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MACKEREL TUNA (EUTHYNNUS AFFINIS) SUPPLY CHAIN AT THE BELAWAN OCEAN FISHING PORT, NORTH SUMATERA PROVINCE

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Abstract

This research aims to determine the supply chain for tuna fish at the Belawan Ocean Fisheries Port (PPS). The research was conducted at the Belawan Ocean Fisheries Port (PPS), North Sumatera Province. The data collected included observation, interviews and literature research (excavating secondary sources). The research results show that the results of the analysis of the tuna fish supply chain show that there are four supply chains and four actors. The shorter the supply chain and the smaller the marketing margin, the greater the profits and marketing costs received. This indicates that marketing of tuna fishery production will be more efficient, and vice versa. The shortest supply chain alternative is highly recommended to ensure stock availability, minimize prices, increase profits, empower local assets and culture of North Sumatara Province which must be maintained, and the role and contribution of the government is really needed, especially when the availability of tuna stocks is abundant.

Keywords : ***Supply Chain, Mackerel Tuna (Euthynnus affinis), Belawan Ocean Fisheries Port (PPS), Fisheries.***

1. INTRODUCTION

Mackerel Tuna *(Euthynnus affinis)* is a type of sea fish that is popular in various markets and kitchens around the world (Ali et al., 2021). Mackerel tuna have a long, cylindrical body with a relatively small head. The body is covered in small scales and can vary in color, generally metallic blue on the top and silver on the bottom. The dorsal fin is high and erect. The size of mackerel varies, but generally ranges from 30 to 100 cm in length, depending on the species (Setyobudi et al., 2018). This fish is known for its striking characteristic, namely the presence of long lateral lines on the sides of its body. These lines are often dark in color and help in acclimating the fish to its environment. Mackerel Tuna *(Euthynnus Affinis)* can be found in tropical and subtropical waters throughout the world (Fadhilah et al., 2021). They usually reside in open waters, including the deep sea and offshore. Mackerel Tuna *(Euthynnus Affinis)* tend to form large groups and can move long distances (Saba et al., 2021). They are aggressive predators and eat a variety of small fish, shrimp, and squid. Mackerel Tuna *(Euthynnus Affinis)* has high economic value because of its delicious and versatile meat (Lelono & Bintoro, 2019). The flesh is pink to dark red, rich in protein, omega-3 fatty acids and other nutrients. Mackerel Tuna *(Euthynnus Affinis)* a fish is often processed into various products such as canned fish, sardines, or cooked directly as a main dish (Rajan & Mathew, 2017). Its rich taste makes it a popular choice in various seafood dishes around the world.

Mackerel Tuna *(Euthynnus affinis)* are known in international trade as kawakawa, belonging to the Scombridae family. This fish is a pelagic fish, forms schools, is a fast swimmer and a carnivore. According to Capture Fisheries Statistics, there are 3 types of tuna, namely krai tuna (Frigate tuna), komo tuna (*kawa-kawa*, Eastern little tuna) and ash tuna (Longtail tuna). Apart from being an export commodity, tuna is also a strategic commodity for fishermen to increase their income (Chodrijah et al, 2013). Utilization of Komo Tongkol fish resources will increase every year in line with increasing market demand. Tuna production still relies on fishing from public waters. Fishing for tuna is generally carried out using purse seines, gill nets and longline fishing. The availability of Tuna fish on the market is not guaranteed if you only rely on fishing in the wild.

One of the large pelagic fish resources with high economic value landed at the Belawan Ocean Fisheries Port (PPS) is the Mackerel Tuna *(Euthynnus affinis)*.

Belawan Port is a port located in the city of Medan, Indonesia (Many, 2018). Located on the upper east coast of Sumatera, precisely in Medan sub-district, it is one of the busiest ports outside Java. One reason is that this base is very close to the port in Penang, Malaysia. Medan is the capital of the North Sumatera region of Indonesia. Located on the upper east coast of the island of Sumatera, Medan is the fourth largest city in Indonesia by population, after Jakarta, Surabaya and Bandung. Medan has long been known as a popular tourist destination among history buffs and foodies, and is the gateway to other famous holiday spots in North Sumatera, especially Lake Toba. Belawan Ocean Fishing Port is located in a quite strategic position, namely located between the waters of the East Coast of Sumatera (Strait of Malacca) (Thia-Eng et al., 2000), the waters of the Indonesian Exclusive Economic Zone (ZEEI) and the South China Sea, and is the entry point for the economic activities of several countries in Asia (Rochwulaningsih et al., 2019). High value commodities will be the main priority, but things related to marketing need to be considered (Ratnawati, 2019).

Superior commodities are goods or services produced by society through a selection and development process, and have more value than other products. Calculation of superior commodities is carried out using the Location Quotient (LQ) method. The determination is based on four criteria, namely: LQ value from fish production volume, LQ from production value, and production of exported catches through SHTI issuance. The selection of superior fish commodities is then carried out using the Comparative Performance Index (CPI) method. Based on LQ calculations, four types of catch with the highest production volume LQ values were obtained, namely squid of 24.19; cuttlefish 4.10; cob 3.62; and shrimp 3.31. Based on the LQ production value calculation, it was obtained that the largest LQ production value was for squid of 11.23; shrimp at 5.98; cuttlefish 1.45; and a cob of 1.02. Based on the market potential for exported catches through SHTI issuance, the largest catch was 13,566.09 tonnes of squid, 10,485.15 tonnes of cuttlefish, 4,586.10 tonnes of tuna, and 3,971.48 tonnes of shrimp. Based on these three criteria, squid was found to be the leading commodity at PPS Belawan with a total CPI analysis of 2173, shrimp of 786, cuttlefish of 530, and tuna of 325.

