna that is not suitable for export is caused by poor fish handling due to lack of facilities and the ability of unskilled fishermen. According to Dien *et al.* (2023), good fish handling is often ignored by business actors starting from post-catch to processing fishery products, so that quality decreases and is potentially unsafe for consumption.

However, so far, UPI has obtained raw materials for fresh tuna export standards, generally derived from the catch of tuna fishers landed at the Bitung Ocean Fishing Port (PPS Bitung). The supply of tuna from only one source makes it difficult for the UPI to meet the demand for fresh tuna in the Japanese export market. In addition, the large number of UPI means that there is competition to export tuna raw materials to other countries. The research results of Theis *et al*. (2017); Talumesang *et al*. (2020) stated that the tuna catch in Bitung is intended to meet the needs of canning factories and frozen tuna. Tuna exports from Bitung amounted to 60% of processed canned tuna and 40 percent were fresh and frozen tuna, with the destination of the United States

as the main market, followed by the European Union and Japan (USAID 2020). This condition explains why the high amount of tuna raw material needed for export can affect the ability of fresh tuna exporters to meet direct export quotas to Japan.

The sustainability of fresh tuna direct exports not only faces the problem of inability to meet export quota targets but also has an impact on foreign exchange earnings in the fisheries sector. In 2020, foreign exchange earnings amounted to USD 877,974.18; in 2021, they rose to USD 1,198,276.61. Furthermore, in 2022, there was a drastic decrease to USD 556,233.57. This situation can certainly threaten the sustainability of direct exports, which is the flagship program of the Government of North Sulawesi, as well as potentially reduce foreign exchange income from the fisheries sector.

Based on the conditions described, it is important to conduct a study to determine the extent of the development of tuna direct export activities to Japan. The purpose of this study is to identify the current condition of direct tuna exports to Japan and what policies have been implemented by the Regional Government of North Sulawesi Province. Then, we analyze the cause of the problem that has not met the target cargo quota for direct export of fresh tuna to Japan. Furthermore, this study also attempts to provide solutions for the sustainability of direct exports so that future policy improvements can be made by local governments as policymakers.

METHODS

This research was conducted from December 2023 to February 2024 at the Bitung Ocean Fisheries Port (PPS Bitung) and Tuna Fish Processing Unit in the cities of Manado and Bitung (Figure 1). The collected data consisted of primary and secondary data. Primary data were obtained from in-depth interviews and direct observations at the location of the research object. Interviews related to current (existing) conditions of direct exports and the tuna fish supply chain through the export process. Direct observations were carried out to determine tuna fishing operations, tuna landing at PPS Bitung, and the export preparation process at Manado's Sam Ratulangi Airport. Secondary data collection includes the direct export volume, tuna production, and number of tuna fishing units, sourced from Marine and Fisheries Agency (DKPD) of North Sulawesi Province, Fish Quarantine Center for Quality Control and Safety of Fishery Products Manado (BKIPM Manado), and PPS Bitung.

Interview respondents were determined using a purposive sampling *technique*, namely representatives of DKPD North Sulawesi Province, BKIPM Manado, PPS Bitung, and five fish processing units (UPI) as exporters. Meanwhile, determination of respondents using the accidental sampling technique were as follows: three collectors, and 50 fishermen catching tuna of various sizes of boats and different fishing gear, namely: 5 units of longline vessel, 20 units of handline vessel measuring 1-5 Gross Tonnage (GT), and 25 units of handline vessel measuring 6 to above 30 GT. The determination of accidental sampling respondents was based on the parties who could be found at the research location and were willing to be interviewed.

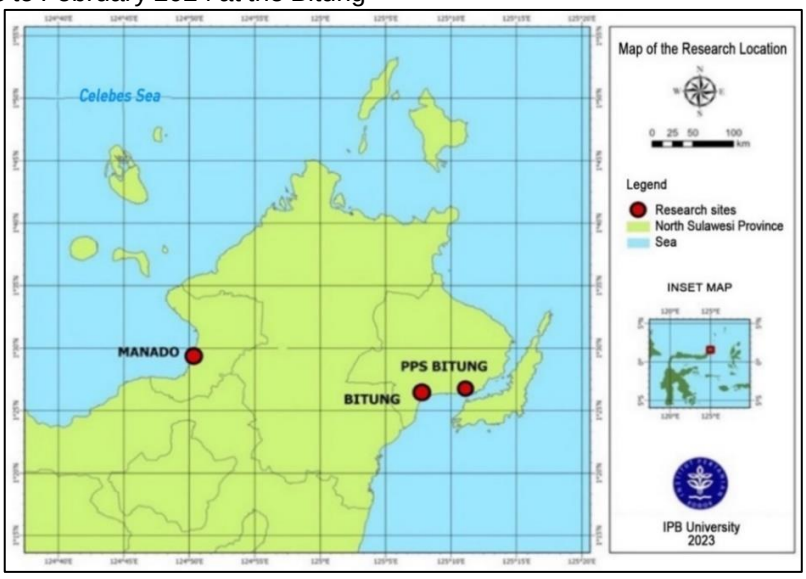

Figure 1 Research location in North Sulawesi Province, Indonesia

The data were processed both qualitatively and quantitatively. Data sourced from interviews and direct observations were processed qualitatively, while data related to direct export volume, tuna production, and the number of tuna fishing units were processed quantitatively. Next, quantitative data processing uses the Microsoft Excel application. Data analysis was carried out to describe the current conditions related to direct tuna export operations from Manado to Japan. Next, it explains the problems that cause direct exports to fail to be fulfilled.

