

Traceability schemes and supply chains of tuna fisheries in Indonesian fishing ports: case study of Bitung Ocean Fishing Port and Pondok Dadap Beach Fishing Port, Indonesia

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Abstract. Indonesia has 578 fishing ports spread from Aceh to Papua Province. The fishing ports are divided into four categories, type A (Ocean Fishing Ports/PPS), type B (Archipelago Fishery Ports/PPN), type C (Coastal Fishing Ports/PPP), and type D (Fish Landing Base/PPI). Each port type has a different supply chain and traceability scheme. The supply chain at the fishing port also affects the traceability scheme, which in this case, is more dominated by documents that fishery business actors must handle. The locations selected in this study were Pondok Dadap Coastal Fishing Port and Bitung Ocean Fishing Port. Both ports are fishing ports in Indonesia that produce much tuna. Pondok Dadap Coastal Fishing Port PPP and Bitung Oceanic Fishing Port PPS was chosen to compare traceability schemes in PPP and PPS. The traceability scheme will be described using qualitative methods with the Global Production Network (GPN) approach. The study results showed that the supply chain and traceability schemes in tuna fisheries are inseparable because they are interrelated. At every stage in the supply chain process, traceability documents must be fulfilled for the tuna products to be properly recorded and certified. There are several basic differences between supply chain and traceability schemes at PPS Bitung and PPP Pondok Dadap. First, the supply chain scheme at PPP Pondok Dadap only stops at Supplier/Middleman because there is no fishing processing unit at PPP Pondok Dadap. While landed tuna in PPS Bitung is immediately distributed to fish processing units. Second, the technical services that the two ports provided differ. PPP Pondok Dadap implements shorter technical services for traceability documents such as fish catch certification (SHTI).

Key Words: capture fisheries, fish certification, fisheries management.

Introduction. A lack of a reliable legal traceability system in Indonesia is one of the issues plaguing the Indonesian food industry, particularly regarding fishery commodities and processed marine products. Globally, the need for security in the food industry is a pressing concern. Regarding product safety, food products are more vulnerable than other products in several ways. Traceability must be implemented to improve food quality and ensure consumer safety.

Government agencies, non-governmental organizations, and retailers in the European Union (EU) and the United States of America (USA) require more information to ensure that seafood products are captured and processed in accordance with international standards for food safety, quality, legality, and sustainability. Moreover, imported goods are increasingly subject to private food safety standards, such as British Retail Consortium (BRC) certification, and public regulations, such as Council Regulation (EC) No. 1005/2008 (Council of the European Union 2008) regarding illegal, unreported and unregulated (IUU) fishing (Doddema et al 2020). Therefore, suppliers in exporting countries are required to collect, compile, and share data on the behavior and

performance of fishery production, processing, and trade in order to comply with these requirements and maintain access to key export markets. Transparency regarding where, how, and by whom fish are caught and sold is becoming increasingly important. Transparency in the supply chain has a positive connotation, indicating that the greater the transparency, the greater the production chain's sustainability and continuity (Mol 2015). Transparency requirements are obligatory, particularly in significant import markets such as EU and the USA (Willette & Cheng 2018; Lewis & Boyle 2017).

The traceability system can be interpreted as a complex system because it consists of four components: (1) process, (2) work organization, (3) information, and (4) technology, whose integration process involves both internal and external processes, with the fundamental principle of being able to track products and processes (Vanany et al 2014). Traceability can also be defined as a crucial component of the food safety management system and a component of the product supply chain that can be used to track the documented product history. Traceability is a response to various sustainability challenges in the fisheries sector, beginning with the prevalence of illegal and unsafe fishing (Pramod et al 2014), limitations on product labeling on the market (Helyar et al 2014), and overfishing (FAO 2018). Sustainability means protecting habitat, preventing overfishing, and ensuring that people who depend on fishing can maintain their livelihoods (Roheim et al 2018).