The shortest supply chain according to the situation and conditions when expensive fish is very suitable, a short supply chain is highly recommended because it will have an impact on efficiency related to minimizing delivery time and costs, this is in accordance with the opinion (Manzoor et al., 2022). Furthermore, if prices are high, the second alternative is proposed to cut the supply chain so that it is not too long (Simioni et al., 2013), and it is hoped that the government will play an active role and re-function several Fish Landing Bases (PPI) as marketing facilities and cold storage as a means of storing fishermen's catches. The distribution and marketing process requires special treatment so that the quality and durability of the fish can be maintained (Brindley & Oxborrow, 2014). This special treatment is one of the marketing functions which aims to increase the economic value of fishery products, which can be done through increasing the efficiency of the marketing system in the context of coordination mechanisms for fish production, distribution and consumption activities. The supply chain consists of various actors (main producers, processors, traders, service providers) and can be formed if all actors in the chain work in such a way as to maximize the formation of value along the chain (Grema et al., 2020). Therefore, this research aims to find out the Tuna Fish Supply Chain at the Belawan Ocean Fisheries Port (PPS), North Sumatera Province.

2. IMPLEMENTATION METHOD

This research uses descriptive qualitative research methods (Koh & Owen, 2000). The data collected included observation, interviews and literature research (excavating secondary sources). This research was conducted at the Belawan Ocean Fisheries Port (PPS), Medan Belawan, North Sumatera. This research uses primary data and secondary data. Primary data was obtained through

capture fisheries time series data from Belawan PPS, Medan City Agriculture and Fisheries Service (DPP), North Sumatera Maritime and Fisheries Service (DKP), Fish Catch Certificate Issuance Office (SHTI), and conducting interviews. Secondary data is supporting information sourced from journals, books, theses which will be used as comparative data for the analysis results obtained.

There are two types of data used, namely primary and secondary data. Primary data was collected through interviews, direct observation and questionnaires from respondents and sources selected purposively provided that the person concerned had an understanding and was involved in the fresh fish *(tongkol)* supply chain. The data collected are: a) distribution channels for fishermen's catches from SPI Eri to final consumers, b) costs incurred for marketing tuna fish (product) and the percentage of profits from each member of the supply chain, starting from fishermen (producer) to final consumers, c) the number or percentage of products from producers to each member of the supply chain, for example what percentage of products from producers directly to consumers, what percentage to retailers and so on, d) the total number of tuna products, the number of fish products tuna at the Belawan Ocean Fisheries Port (PPS), North Sumatera Province which is supplied from each member of the supply chain, what percentage of tuna products are in the total stock of tuna products at the Belawan Ocean Fisheries Port (PPS), North Sumatera Province.

Secondary data was collected from the City/Regency and North Sumatera Province Maritime and Fisheries Services, Industry and Trade Services. Data includes production quantities, prices, fleet size, number of fishermen and fishing gear used. The data obtained was then analyzed descriptively statistically (Marshall & Jonker, 2010), to describe catch distribution activities and the parties involved. Supply chain performance analysis to measure the level of supply chain efficiency. The measurement is by taking into account the costs incurred for product marketing purposes and the percentage of profits from each actor. Supply chain efficiency can be described by calculating the marketing margin percentage, profit margin, marketing cost ratio using the formula according to Jumiati et al. (2013) and Harlawati et al., (2020).

3. RESULTS AND DISCUSSION

Target of the Mackerel Tuna *(Euthynnus Affinis)* Supply Chain

The target of the tuna supply chain explains the target market and customer desires. According to Yolandika et al. (2017) supply chain targets are goals to be achieved in implementing management.

Target Market

The market destination for tuna at the Belawan Ocean Fisheries Port (PPS), North Sumatera Province is divided into two, namely out-of-town consumers and local consumers. This explanation can be seen in Table 1.

Table 1. Supply Chain Actors and Market Destinations at Belawan Ocean Fisheries Port

	Supply Chain Actors	Market Objectives	Request Form
	Company/CV	Fish Container, Fish Processor, Out-of-Town Consumers	Frozen Mackerel Tuna *(Euthynnus affinis)*
	Large container	Out-of-town consumers	Fresh Tuna Mackerel
	Small Container	Local consumers: consumers located around the port	Fresh Tuna Mackerel
	Fish processor	Out-of-town consumers and local consumers consist of consumers located around the port	Mackerel Tuna in processed shredded form

Supply chain actors at the Belawan Ocean Fisheries Port (PPS), North Sumatera Province already have their own market objectives. Companies located at the Belawan Ocean Fisheries Port (PPS), North Sumatera Province usually distribute their fish to consumers outside the city such as

the Medan area or North Sumatera Province. During the fishing season, usually a lot of tuna are landed at the port so that the tuna enters the company. However, when it is not in season, the company lacks a supply of fish for distribution. So we bring in tuna from companies outside the area. Other actors such as fish baskets and fish processors are hampered by the availability of tuna for the distribution process if the catch landed at the port is small. These actors usually provide a supply of tuna, buying from companies or middlemen. The availability of fish as a raw material determines whether or not the supply flow will reach consumers with the desired quantity and quality (Kemkes et al., 2010; Bagstad et al., 2013).