RESULTS

Overview of direct export of tuna from Manado to Japan

The breakthrough policy of the direct export of tuna fish from Manado to Japan has been running for approximately four years in 2023, starting in September 2020. Export activities are followed by seven fish processing units (UPI) as exporters, starting from UPI and large- and small-scale businesses. However, the problem of shortage of raw materials has continued to occur since the last 3 years (2020-2022). Based on the confessions of several fish processing companies that have been routinely exported, they have complained about the difficulty of obtaining raw materials for export-quality tuna to meet the demands of Japanese buyers. Even though fishers's catches are widely available, the quality of the tuna is not yet in accordance with the requirements, grade A.

At the beginning of 2023, the North Sulawesi Regional Government will try to find a solution to this problem by improving the strategy, namely, opening the regular Garuda Indonesia flight route Bali-Manado-Japan starting in March and scheduled once a week every Thursday. This strategy aims to reduce the cargo quota from 20 ton per trip per week to a minimum of 3 ton per trip per week, and still provide subsidies if the cargo volume has not been met; thus, it is hoped that direct exports will continue to operate.

Shipping volume in 2023 (Figure 2) experienced target fluctuations from March to December. The average export volume in March was 3.35 ton, in April it fell to 3.04 ton, in May and June it continued to decline drastically to 1.82 ton and 1.16 ton. However, export volume rose again in July and August to 2.26 ton and 2.88 ton, although there was another drastic decline in September to 0.86 ton. In October and November there was an increase to 1.85 ton and 2.36, and then in December the export volume increased significantly to 7.34 ton. Figure 2 shows the monthly direct export volume of tuna by 2023. Fresh tuna is the main commodity that is exported directly to Japan. The exported tuna products are in the form of whole tuna and loins. The most exported types of tuna are yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*), and albacore (*Thunnus alalunga*).