This paper will further elaborate on Indonesia's traceability system for tuna fisheries. Tuna is Indonesia's most crucial seafood category (Duggan & Kochen 2016). Albacore tuna (*Thunnus alalunga*), madidihang/yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*), and Southern bluefin tuna (*Thunnus maccoyii*) are the most common tuna species caught in Indonesia (Muawanah et al 2021). Tuna is a food commodity that is a leading export from Indonesia and requires good product management. According to data from the Central Bureau of Statistics Republic of Indonesia (BPS 2021), 358,626.16 tons of tuna were produced in 2021. This figure increased by 19.22% over the prior year's total of 300,803.5 tons. Traceability is one of the most critical issues in the tuna supply chain due to its unique characteristics, including complex supply chain networks and perishable food (FAO 2016). In addition, traceability is a commitment to sustainable tuna fishing (The Ocean Conference 2017). If no information about IUU-related international fisheries regulations is applied, it will likely lead to inferences about illegal fishing activity (Halim et al 2018). Consequently, on a large and small scale, tuna fisheries will be affected because they have raised concerns over allegations of illegal fishing (Khan et al 2018).

Traceability also aims to boost the competitiveness of Indonesian tuna exports to important markets such as the United States of America and the European Union (Pramod et al 2014). When exporting tuna to target nations, tuna fishermen need a traceability system to make product data and quality transparent. Traceability in destination nations is enhanced by national legislation and commercial norms governing the production of tuna in each country (Olsen & Borit 2013). Thus, the availability of information demonstrating that Indonesia meets its traceability obligations is essential (Bush et al 2017).

In supporting the implementation of the traceability system, fishing ports (PP) and fish landing bases (PPI) are vital infrastructures built by the government with a service orientation to port users. From a supply chain perspective, fishing ports are one of the entities that contribute to the flow of the fishery product supply chain (Muninggar 2008). A supply chain is a network of multiple actors or stakeholders, including suppliers, transporters, processing facilities, distribution centers, retailers, and buyers (Karningsih et al 2018). According to Kresna et al (2017), the tuna supply chain in Indonesia consists of several actors, such as fishing vessels, transit, fish processing units (UPI), transporters, distributors, retailers, and the government. In Indonesia, variations in supply chains are influenced by the characteristics of each region. However, the primary difference is that tuna fisheries start with fishing, divided into industrial and traditional fishermen (Presillia & Atmaja 2020).

Activities of actors such as fishing vessels, transit, fish processing units, transporters, distributors, and retailers are at fishing ports. Fishing vessels are the first

layer in the tuna supply chain that catches tuna from the sea with various activities such as the long line method, carrying out onboard handling, and storing tuna on board. Transit is responsible for unloading tuna from fishing vessels, inspecting its quality, and selling it to the fish processing unit (UPI). The fish processing unit is the "captain" of the chain in the tuna supply chain with the activity of receiving tuna from fishing vessels, checking the quality of the tuna, and processing it into a variety of frozen products, including tuna loin, tuna steak, and tuna cubes. In addition, the fish processing unit conducts laboratory testing to ensure the quality of products and processing procedures.

Each actor has information, and coordination flows with the government, particularly for permits and certification. Actors throughout the tuna supply chain are obligated to comply with and implement tuna processing standards, which must subsequently be documented. Documentation is essential to developing a flawless traceability system. In addition, informational transparency along the tuna supply chain is required to prevent the possibility of divergent tuna quality standards. As the first actor in the tuna supply chain, fishing vessels must have complete records for both pre-capture and post-capture. Consequently, this study will focus on fishing vessels, which are the first layer and actor in the tuna supply chain's traceability.

The fishing business is capital-intensive, so relatively large funds are needed to procure boats, boat engines, nets, and to manage operational fishing costs (Cahyono & Nadjib 2017). Similarly, traceability documentation must be completed prior to and after the ship's departure. Seventy percent of the output of tuna, cob, and skipjack fisheries comes from small-scale fishermen. For fishermen, traceability requirements can incur additional costs in the fishing business. Fishermen must obtain proof of fishing vessel registration as documentation before and after sailing. The principle of the completeness of supply chain documentation, starting from the transfer of product from the ship to the sorting place owned by collectors, as well as the distribution of products to companies, is the determination of quality and added value of tuna products (Janvier-James 2012). Fishermen often experience funding difficulties in obtaining certification, primarily to obtain voluntary certificates for medium-sized fishing companies. This study aims to map actors in the tuna supply chain at fishing ports and analyze traceability schemes in Indonesia's tuna supply chain.