Customer Desires

The tuna mackerel caught have various sizes. In the market survey, supply chain actors have not conducted a survey. The company and the fish basket never conducted a survey of customer desires. However, as the main supplier, it is very important to know what consumers want. Fish baskets in fish sales activities meet consumers directly. Based on information from fish baskets, consumers prefer tuna caught by *Payang* (one of the fishing tools that is widely used by small-scale fishermen and is operated on fishing routes I-II in Indonesian coastal waters) fishing gear rather than gillnet (Atikasari et al., 2022). Consumers also prefer fresh tuna with a size of 3 per kilogram. Knowing market surveys helps in measuring supply chain performance (Oey et al., 2023).

Figure 1. Payang Type Fishing Equipment

Fish marketed by supply chain actors experienced a decline in quality. This happens in fish baskets that lack ice, so the quality of the fish decreases. The decreasing quality of marketed fish has an impact on decreasing consumer demand. This is different from fish processors who market their products in the form of shredded meat. Products marketed still tend to last a long time. It is important to adjust the quality and quantity marketed to consumer demand and expectations so that a good relationship occurs (Engelseth, 2016; Jaffry et al., 2016).

Tuna Mackerel Supply Chain Management

Tuna Mackerel fishermen act as suppliers of tuna mackerel to middlemen. The caught fish is dismantled by the bricklayer and then sorted by the middleman. Fish that have been sorted by middlemen are sold to companies or CV *(Commanditaire Vennootschap)*, fish processors, and baskets located at the Belawan Ocean Fisheries Port (PPS). Apart from that, the CV/Company which is located at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province, continues to maintain the supply of tuna fish supplied by the CV/Company which is located in Jakarta. The tuna mackerel supplied is frozen fish which is stored in boxes. Each box contains 10 kg. The distribution process uses cars that are equipped with refrigeration.

The distribution process takes around 8-9 hours with a weight of 3 tons of fish in one delivery. A good supply chain certainly requires effective timing. Transportation costs incurred by the company amount to Rp. 1.500.000 in one delivery. The company tries to reduce transportation costs by storing fish in refrigerated cars as long as distribution has maximum capacity. Many or few fish in one shipment will have the same transportation costs. The longer the process takes, the greater the costs that must be incurred (Baso et al., 2021; Bintoro et al., 2022). The company is able to sell 10-15 tons of tuna in a month. The tuna mackerel that has been received at the company or CV is put into cold storage. The purpose of putting it in cold storage is to maintain the quality of the fish.

Figure 2. Distribution of Catches at the Belawan Ocean Fishing Port, North Sumatera

Companies and tuna fishermen have an important role in this supply chain, because they are the main suppliers that provide tuna. The tuna is purchased by fish baskets and processors. Tuna fishermen always sell their fish to middlemen. Middlemen buy tuna mackerel from fishermen to resell to other supply chain actors.

Partnership

Tuna mackerel fishermen do not have specific criteria for selecting partners to market their tuna catch. Tuna mackerel fishermen and middlemen have an interdependent relationship. So the fish they catch are always sold to middlemen (Miñarro et al., 2016; Roberts et al., 2022). The positive impact of selling fish on middlemen is that tuna fishermen can easily market their catch. However, these sales also have a negative impact on fishermen, because prices are usually determined by middlemen. Fishermen usually get inappropriate prices. Fishermen find it difficult to market their catch other than to middlemen. This is because some of the ship or fishing operation costs come from middlemen. Fish baskets and fish processors who buy fish from middlemen or companies do not have partner selection criteria. However, there is often haggling over the price of fish. In the bargaining process, a price is obtained based on mutual agreement. An agreement between these parties builds a good relationship.

Contractual Agreement

In this contractual agreement, what is seen is between tuna fishermen, companies and middlemen. Tuna mackerel fishermen in this supply chain member act as the main supplier. So it determines whether there are fish stocks or not in other members of the supply chain. Most fishermen at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province sell their catch to middlemen. The contractual agreement between tuna mackerel fishermen and middlemen is carried

out verbally (Azis & Wahyudi, 2020). Each fisherman and middleman has a different contract length. Some have been running for 2 years and some have been going on for more. The company and the middleman do not have a definite contractual agreement. Middlemen who receive large catches from fishermen usually sell the tuna to the company. Before the sales process, the middleman and the company make a verbal agreement. The aim of middlemen selling tuna to companies is to reduce the risk of the fish rotting. Tuna must be handled quickly because it rots quickly. The company has cold storage to accommodate fish in large quantities. Fish processors and baskets do not have contractual agreements with middlemen or companies, because they sell fish directly to consumers.

Figure 3. Belawan Harbor in North Sumatera (Fadli & Alexander, 2022)

Transaction

The payment process between tuna mackerel fishermen and middlemen is usually carried out directly. The catch received by the middleman from the fishermen is immediately paid in cash. The difference between middlemen and companies is that the payment process is delayed. The company pays the middleman when the fish is sold. Other actors such as fish baskets and fish processors carry out transactions with companies or middlemen directly (cash). Fish baskets and processors come to the company or middleman to buy fish and are paid directly on the spot. After that, the basket or fish processor sells the fish to consumers. The transaction processes that occur are usually cash and account transfers.

The Structure of the Tuna Mackerel Supply Chain

This supply chain structure explains several members involved and their roles in the tuna fish supply chain. In this supply chain structure, each actor has a different role. The back and forth flow of products occurs between the middleman and the company. This happens when the supply of tuna runs out. The middleman, if there is a shortage of tuna, is supplied by the company. Likewise, if tuna fish is abundant at the company's port, it is supplied by middlemen. The structure of the tuna mackerel supply chain at the Belawan Ocean Fishing Port, North Sumatra can be seen in Figure 4.