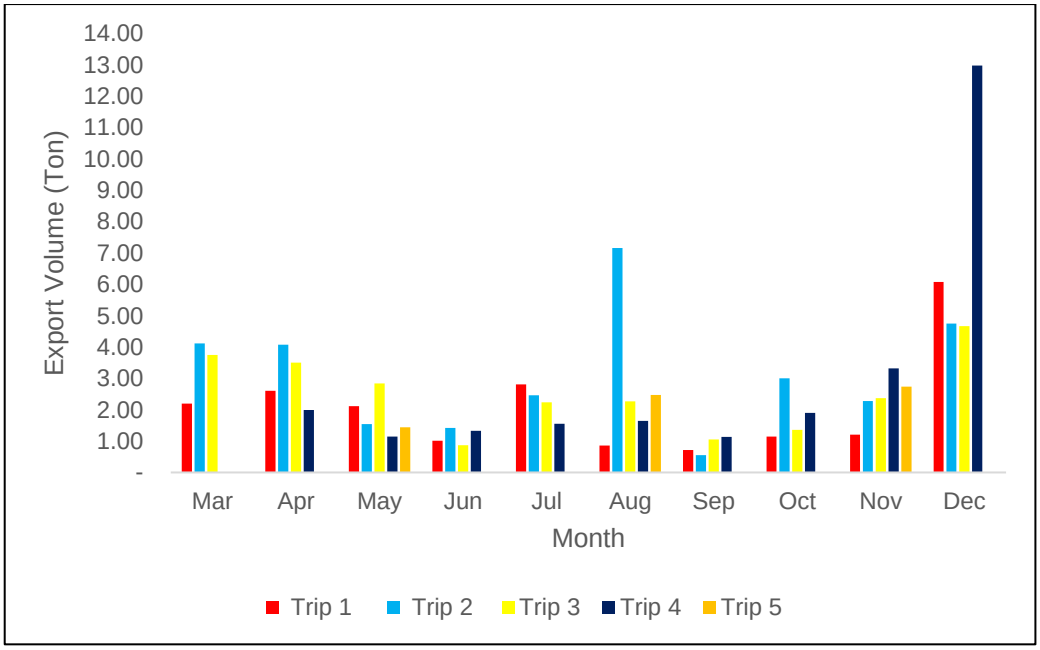

Figure 2 North Sulawesi Province's Tuna direct export volume in 2023

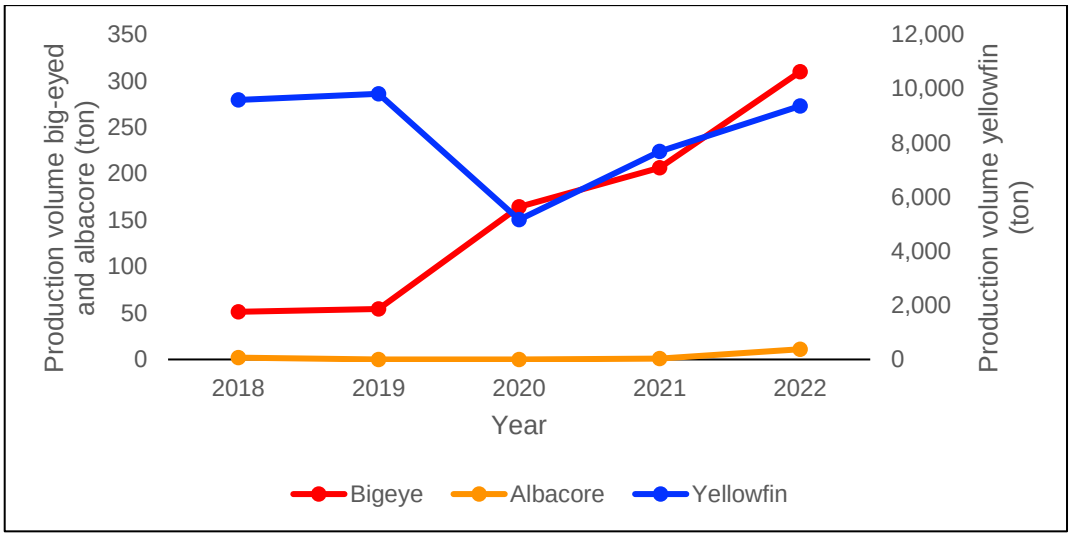

Figure 3 Production trends per type of tuna at PPS Bitung (North Sulawesi Province, Indonesia) in 2018-2022

Tuna fish production by type at PPS Bitung.

PPS Bitung is the center of capture fisheries activities in North Sulawesi, especially tuna fisheries activities. The volume of tuna production in North Sulawesi refers to the tuna landing data at Bitung PPS. The tuna catches landed at PPS Bitung were yellowfin tuna, bigeye tuna, and albacore tuna.

Figure 3 shows the trend of tuna production by type in PPS Bitung over the last five years (2018-2022). The tuna production volume fluctuated. In 2018 yellowfin tuna production was 9,587.41 ton or 99.45 percent; bigeye tuna of 51.34 ton or 0.53 percent; albacore was 1.83 ton or 0.02 percent. In 2019, yellowfin and bigeye production rose to 9,809.64 ton or 99.45 percent and 54.36 ton or 0.55 percent, while albacore was not caught in 2019 and 2020. In 2020 yellowfin production dropped drastically to 5,161.35 ton or 99.91 percent; The decline in production was not followed by bigeye, which increased to 164.39 ton or 3.09 percent. In 2021, yellowfin production will increase again to 7,675.58 ton or 99.37 percent; bigeye also increased to 206.55 ton or 2.62 percent; while albacore production is only 0.85 ton or 0.01 percent. In 2022, yellowfin production will increase to 9,356.55 ton or 96.68 percent; bigeye increased to 309.81 ton or 3.20 percent; and albacore production rose to 11 ton or 0.11 percent.

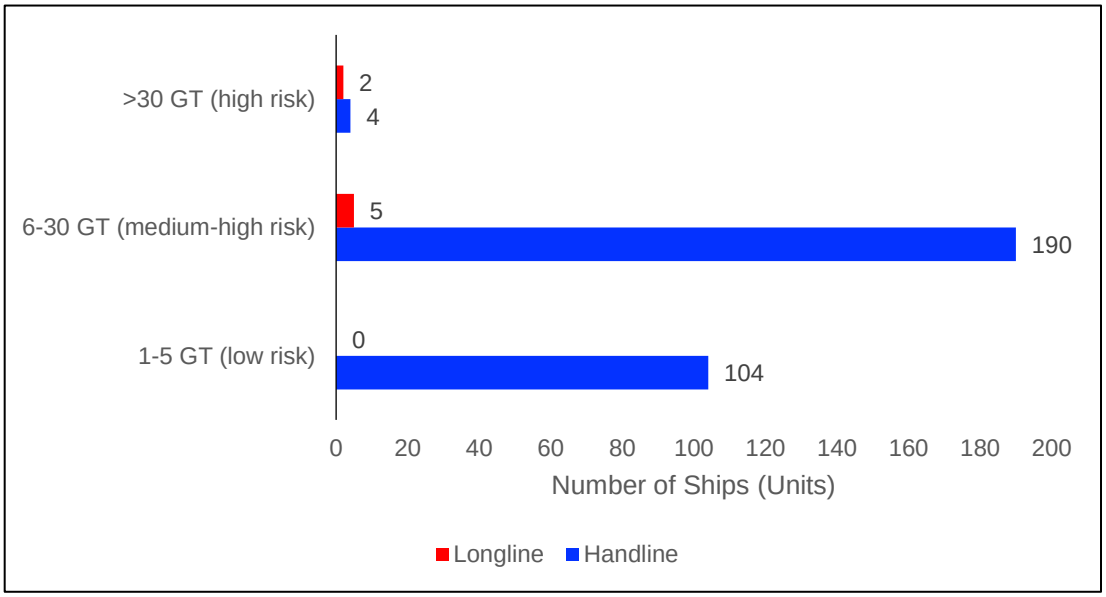

Figure 4 Number and size of tuna fishing units in 2023 at PPS Bitung (North Sulawesi Province, Indonesia)