Material and Method. The traceability scheme will be described using qualitative methods with the Global Production Network (GPN) approach. The GPN concept depicts production and distribution networks, stakeholder networks, and their relationships in the traceability scheme for tuna commodities in Indonesian ports. This strategy refers to trading relationships inside a network structure that is interconnected and extend beyond national borders. The port dynamics will be depicted by photographing and analyzing the political-economic motivations and strategies of the actors involved in building relationships between these networks (Coe & Yeung 2019). GPN also observes that the configuration of the existing schemes at the locus is based not only on regional influences but also on social and economic dimensions at the global, regional, and local levels in every process that exhibits forms of economic globalization and influences regional supply chains (Henderson et al 2002; Bridge 2008). In terms used by Coe et al (2008), GPN is a heuristic framework. In addition, methodologically, GPN pays attention to the corporate network, the distribution of corporate power within the network and its changes, institutions outside the network that affect corporate strategy and the implications of the corporate network for other companies and the community involved in the corporate network (Henderson et al 2002). In other words, GPN is an organization consisting of economic and non-economic actors interconnected and coordinated by global companies to produce goods or services in several locations to meet global market needs (Coe & Yeung 2015).

Site selection. This research was conducted in Malang Regency, East Java, and Bitung City, North Sulawesi. The research location for Malang Regency is at the Pondok Dadap Coastal Fishing Port (PPP), and for the city of Bitung at the Ocean Fishing Port (PPS). The two fishing ports were chosen because they represent tuna landing spots in Indonesia.

Also, the two ports are governed differently, with PPS Bitung managed directly by the Ministry of Marine Affairs and Fisheries and PPP Pondok Dadap, on the other hand, is handled by the East Java provincial government.

Data collection and analysis. Data were collected from February 2022 to June 2022 using in-depth interviews both face-to-face and online. Informants were selected using purposive sampling, considering their expertise, authority, and knowledge. The 25 informants represented the central government, regional governments, fishing companies, fishery associations, middlemen, and fishermen. Primary data from interviews were used to map actors in the tuna commodity supply chain and their roles. In addition, it was utilized to examine the traceability plan for tuna fisheries, which is a requirement at every fishing port. This study also analyzes the differences in traceability schemes in fishing ports managed by the provincial and central governments. Secondary data in documents and reports were obtained from the government and private fishing companies. This document validates mapping actors' roles in the supply chain and material for analysis of the tuna fisheries traceability policy scheme. To comprehend the condition of the tuna fishery occurring at the port, direct observations were made at the two ports.

Results and Discussion

Traceability policy scheme based on the category of fishing ports in Indonesia.

Fishing ports have an important role in fisheries traceability policies in Indonesia. Before the Job Creation Law was implemented through Government Regulation No. 27 of 2021 (The Government of the Republic of Indonesia 2021) concerning the Implementation of the Marine and Fisheries Sector, the Ministry of Maritime Affairs and Fisheries first classifies fishing ports into four categories, namely Ocean Fishing Ports (class A), Archipelago Fishery Ports (class B), Coastal Fishing Ports (Class C), and Fish Landing Base (Class D). Based on Government Regulation No. 27 of 2021 (The Government of the Republic of Indonesia 2021), fishing ports are also differentiated based on their authority. The first category consists of central government-owned fishing ports, such as Ocean Fisheries Ports and Archipelago Fisheries Ports. The second category consists of provincial government-owned fishing ports, such as Coastal Fishing Ports.

A fishing port is defined as "a site consisting of land and surrounding waterways with particular boundaries that are used by fishing vessels to dock, anchor, load or unload fish and is equipped with shipping safety facilities and fisheries support activities." (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2012a) This research focuses on two fishing ports. The first is the Samudera Bitung Fishing Port, which falls under the jurisdiction of the Ministry of Maritime Affairs and Fisheries of the Central Government (KKP). The second is the Pondok Dadap Beach Fisheries Port, which falls under the jurisdiction of the Provincial Government of East Java, namely the East Java Maritime Affairs and Fisheries Service.

Indonesia's fishery product traceability system starts from the fishing port, especially in capturing fishery products. Based on the Decree of the Ministry of Marine Affairs and Fisheries Number 109 of 2021 (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2012b) concerning the National Fisheries Port Master Plan (RIPPN), one of the goals and directions of the national fishing port policy is to increase the competitiveness of fishery products because fishing ports have a central role in supporting quality standardization and product traceability for export to the international market. The Bitung Ocean Fisheries Port (PPS) has the port code 715.71.01 in the RIPPN, and it is projected that from 2021 to 2040, it will continue to operate as a PPS under the jurisdiction of the Central Government. The Coastal Fisheries Port (PPP) Pondok Dadap with port number 573.35.27 is expected to remain a PPP under the jurisdiction of the East Java Provincial Government from 2021 to 2040.