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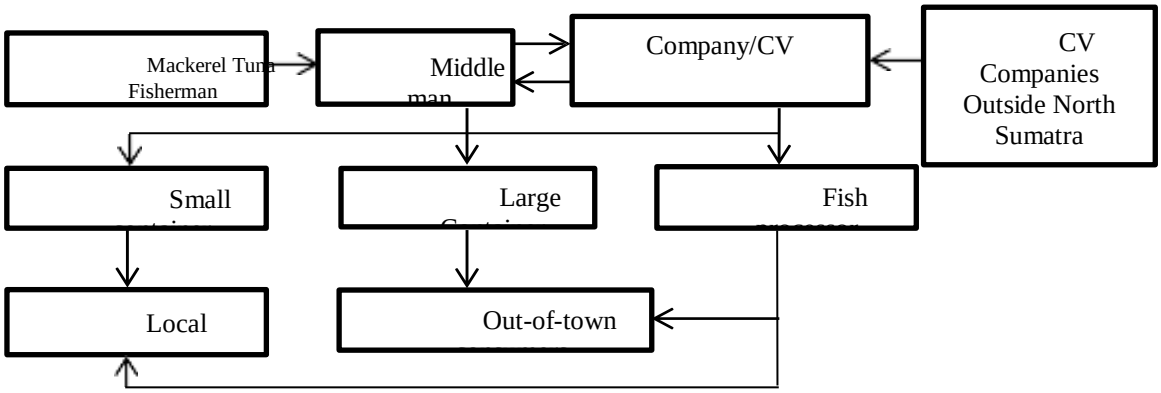


Figure 4. Structure of the mackerel supply chain at the Belawan Ocean Fisheries Port

Tuna Mackerel fishermen sell fish to middlemen. The middleman sells tuna to the company when there is an abundance of tuna at the port. However, if there is a shortage of tuna at the port, the middleman buys the fish from the company. There is a back and forth sales process between the middlemen and the existing companies/CVs, namely to mutually maintain the supply of tuna for sale to consumers or other supply chain actors. Actors involved in the tuna fish supply chain at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province have their own different activities. The explanation can be seen in Table 2.

Table 2. Actors in the Tuna Mackerel Supply Chain and their Activities at the Belawan Ocean Fisheries Port (PPS)

Level	Member	Activity
Supplier	Tuna Mackerel fishermen Middleman Company/CV in North Sumatera	Supplying Tuna Mackerel catch to middlemen. Supplying Tuna Mackerel to fish processors and fish baskets. Supplying Tuna Mackerel in frozen form to the CV company located at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province.
Distributor	Company/CV Outside North Sumatera	Supplying Tuna Mackerel to baskets, fish processors, and selling to out-of-town consumers.
Retailer 1	Tuna Mackerel Container	Buy fish from middlemen or companies/CVs at the Belawan Ocean Fisheries Port (PPS) and sell them to local consumers or out-of-town consumers.
Retailer 2	Fish processor	Buy fish from middlemen or companies and process Tuna Mackerel and sell it to local and out-of-town consumers.
Customer	Consumer	Purchasing Mackerel Container catch. The fish purchased is either fresh fish or processed fish.

In Table 2, it can be seen that there are activities carried out by the company/CV, supplying tuna to the company/CV. This happened when the catch of tuna landed at the port decreased. So the company/CV is short of supply of tuna. There are quite a lot of actors in the supply chain at the

Belawan Ocean Fishery Port (PPS), North Sumatra Province, so management must be good. The more actors in the supply chain, the more complex it will be and requires good management (Kabu & Tira, 2015). Usually when we enter August or September we catch a lot of tuna. So the company does not need to bring in tuna from Padang City. Tuna fish that enter the company are immediately distributed outside the city, for example Pekanbaru City and others. Distribution uses cars equipped with refrigeration. There is no special packaging for tuna, only plastic is used.

Tuna Mackerel supply chain resources

The chain resources discussed include physical, technological, human and capital resources.

Physical Resources

The physical resources in the tuna fish supply chain at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province are in the form of a 2 GT ship with a 15 PK Yamaha outboard engine or commonly called a ship. Apart from that, there are also *payang* and gillnet fishing gear. Gillnet and *payang* fishing gear can be seen in Figure 1. Some of these physical resources are in the form of assistance from the government and some are from private sources. This assistance is still not evenly distributed among fishermen, so social jealousy often occurs. There are still many physical resources that support the tuna fish supply chain at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province, for example the small size of the vessels. The small size of the ship results in a close reach to the Fishing Area (DPI) so that fish catches are usually low per fisherman. Fishermen have not been able to use technology to increase the productivity of their catch, for example sensors to detect the presence of fish. In fact, if it is able to use it, it will have great potential in the fishing business, because there will be an increase in catch production. Technology is a very important factor in producing quality products, resulting in competition in business.

Capital Resources

Financing, especially for Tuna Mackerel fishermen in tuna fishing operations, comes from private sources. Fishermen usually experience losses if their catch is small. So just to replace the cost of supplies such as fuel, it cannot be replaced with the catch obtained. There is a strategy from fishermen in the form of setting aside money from the catch. This money is managed by the boat captain, and when the catch is small fishermen can still carry out fishing operations with capital from the set aside fee. However, there are also fishermen who borrow capital for fishing operations from middlemen. Loans are made when fishermen do not get their catch and want to carry out fishing operations. The capital provided by the middleman is paid by the fishermen with the catch they get. The catch is sold to middlemen at a price agreed upon by both parties. Fishermen also receive assistance from the government in the form of fishing equipment and 2 GT fishing vessels to invest in going to sea. These boats and fishing gear really help fishermen, but not evenly distributed. So, social jealousy often occurs. Other actors in the supply chain, such as middlemen, fish processors, and baskets (container), sourced private capital. There is no assistance from the local government for these perpetrators.