Tuna fishing unit

In general, tuna fishing units based at PPS Bitung use two fishing gear, namely tuna handline and tuna longline. The two capture units were divided into several vessel sizes: 1-5 GT, 6-30 GT, and above 30 GT (Figure 4). The size of the vessel refers to Government Regulations (PP) number 5 of 2021 concerning risk-based business licensing, which is divided into three size groups: low-risk risk 1-5 GT, medium-high risk 6-30 GT, and high risk (above 30 GT). Handline fishing gear dominates the most in terms of number on each vessel size compared to longline fishing gear. Handline is used in all sizes of vessel ranging in size from 1 GT to above 30 GT, while longline sizes ranging from 6 GT to above 30 GT. Handline boats measuring 1-5 GT called pumpboats are generally small-scale fishers, sizes 6 to 30 GT and above for handline and longline boats owned by business actors with large capital and tuna processing companies. Furthermore, the number of personnel for handline vessel measuring below 5 GT ranges from 4-10 people in each trip with a maximum operating time of 10 days, while handline and longline vessel measuring 6-30 GT and above 30 GT are each ranging from 5-14 people and 12-16 people with a length of operation time each ranging from 2 weeks to a maximum of 3 months. Meanwhile, from the results of this study, it is also known that fishing areas are in fisheries management areas 715 and 716, precisely for 715 in the waters of the Maluku Sea while 716 in the waters of the Sulawesi Sea.

Figure 5 shows that the type fishing gear that produces the most tuna is handline compared to *a* longline. The average production of tuna caught using handlines is 8,207 ton per year, although in 2020 and 2021, production only reached 5,059 ton and 7,591 ton, respectively. The decline in production in 2020 was due to the Covid-19 pandemic, but by 2021, increase in production. The longline is the second fishing gear that produces tuna. The average production of longline fishing gear is 274 ton per year, although tuna production only reached 122 ton in 2018.

Portrait of handling tuna fish

The process of handling tuna is divided into two fishing gear activities: tuna handline fishing and tuna longline (Figure 6). The handline vessel was operated in a short time. The caught fish was lifted from the supporting vessel onto the main vessel by pulling a rope tied to the mouth of the fish and placed on the deck/floor of the vessel adjacent to the hold. Cleaning begins by inserting a clean water hose into the mouth of the fish to remove leftover food or bait, followed by washing the entire surface of the fish's body up to the tail without removing the gill and stomach contents. The fish were washed while they were still moving/thrashing around in a limp state, then put in and arranged/stacked in a hold filled with flakes ice at a temperature of -1 to 2°C. This type of storage method resulted in some fish being found with abrasions on the surface of the skin that peeled off or even the fish flesh. The shortage of ice blocks and rapidly melting ice has an impact on increasing temperatures and freshness levels as well as decreasing the quality of tuna fish.

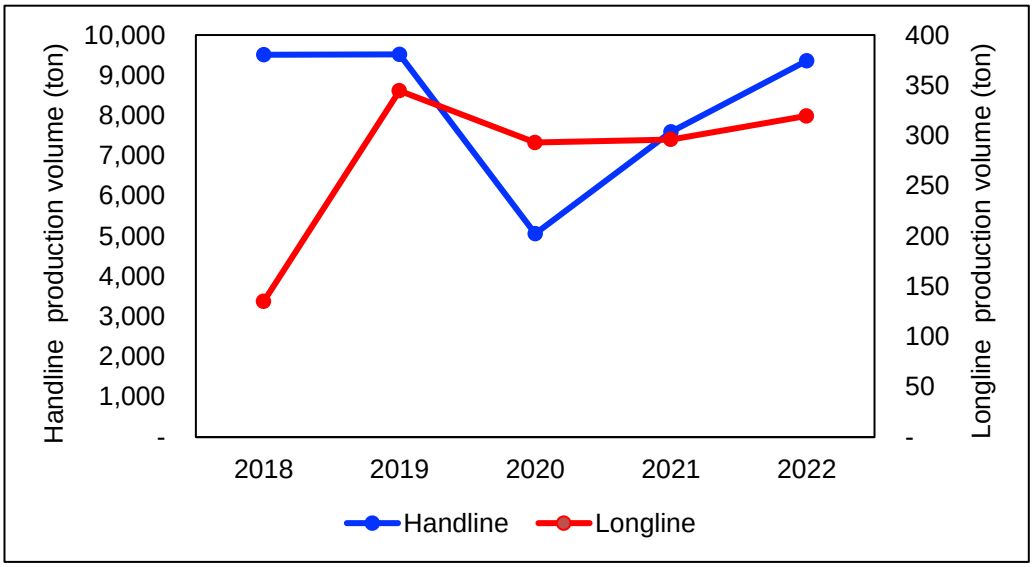

Figure 5 Tuna fish production by type of fishing gear in 2018-2022 at PPS Bitung (North Sulawesi Province, Indonesia