This research examines the traceability policies implemented in Indonesia from upstream to downstream. Traceability is also an information base that can mitigate risks and improve the quality of fishery products (Parenreng et al 2016). The policy for the traceability system begins before the fishing vessel departs and ends at the fish

processing unit. This study also examines the traceability system in PPS Bitung (under KKP jurisdiction) and PPP Pondok Dadap (under the East Java Province jurisdiction). Both ports are equally productive in producing tuna. A traceability system is intended to promote legal, recorded, and regulated fishing (Bailey et al 2016). The traceability system must be created with a clear paradigm beginning with the fundamentals, such as fish landing, trading, and processing, as these factors influence the information on fishery products along the value chain (Doddema et al 2020).

The traceability system created by the Indonesian government focuses more on fishing-related documents (Figure 1). We divide it into pre-capture and post-capture, where all existing documents are intertwined from pre-capture and post-capture to the downstream, where fish catch certification (SHTI) can be issued. In processing these documents, agencies in fishing ports are involved, such as fisheries harbourmasters and Marine and Fisheries Resources Supervisors (PSDKP).

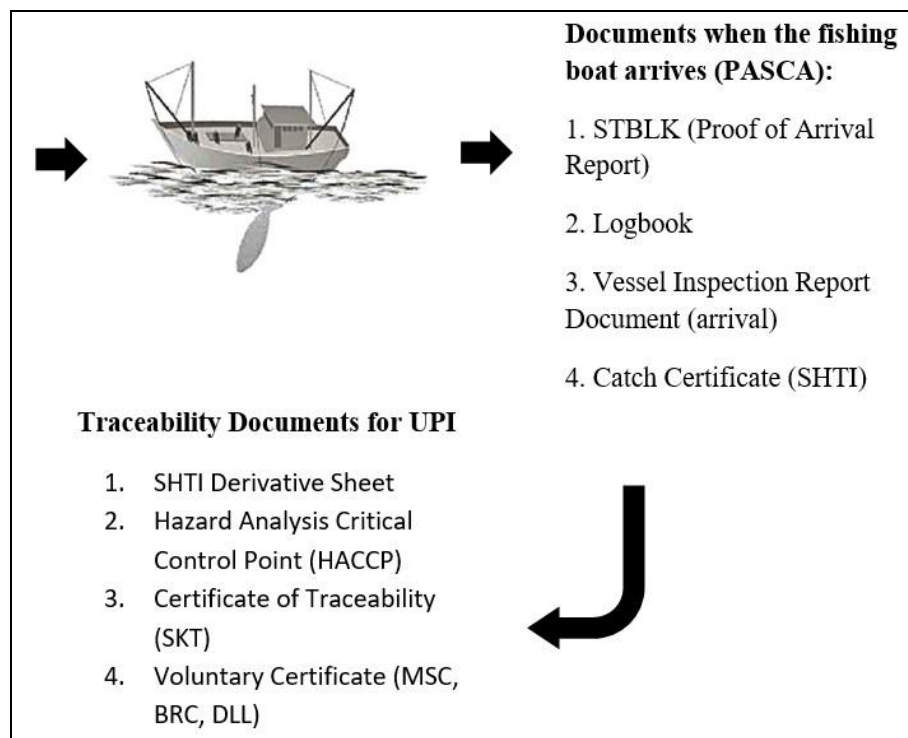


Figure 1. Scheme of fisheries traceability documents.

Before the fishing boat departs, the fishing vessel must possess two essential documents to conduct fishing operations: Letter of Operational Eligibility (SLO) issued by the PSDKP, and a Sailing Approval Letter (SPB) issued by the fishery expert (syahbandar). Usually, these two documents are managed simultaneously at the one-roof service at the port. The requirements for obtaining an SLO are submitting an application letter, a photocopy of an active fishing permit (SIPI), a photocopy of a fisheries business license (SIUP), a ship inspection report (HPK) filled out by PSDKP officers, and a list of crew members (along with a photocopy the crews' residence identification card KTP). After completing the SLO, it is continued the processing of the SPB document with the requirements, namely, the application letter, Proof Departure Report (STBLK), list of crew members, photocopy of documents fishing permit (SIPI), fisheries business license (SIUP), measurement, certificate of seaworthiness and manning of fishing vessels, certificate of proficiency), large or small fitting for fishing vessels under 5 GT, and SLO.