Tuna Mackerel Supply Chain Business Process

The supply chain business process reflects the processes that occur throughout the tuna mackerel supply chain. A good chain business process is one that has good integration with each other. The chain business process discussed in the tuna fish supply chain at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province includes chain business process relationships and risk aspects.

Chain Business Process Relationships

This supply chain business process explains the relationships between supply chain members. The strength of business relationships between supply chain actors is good business

relationships between supply chain actors. Good business relationships between supply chain actors occur because supply chain actors have known each other for a long time, trust each other and business relationships are well and smoothly established. The business relationships that occur in the tuna mackerel supply chain are viewed from the pull/push process. The push process occurs before there is an order from the end consumer, while the pull process occurs if there is a prior order from the end consumer.

The supply chain actors who implement the push process are tuna fishermen with the aim of anticipating subsequent consumer demand. Likewise with other members, middlemen work with baskets and companies with the aim of getting the goods to consumers quickly. According to Marimin and Maghfiroh (2010), in terms of speed of customer service time (responsiveness), the push process is better than the pull process. The pulling process is carried out by fish processors. The pull process occurs if out-of-town consumers have placed an order for tuna mackerel products. Usually out-of-town consumers place orders by telephone. The advantage of the pull process is that sellers can reduce product inventory costs and reduce product costs that accumulate due to the effects of excess stock (Siriban-Manalang et al., 2019).

Prices vary for each supply chain actor. Fishermen sell fish to middlemen for IDR 15,000, while middlemen sell to companies for IDR 17,500. The margin obtained is IDR 2,500. A high increase in margins will result in higher prices for other supply chain actors, namely consumers. A larger margin percentage will have an impact on poor supply chain performance, resulting in higher prices for consumers (Husna et al., 2020). Below are presented the price margins for tuna at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province in Tables 3 and 4.

Table 3. Price Margin for Tuna Mackerel

No	Chain	Price (Rp)	Price Increase Rate (Rp)
1	R1	15 000	
2	R2	17 500	2 500
3	R3	20 000	2 500
4	R4	25 000	5 000
	Margins	10 000	

Information:
R1 = Tuna fishermen
R2 = Middleman
R3 = Company/CV
R4 = Fish basket

Table 4 Price Margin for Tuna Mackerel for Processors

No	Chain	Price (Rp)	Price Increase Rate (Rp)
1	R1	16 500	
2	R2	20 000	3 500
3	R3	30 000	10 000
	Margins	13 500	

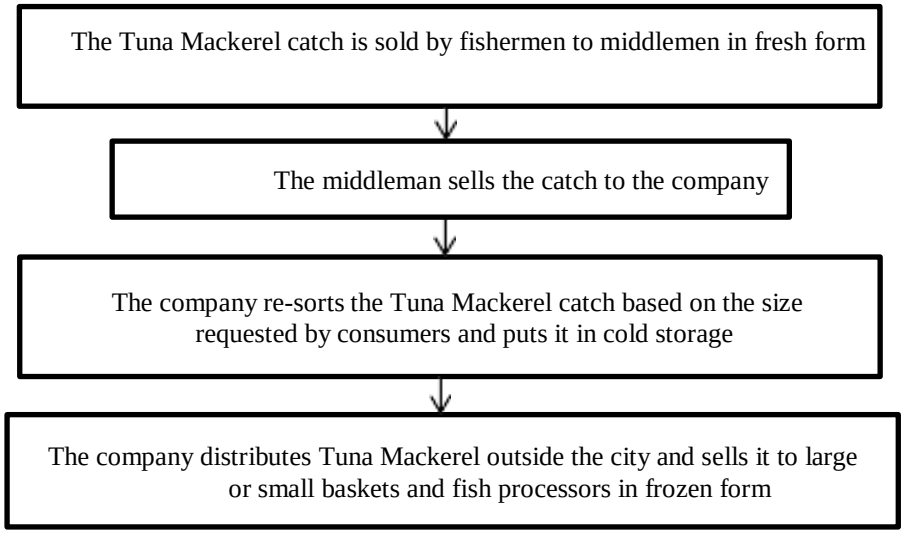
Information:
R1 = Company/CV
R2 = Company/CV
R3 = Fish Processor

Based on tables 3 and 4, it can be seen that there are different margins. In Table 4 it can be seen that the margin is IDR 10,000 and in Table 9 the margin is IDR 13,500. Based on interviews that have been conducted, the increase in margin is caused by the cost of providing ice to maintain

fish quality and transportation costs. The flow of information that occurs in each supply chain actor is that they know each other. You no longer need to find out information about marketed fish products, because you already know it beforehand.