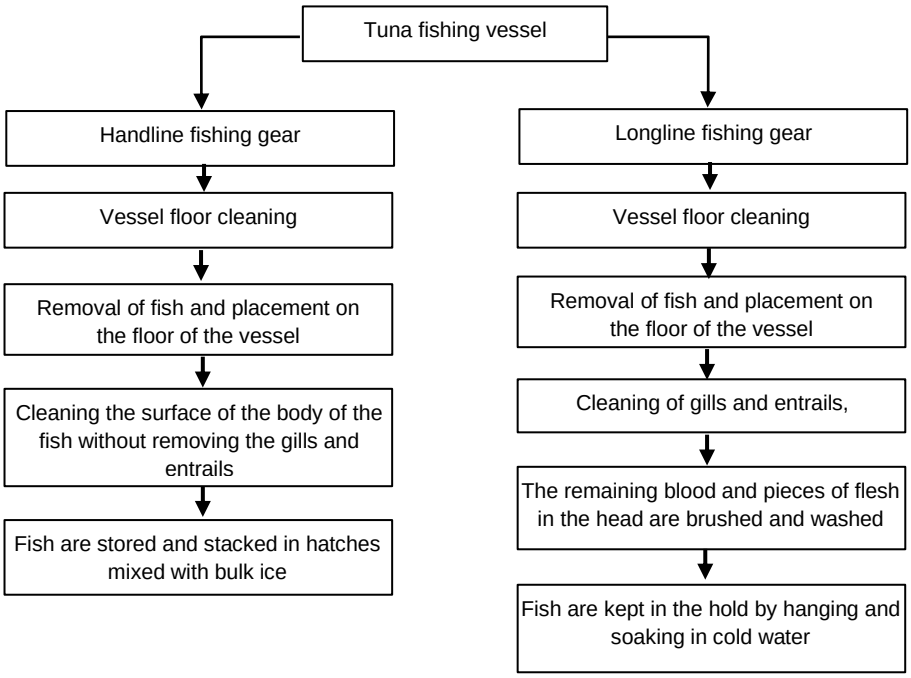

Figure 6 Handling tuna fish on handline and longline vessel based on PPS Bitung (North Sulawesi Province, Indonesia)

In contrast to the handling method on longline vessel, at the beginning, the tuna fish were cleaned by several crew members by washing the fish's body with running water and using a knife to remove the gills and stomach contents that were pulled from the head. Then, the inside of the head was washed again and brushed thoroughly to remove the remaining pieces of flesh, and foam was used to absorb the remaining blood. The cleaned fish were tied using a nylon rope at the mouth, then hung and soaked with the whole body of the fish in a hold filled with chilled sea water (CSW) or refrigerated seawater (RSW) has a temperature of -0.8 to -9°C. However, if the catch is large, the fish are not hung but released below the bottom until the hold is full. Based on observations, no tuna fish caught by longline vessel were found to have abrasions or wounds on the surface of the fish's body, even when the fish looked fresh.

Manado-Japan Tuna Direct Export Supply Chain

Figure 7 shows the supply chain process for the direct export of fresh tuna fish to Japan. Starting with fishers carrying out tuna fishing operations using handline and longline fishing vessel, the catch is landed at PPS Bitung in the form of whole tuna. Handline-caught tuna undergoes a cleaning process first, namely removing the gills and entrails of the tuna, and then a *checking* and sorting process is carried out by the fish company. The treatment of longline vessel is different, and the tuna catch is immediately checked *because* it has been cleaned during fishing operations. However, several fishing companies that also own fishing vessel carry out checks and sorting at company locations.

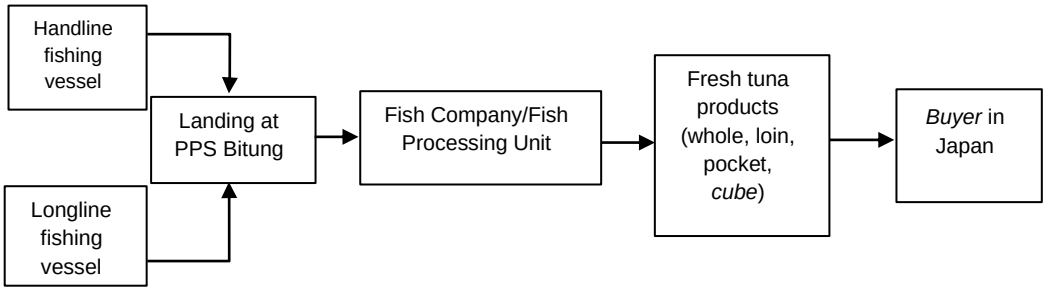

Figure 7 Direct export supply chain of fresh tuna fish at PPS Bitung, North Sulawesi Province, Indonesia

Table 1 Classification of tuna quality in North Sulawesi Province, Indonesia

Grades	Price range (Rp.)	Weight (Kg)
A	70,000-75,000	above 30
AB	60,000-70,000	above 30
C	45,000-55,0000	above 30
A B C	45,000	above 20
Local	30,000-35,000	above 10
Reject	25,000	above 10
Asuki (crushed meat)	20,000	above 10

Source: 2023 research results

The checking and sorting process aims to determine the quality (grade) of tuna fish based on their body condition, flesh color, and weight. The fish examination results were classified into several levels (Table 1).

The tuna processing process begins with weighing fish weight starting at 30 kg for yellowfin tuna and bigeye tuna, then washed using a brush and clean water mixed with 50 ppm chlorine solution as a disinfectant, starting from head to tail, which aims to prevent possible contamination of bacteria, dirt, and residual blood attached to the body of the fish. In addition, it also makes the fish appear bright and shiny. In the next process, the fish are separated according to the buyer's request, namely, whole tuna without gills and entrails (whole gillet and gutted/wgg), tuna without head and guts (headless and gutted/hg), and fresh tuna loin. Whole tuna fish products were stored in a cold room until they reached a temperature of 0-4^{0}C for ±24 hours by adjusting the delivery schedule, and then dried in preparation for packaging. Next, for fresh tuna loin, the head of the tuna was cut off, and the body of the fish was divided into four parts, consisting of two loins, the back, and the stomach. Subsequently, the tuna loin was packaged using plastic and vacuumed to remove air from the packaging. The process of packing whole fresh tuna or fresh tuna loin is done by wrapping it in thin foam and adding dry ice, which helps to maintain the cold temperature of the fish, then putting it in a plastic wrap, and putting it in a styrofoam/cardboard box. The tuna is then transported to the Sam Ratulangi Airport cargo terminal for shipping to Japan.

Fresh tuna exported to Japan are distributed to distribution agents or wholesalers, distributed to the market for auctions, and some are distributed to fish companies that process seafood. The auction market is the center of the metropolitan wholesale market in Tokyo, known as *Tsukiji* market, which is the gathering point for all seafood products sourced from local fishermen and imported products, and is the starting point for distribution before going to consumers (ITPC Osaka 2020). It was further explained that auctioned or processed fish are purchased by retail traders, purchased by retail business actors, including supermarket agents and restaurants, and then sold to final consumers. Based on the results of interviews with exporting companies, the buying price of tuna varies quite slightly, namely, whole tuna ranges from Yen (¥) 400-1100 per kg and tuna loin ranges from (¥) 700-850 per kg. Prices are influenced by consumer demand and the amount of tuna available in the market.

DISCUSSION

The description of the operational conditions of direct export of tuna to Japan is the fact that one of the policies formulated by the North Sulawesi Regional Government in order to increase the competitiveness of tuna fisheries has not run normally. Although the North Sulawesi Regional Government has improved its strategy by reducing the export cargo quota from the original 20 ton/trip down to 3 ton per trip, the current situation has not been as expected. Based on the 2023 Manado BKIPM report, the average monthly volume of tuna exports to Japan is only three months that reach the quota target of 3 ton, namely March of 3.35 ton, April of 3.04 ton, and December of 7.34 ton. Compared to several months that did not reach the target, namely May of 1.82 ton, June of 1.16 ton, July of 2.26 ton, August of 2.88 ton, September of 0.86 ton, October of 1.85 ton and November of 2.36 ton. The difficulty in meeting the export quota target is due to the limited supply of high-quality fresh tuna raw materials.

The calculation of tuna production based on PPS Bitung data for 2018-2022 states that the total production is 36,135 ton or an average of 7,227 ton per year. Thus, with the trend of tuna production that continues to increase every year, export quotas should be achieved. The study of Saputra *et al*. (2022) states that

the tuna processing industry in Bitung has difficulty in meeting foreign market demand even though production is quite large, because the distribution of tuna is distributed to the processing industry in Bitung but also to other companies.

Furthermore, the results of this study found that yellowfin tuna was exported most directly to Japan at 95%, followed by bigeye tuna at 5 percent. According to Yusra *et al*. (2014), the Japanese market has great potential for yellowfin tuna and bigeye tuna from Indonesia, which are strongly influenced by the high purchasing power of the Japanese people. In addition, according to Pan and Pooley (2004) in Arthatiani *et al*. (2020), bigeye tuna has a higher price than yellowfin tuna. In fact, according to ITPC Osaka information (2020), as many as 55 percent of Japanese consumers make yellowfin tuna and big eyes as raw materials for making *sashimi* food other than bluefin tuna.