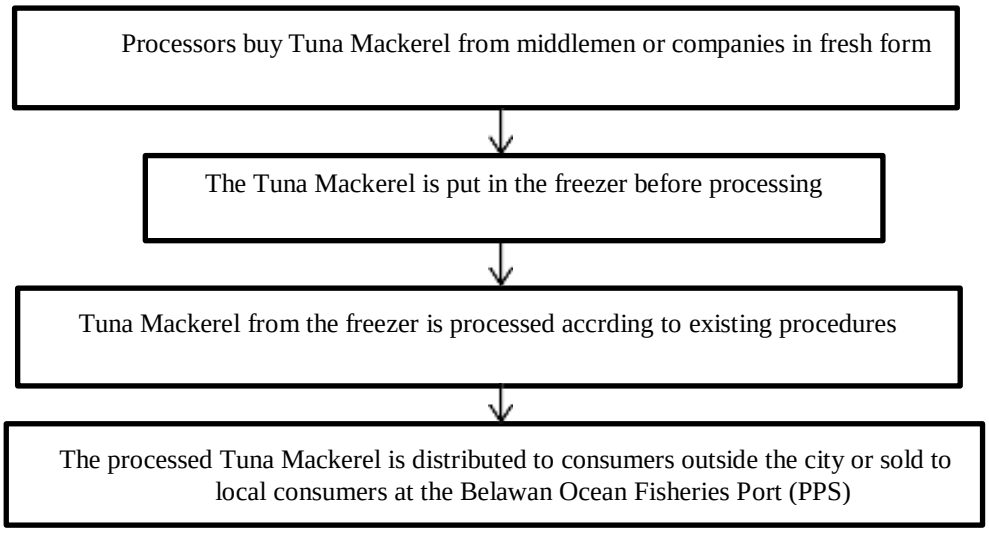
In the chain business process relationship there are two product streams, namely those carried out by the company and the fish processor. In general, the flow of products in the tuna fish supply chain at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province is running well. The company anticipates the supply of tuna by importing it from companies in Padang City. On the other hand, fish processors to provide fish stock for the processing process come from middlemen or companies at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province. It is easier for processors to provide fish stock because suppliers are close by, namely around the port. The close distance between fish processors and middlemen or companies reduces margin costs. So the price received by fish processors is not too high. An explanation of product flow by company can be seen in Figure 4.

Figure 4. Flow of Tuna Mackerel products by company



The product flow that occurs by the company begins with fish caught from tuna fishermen being sold to middlemen in fresh form. Then the middleman sorts the catch to be sold to the company. The fish company is stored in cold storage before the distribution process is carried out. After that, the company carries out the distribution process to out-of-town consumers or to supply chain parties such as large baskets, small baskets and processors. The product flow that occurs in fish processors is different from companies. The explanation can be seen in Figure 5.

Figure 5. Flow of Tuna Mackerel Products by Fish Processors



The flow of products by fish processors begins with the purchase of fresh tuna mackerel products from middlemen or companies. Before processing the fish, put it in the freezer. The tuna mackerel will be processed immediately if an order has been placed by out-of-town consumers. Unlike local consumers, tuna fish is first processed. This aims to anticipate orders by local consumers. In a month usually 50 kg of tuna mackerel are sold at a price per kg of IDR 30,000. Marketing channels describe the sequence of marketing institutions that a product must go through from production to final consumer (Bambang, 2018). Generally, a product has more than one type of marketing channel and can be simple or complex, depending on the product. Marketing institutions that are quickly able to distribute products to consumers usually have simpler marketing channels. Marketing channel activities are an economic action based on their ability to help create economic value. In addition, intermediary traders are a group of traders who deal directly with fishermen at fish landing sites and often act as agents for large traders. The relationship between fishermen and intermediaries has been formed since the fish trade existed and the economic relationship between the two took the form of an agreement (Pedroza, 2013).

In distributing the tuna mackerel by fishermen to the market, there are a number of institutions involved and working together so that fresh fish can reach consumers at the time needed. The involvement and cooperation of these institutions is very dependent on the amount of fishermen's catch and traders' capital. According to Gutiérrez et al. (2011), cooperation or partnership between institutions in capture fisheries is a form of working relationship that occurs between two or more parties who share a commitment to achieving goals by combining resources and coordinating joint activities. Fish and other fishery products are perishable and easily damaged. However, the production center for fish and other fishery products in Medan City or North Sumatera Province is not too far from the market. The fishing location is around 3-4 hours or more from the fishing village plus a fishing time of 4-6 hours, causing fish caught by purse seine or long boat fish to still be fresh when they arrive at the fish landing center (SPI).

4. CONCLUSION

The success of a business is demonstrated by the business's ability to market the products it produces. As an important aspect of the success of a business, marketing must be carried out in a system. This indicates that the market is no longer placed at the end of marketing activities but at the forefront, which means that the final goal of a fishing activity is the market, or consumer. The main key in the systems approach is that all components are equally important or indispensable. Therefore, the main function of a good fishery product marketing system, among others, is to

provide fishermen as subjects or economic actors, a price level that is appropriate to the level of risk they face, both due to technical risks such as natural factors and market risks, as well as to provide a price level that is commensurate for consumers according to the quality of the product they receive without forgetting the meaning and important role of the institutions involved in the marketing process of fishery products. Marketing Margin Analysis is often used as an indicator of marketing efficiency. The amount of marketing margin in various marketing channels can be different, because it depends on the length of the marketing channel and the activities that have been carried out as well as the profits expected by the marketing institutions involved in marketing. In this case, what we want to look at is the marketing institutions carried out by auctioneers and papalele who market tuna mackerel. Measuring supply chain efficiency needs to take into account the costs incurred for product marketing and the percentage of profit from each member of the supply chain. Supply chain efficiency can be described by calculating the marketing margin percentage, profit margin, marketing cost ratio from the beginning to the end of the supply chain members. The results of the analysis of the tuna supply chain at the Belawan Ocean Fisheries Port (PPS), North Sumatra Province show that there are four supply chains and four actors. The shorter the supply chain and the smaller the marketing margin, the greater the profits and marketing costs received. This indicates that marketing of tuna fishery production will be more efficient, and vice versa. The shortest supply chain alternative is highly recommended to ensure stock availability, minimize prices, increase profits, empower local assets and culture in North Sumatra Province that must be maintained, and the role and contribution of the government is really needed, especially when the availability of tuna mackerel stocks is abundant.