High demand can benefit North Sulawesi because of the ability to produce yellowfin and big-eyed tuna, especially yellowfin, which is quite abundant, thus increasing the competitiveness of the tuna fishing industry. The results of the study by Rifaldi *et al*. (2020) stated that the guarantee of tuna raw materials can continuously increase the value of exports. Based on the results of the analysis, the average production for three types of tuna for the last 5 years (2018-2022) is yellowfin tuna of 8,318.11 ton or 97.97 percent, bigeye tuna of 157.29 ton or 2 percent, and albacore tuna of at least 4.56 ton or 0.03 percent. This condition is in line with several previous studies at PPS Bitung, namely Darondo *et al*. (2014) stated yellowfin tuna and bigeye tuna by 94 percent and 6 percent, respectively, while Dalegi *et al*. (2020) stated yellowfin tuna and bigeye tuna by 93.38 percent and 6.62 percent, respectively. Then, Kusumaningrum *et al*. (2021) revealed that one of the leading commodities in Bitung is yellowfin tuna and bigeye tuna with sustainable potential and utilization rates of 15,251 ton or 86 percent and 111 ton or 69 percent. The dominance of yellowfin tuna and bigeye tuna catches also occurred in other regions, namely the Banda Maluku Sea by 59.96 percent and 25.73 percent (Haruna *et al*. 2019) and in the Palabuhanratu Fishing Port around an average production of 7,747,219 ton or 38 percent and 9,438,961 ton or 46 percent (Imron *et al*. 2019).

In contrast to the type of albacore tuna which has a very small amount of production. The results of interviews with several Bitung fishers, revealed that albacore tuna is only caught at certain times not every month such as yellowfin tuna and bigeye tuna. In addition, the average weight of fish is below 30 kg per head, which weight is not included in the category of fresh tuna for export. Based on the BKIPM Manado report (2023), the types of whole fresh tuna exported directly to Japan are mostly yellowfin tuna, followed by bigeye tuna with an average weight of over 30 kg per head. Furthermore, the results of interviews with fish companies stated that albacore tuna is not for export whole but as raw material for canned fish and frozen tuna for export and local markets. Quoting Collete and Nauen (1983) in Bahtiar *et al*. (2014), the catch of albacore tuna in the Pacific Ocean is used as a product for canned tuna.

Furthermore, tuna landed at PPS Bitung is caught using handline and longline fishing gear, but handline is a common fishing gear and most widely used by fishermen. Handline fishing gear is easy to operate and in terms of price can be affordable compared to longline (Darondo *et al*. 2014; Karyanto *et al*. 2021; Simanjuntak *et al*. 2019). The results of research from Yusuf *et al*. (2017) as many as 31 percent of fishermen in Indonesia use handlines because they are considered to be able to maintain the quality of tuna catches produced compared to other fishing gear such as longline, troll line, and pole and line. In Figure 5, it can be seen that the handline is the fishing gear that produces the most tuna compared to the longline. The results of the analysis stated that the productivity of each tuna fishing gear was 97 percent handline and 3 percent longline. Handlines are operated using vessel measuring 1-30 GT and above, while longlines are operated using vessel measuring 27-73 GT. Handline fishing units are tuna fishery businesses ranging from small to medium to upper scale, while longlines are dominated by business actors with large capital and owners of fish processing companies.

However, the handling of tuna on boats by fishermen in Bitung is still an obstacle, resulting in a decrease in the quality of fish that does not meet the demand of Japanese consumers. This makes it difficult for exporters to meet export quota targets. Interviews with fish companies revealed that it is estimated that around 25-30 percent of fresh tuna is eligible for export directly to Japan, while ineligible fish are intended to meet market demand in other countries as well as local markets in various processed fish forms. The same condition occurs at the Nizam Zachman Ocean Fishing Port Jakarta, the best quality tuna will be directly exported in whole and fresh

form, otherwise what is not standard is processed into frozen tuna products, steaks, pocket tuna, and canned tuna (Ratri 2021).

According to research by Mustaruddin *et al*. (2016) in Bitung, product handling in tuna fishing operations in Bitung is still not optimal. The progress of handling related to the hauling period, fish shutdown, cleaning, and product storage is around 83.33%, 50%, 33.33%, and 100%, respectively. According to Byrnes *et al*. (2016), on-board handling systems can include handling during fishing operations and quality control of the products produced. The process of handling fish onboard is an initial and vital part of the tuna supply chain process that produces high-quality and highly competitive tuna products (Dutta *et al*. 2016; Kresna *et al*. 2017). In line with the observations, it was found that fishermen's lack of concern to maintain and maintain the quality of tuna fish was seen in fish cleaning and storage actions, such as not using work equipment according to standards and unsanitary vessel deck conditions and entering the hold using dirty sandal footwear. This condition is contrary to the study of Sari *et al*. (2020); which states proper fish handling procedures, namely the crew must use work clothes according to operating standards, the floor and hatch of the vessel must be clean, and fish must be handled quickly and must not be left long outside the unrefrigerated hatch. The study was strengthened by Hartanto *et al*. (2021); Dien *et al*. (2023) fish handling on board must pay attention to the cleanliness of the deck and hatch of the vessel and the health condition of working people because it can affect the quality and freshness of fish, as well as the shelf life and safety of fish products. Furthermore, according to Dien *et al*. 2023 in general, the character of fish is very perishable for it to be handled carefully by paying attention to four handling principles, including, fast, cold, clean, and careful. On the other hand, the factor of lack of skills and quality control of fishermen and crew in supply chain activities and fish handling greatly affects the quality of tuna to be not fresh physical defects and unsafe for consumption (Mboto *et al*. 2014; Pratiwi *et al*. 2021).

Another important factor that affects the deterioration of fish quality is the lack of ice supply, which has an impact on rising fish temperatures, thereby reducing the level of freshness of tuna. To obtain the best quality tuna, the use of ice is the most important part of the cold chain and the most critical point in the process flow of handling and distributing tuna (Jati *et al*. 2014; Lailossa 2015; Wahyu *et al*. 2019). However, ice shortages are often experienced by fishermen who use small and large handline boats. On the handline vessel, allegedly because of damage to the hatch where the ice was stored so that the ice melted quickly, it also found more fish than the available ice. According to Deni (2015), the freshness of fish is determined by the amount of ice used and the duration of detection, but still pay attention to the comparison with the number of fish so as not to damage the physical fish due to friction and pressure by chunks or ice fragments. The results of longline vessel observations for fish storage in the average hatch have been equipped with refrigerated sea water so that the temperature of the fish is maintained and the quality of tuna landed is of good quality.

Referring to several studies related to the impact of deterioration and damage to the quality of tuna due to improper fish handling in other areas such as research conducted by Gigentika *et al*. (2017) in Nusa Tenggara, around 15-40 percent of the total tuna landed experienced quality degradation. Then at the Nusantara Palabuhanratu Fishing Port, the cause of the decline in tuna quality is caused by the lack of fishermen's ability to handle fish on board (Anugerah *et al*. 2016), and the discovery of physical defects in the fish's body such as eye damage, not chewy meat, and slimy bodies (Yuliyanah *et al*. 2019).

Based on the description of the problem, the solutions that can be offered are as follows**:** **First**, to meet the raw materials for fresh tuna, supplies from outside North Sulawesi are needed, which come from island areas in the North Sulawesi region, namely the Sangihe Islands (Nadjib 2015) and Talaud Islands (Naung *et al*. 2018), and nearby areas outside North Sulawesi such as Gorontalo (Gobel *et al*. 2019). This strategy is reasonable because, thus far, almost all tuna supply has been sourced from catches landed at PPS Bitung. The results of the study of Palandeng *et al*. (2018) stated that to meet the demand of the tuna export market, the importance of supply chain flexibility through improving relationvessel with tuna suppliers from within and outside North Sulawesi so as to increase the competitiveness of export products and improve the company's performance as an exporter. For example, and have been implemented at PPS Nizam Zachman Jakarta to meet the needs of the direct export of tuna originating from Bitung, Cilacap. Malang, and Pelabuhan Ratu (Hutapea *et al*. 2017). **Second,** there must be refrigerated transportation service facilities on land and

vessel that function to maintain the temperature of fresh tuna fish in Bitung. **Third**, the importance of central and local government attention to carry out quality control through the monitoring and evaluation of tuna fishing vessel business actors and providing training to fishermen and fishing vessel crews regarding good fish handling methods. It is hoped that through a partnership cooperation approach, the constraints of the shortage of fresh tuna raw materials can be overcome to meet the target of the Manado direct export cargo quota to Japan so that Japanese consumer demand is met and has a positive impact on regional income and foreign exchange of the country.

CONCLUSION

Based on the research results, it can be concluded that the policy of direct export of fresh tuna from Manado to Japan is currently not running optimally because exporters have not been able to meet the cargo quota target of three ton per trip, so the North Sulawesi Regional Government still has to provide subsidies to continue operating. The obstacles faced are: (1) it is still difficult to obtain high-quality fresh tuna in large quantities; (2) fishermen have not fully implemented good fish handling methods in fishing operations; (3) the fresh tuna supply chain system, which only relies on the catch of fishermen based on PPS Bitung; and (4) there are no land or sea transportation facilities specifically for fresh tuna from inside or outside North Sulawesi to Bitung.

RECOMMENDATIONS

The central and regional governments hold training to increase fishermen's abilities to handle fish properly on a regular basis, as well as carry out monitoring and evaluation of the quality of the fish produced. Apart from this, diversifying the fresh tuna supply chain by looking for additional sources of supply from outside and within the North Sulawesi region. Then, refrigerated transportation facilities were provided to ensure that the freshness of the tuna was maintained until it reached the location of the fish-processing company.

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