REFERENCES

Ali, S., Hossain, M., Azad, A. B., Siddique, A. B., Moniruzzaman, M., Ahmed, M. A., Amin, M. B., Islam, M. S., Rahman, M. M., Mondal, D., & Mahmud, Z. H. (2021). Diversity of Vibrio parahaemolyticus in marine fishes of Bangladesh. *Journal of Applied Microbiology*, *131*(5), 2539–2551. https://doi.org/10.1111/jam.15093

Atikasari, M., Sawiji, A., & Muslih, T. (2022). Environmental friendliness of fishing gears in Kranji, Lamongan Regency. *Journal of Marine Resources and Coastal Management*, *3*(1), 13–20. https://doi.org/10.29080/mrcm.v3i01.1160

Azis, A., & Wahyudi, R. (2020). Imperfect Victims and an Imperfect Protocol: Reflecting on the Trafficking Experiences of Indonesian Migrant Fishermen. *Journal of Human Trafficking*, *6*(2), 156–167. https://doi.org/10.1080/23322705.2020.1691302

Bagstad, K. J., Johnson, G. W., Voigt, B., & Villa, F. (2013). Spatial dynamics of ecosystem service flows: A comprehensive approach to quantifying actual services. *Ecosystem Services*, *4*, 117–125. https://doi.org/10.1016/j.ecoser.2012.07.012

Bambang, A. N. (2018). Fish Marketing of Ribbon Fish (Trichiurus sp.) in Nusantara Fishing Port (NFP)at Palabuhanratu, West Java. *E3S Web of Conferences*, *31*, 08012. https://doi.org/10.1051/e3sconf/20183108012

Baso, A., Najamuddin, Firman, Chasyim Hasani, M., & Kasri. (2021). Economic analysis of shortfin scads fish (Decapterus spp) business using purse seine in Bone Regency, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *860*(1), 012052. https://doi.org/10.1088/1755-1315/860/1/012052

Bintoro, G., Yulianto, E. S., Lelono, T. D., Prasetyo, D. T., Rahman, M. A., & Sari, W. K. (2022). Utilization status and bioeconomic performance of skipjack tuna (Katsuwonus pelamis) fishery in the south coast of Malang waters, East Java, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1033*(1), 012026. https://doi.org/10.1088/1755-1315/1033/1/012026

Brindley, C., & Oxborrow, L. (2014). Aligning the sustainable supply chain to green marketing needs: A case study. *Industrial Marketing Management*, *43*(1), 45–55.

https://doi.org/10.1016/j.indmarman.2013.08.003

Engelseth, P. (2016). Aligning end-to-end seafood supply through a series of markets. *International Journal of Production Economics*, *173*, 99–110. https://doi.org/10.1016/j.ijpe.2015.12.012

Fadhilah, A., Octavira, D., Leidonald, R., Desrita, & Prasetyo, B. A. (2021). The estimation of mackerel tuna (Euthynnus affinis) fishing ground in Malacca Strait. *IOP Conference Series: Earth and Environmental Science*, *782*(4), 042007. https://doi.org/10.1088/1755-1315/782/4/042007

Fadli, A., & Alexander, H. B. (2022, February). Pelabuhan Belawan di Sumut Bakal Dibangun Jadi Eco Fishing Port. *Kompas.Com*.

Grema, H. A., Kwaga, J. K. P., Bello, M., & Umaru, O. H. (2020). Understanding fish production and marketing systems in North-western Nigeria and identification of potential food safety risks using value chain framework. *Preventive Veterinary Medicine*, *181*, 105038. https://doi.org/10.1016/j.prevetmed.2020.105038

Gutiérrez, N. L., Hilborn, R., & Defeo, O. (2011). Leadership, social capital and incentives promote successful fisheries. *Nature*, *470*(7334), 386–389. https://doi.org/10.1038/nature09689

Harlawati, Budiyanto, & Mansyur, A. (2020). KAJIAN SALURAN PEMASARAN IKAN LAYANG (Decapterus spp) DI TEMPAT PELELANGAN IKAN (TPI) KOTA KENDARI. *Jurnal Sosial Ekonomi Perikanan*, *5*(1). https://doi.org/10.33772/jsep.v5i1.13018

Husna, N., Indra, & Deli, A. (2020). PERFORMANCE ANALYSIS OF SKIPJACK TUNA SUPPLY CHAINS IN ACEH LAMPULO JAYA BAHARI LTD. *Russian Journal of Agricultural and Socio-Economic Sciences*, *101*(5), 84–93. https://doi.org/10.18551/rjoas.2020-05.09

Jaffry, S., Glenn, H., Ghulam, Y., Willis, T., & Delanbanque, C. (2016). Are expectations being met? Consumer preferences and rewards for sustainably certified fisheries. *Marine Policy*, *73*, 77–91. https://doi.org/10.1016/j.marpol.2016.07.029

Jumiati, E., Darwanto, Dwidjono Hadi Hartono, S., & Masyhuri. (2013). ANALISIS SALURAN PEMASARAN DAN MARJIN PEMASARAN KELAPA DALAM DI DAERAH PERBATASAN KALIMANTAN TIMUR. *Agrifor : Jurnal Ilmu Pertanian Dan Kehutanan*, *12*(1), 1–10. https://doi.org/https://doi.org/10.31293/af.v12i1.165

Kabu, E., & Tira, D. S. (2015). Value chain analysis towards sustainability: A case study of fishery business in Kota Kupang, Indonesia. *International Journal of Economics and Financial Issues*, *5*, 150–156.

Kemkes, R. J., Farley, J., & Koliba, C. J. (2010). Determining when payments are an effective policy approach to ecosystem service provision. *Ecological Economics*, *69*(11), 2069–2074. https://doi.org/10.1016/j.ecolecon.2009.11.032

Koh, E. T., & Owen, W. L. (2000). Descriptive Research and Qualitative Research. In *Introduction to Nutrition and Health Research* (pp. 219–248). Springer US. https://doi.org/10.1007/978-1-4615-1401-5_12

Lelono, T. D., & Bintoro, G. (2019). Population dynamics and feeding habits of Euthynnus affinis, Auxis thazard, and Auxis rochei in South Coast of East Java waters. *IOP Conference Series: Earth and Environmental Science*, *370*(1), 012054. https://doi.org/10.1088/1755-1315/370/1/012054

Many, N. (2018). Developing the port of Belawan as a modern and international port. *IOP Conference Series: Earth and Environmental Science*, *126*(1), 012182. https://doi.org/10.1088/1755-1315/126/1/012182

Manzoor, U., Baig, S. A., Hashim, M., Sami, A., Rehman, H.-U., & Sajjad, I. (2022). The effect of supply chain agility and lean practices on operational performance: a resource-based view and dynamic capabilities perspective. *The TQM Journal*, *34*(5), 1273–1297. https://doi.org/10.1108/TQM-01-2021-0006

Marshall, G., & Jonker, L. (2010). An introduction to descriptive statistics: A review and practical

guide. *Radiography*, *16*(4), e1–e7. https://doi.org/10.1016/j.radi.2010.01.001

Miñarro, S., Navarrete Forero, G., Reuter, H., & van Putten, I. E. (2016). The role of patron-client relations on the fishing behaviour of artisanal fishermen in the Spermonde Archipelago (Indonesia). *Marine Policy*, *69*, 73–83. https://doi.org/10.1016/j.marpol.2016.04.006

Oey, E., Puspitasari, P. P. M., Fransiska, N. A., & Polla, J. R. (2023). Identifying and improving customer preferences of frozen tuna for the export market. *International Journal of Productivity and Quality Management*, *39*(4), 512–535. https://doi.org/10.1504/IJPQM.2023.132831

Pedroza, C. (2013). Middlemen, informal trading and its linkages with IUU fishing activities in the port of Progreso, Mexico. *Marine Policy*, *39*, 135–143. https://doi.org/10.1016/j.marpol.2012.10.011

Rajan, D. P., & Mathew, S. (2017). No Title. *Turkish Journal of Fisheries and Aquatic Sciences*, *17*(6). https://doi.org/10.4194/1303-2712-v17_6_12

Ratnawati, E. (2019). Sea Toll As a Means To Increase the Effectiveness of Goods and Services To the Eastern of Indonesia. *Awang Long Law Review*, *1*(2), 120–130.

Roberts, N., Mengge, B., Utina, M. R., Muhatar, F., Anugerah, Icwardanhi, A., Muhammad Zulkifli, R., & Humphries, A. (2022). Patron-client relationships shape value chains in an Indonesian island-based fisheries system. *Marine Policy*, *143*, 105142. https://doi.org/10.1016/j.marpol.2022.105142

Rochwulaningsih, Y., Sulistiyono, S. T., Masruroh, N. N., & Maulany, N. N. (2019). Marine policy basis of Indonesia as a maritime state: The importance of integrated economy. *Marine Policy*, *108*, 103602. https://doi.org/10.1016/j.marpol.2019.103602

Saba, K., Rashid, F., Amin, A., & Bhat, T. H. (2021). Reproductive and Breeding Biology of Tuna Euthynnus affinis. In *Recent updates in molecular Endocrinology and Reproductive Physiology of Fish* (pp. 93–103). Springer Singapore. https://doi.org/10.1007/978-981-15-8369-8_7

Setyobudi, E., Rohmah, I., Fauziana Syarifah, R., Ramatia, L., Murwantoko, M., & Sari, D. W. K. (2018). Presence of Anisakis nematode larvae in Indian mackerel (Rastrelliger spp.) along the Indian Ocean southern coast of East Java, Indonesia. *Biodiversitas Journal of Biological Diversity*, *20*(1), 313–319. https://doi.org/10.13057/biodiv/d200136

Simioni, M., Gonzales, F., Guillotreau, P., & Le Grel, L. (2013). Detecting Asymmetric Price Transmission with Consistent Threshold along the Fish Supply Chain. *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie*, *61*(1), 37–60. https://doi.org/10.1111/j.1744-7976.2012.01257.x

Siriban-Manalang, A. B., Brillante, J. B., Cabahug, F. I. V., & Flores, R. P. (2019). Clean & Lean Production in Fish Canning Industry—A Case Study. In *Lean Engineering for Global Development* (pp. 191–223). Springer International Publishing. https://doi.org/10.1007/978-3-030-13515-7_7

Thia-Eng, C., Gorre, I. R. ., Adrian Ross, S., Bernad, S. R., Gervacio, B., & Corazon Ebarvia, M. (2000). The Malacca Straits. *Marine Pollution Bulletin*, *41*(1–6), 160–178. https://doi.org/10.1016/S0025-326X(00)00108-9

Yolandika, C., Nurmalina, R., & Suharno, S. (2017). Rantai Pasok Brokoli di Kecamatan Lembang Kabupaten Bandung Barat dengan Pendekatan Food Supply Chain Networks. *Jurnal Penelitian Pertanian Terapan*, *16*(3). https://doi.org/10.25181/jppt.v16i3.93