In addition to the regular documents, there are two other documents related to guaranteeing fish hygiene on fishing vessels that must be taken care of every time they depart for a fishing operation, namely a certificate of Proficiency of Fish Handling (SKPI) and a certificate of Good Fish Handling Practices (CPIB). Based on the Regulation of the Ministry of Marine Affairs and Fisheries No. 7 of 2019 (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2019) concerning Requirements and Procedures for

Issuing a Certificate of Good Fish Handling Practices (CPIB), a CPIB certificate is a "certificate given to fishing vessels and/or fish transporting vessels stating that the vessel has met the requirements for Quality Control in Fishing activities". CPIB is one of the Indonesian government's commitments to guarantee the quality of fishery products. CPIB certification is also one of the government's responses to one of the requirements from the European Union regarding guaranteeing fish hygiene on fishing vessels. The optimal application of CPIB will minimize the opportunities for rejecting tuna fishery products to the European market (Sabrina & Nurani 2020). Before a business actor obtains CPIB certification, several requirements must be met by a business actor. In this case, it can be the owner or captain of a fishing boat. First, one fishing vessel's crew member must possess a fishing skill certificate. Second, an application letter from the ship owner and a letter of willingness to be inspected by the quality control team. Third, photocopy of SIPI or SIKPI. The CPIB certificate can be issued by the Head of the Port and is valid for two years from when the certificate is issued.

After the fishing boat has finished operating and returns to the fishing port, several documents must be reviewed and reported. First, the fishing logbook contains data regarding the location of fishing activities, date of fishing, type and total yield of fish caught. Second, a proof of Arrival Report (STBLK) is required. Third, Report of Fish Landing Verification (LHVPI) is reviewed.

After pre-capture and post-capture documents are neatly completed, the ship owner/ship captain/ship management can submit a catch certificate (SHTI) to the fishing port authority. This certification is required for Fish Processing Units to export, particularly to the European Union. SHTI was issued for the first time by the KKP in 2009 through the Ministry of Marine Affairs and Fisheries Regulation (Permen KP) No. 28 of 2009 (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2009). The KP Ministerial Regulation was later amended and updated to become KP Ministerial Regulation No. 13 of 2012 concerning the Certification of Fish Catches (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2012c). In general, SHTI is Indonesia's response to European Council (EC) Regulation No. 1005/2008 of 29 September 2008 (Council of the European Union 2008) establishing a community system to prevent, deter and eliminate illegal, unreported, and unregulated fishing. Specifically, the SHTI is a statement stating that the exported fishery products are not the result of IUU Fishing activities. One of the objectives of the SHTI is to ensure the traceability of fish catches, starting from the fishing stage to marketing.

KP Regulation No. 13 of 2012 (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2012c) also regulates the types of SHTI and requirements. SHTI is divided into three sheets, namely SHTI Initial Sheet (LA), SHTI Derivative Sheet (LT), and SHTI Simplified Derivative Sheet (LTS). SHTI LA and SHTI LT are used for fishing vessels over 20 GT, while SHTI LTS is used for fishing vessels under 20 GT. The management of SHTI LA is usually carried out by the ship owner/ship captain/or ship management when the loading and unloading of fish are completed at the port. The requirements for obtaining the SHTI LA are as follows:

1. SHTI Initial Sheet Draft.
2. Photocopy of the applicant's KTP.
3. Logbook.
4. Fish Landing Verification Report.
5. Photocopy of SIPI.
6. Photocopy STBLK (Arrival).
7. SKPI (Fish Landing Certificate) - for fishing vessels that land fish caught at fishing/public ports that are not designated as local competent authorities.

After the initial SHTI sheet is out and the fish has been purchased by the Fish Processing Unit, the UPI or exporter can submit a derivative SHTI sheet. An application for making SHTI LT does not have to be made at the fishing port where the SHTI LA was issued but can also be made at the nearest fishing port (either owned by the central government or

provincial government) from the UPI or the exporter. The following requirements must be completed to administer SHTI LT:

1. Photocopy of SHTI initial sheet.
2. Draft SHTI derivative sheet.
3. Photocopy of the applicant's identity.
4. Proof of fish purchase.
5. Packing list invoice from the company.
6. Letter of delivery of goods from the company.

It should be underlined that until now, not all fish caught have SHTI. It goes back to the final destination of the fish catch, whether it will be distributed to the domestic or export market. Even so, not all export destination countries require SHTI as a fishery export requirement. The authority to operate SHTI lies solely with the administration of the fishing port. The fishing port authority must submit the number of catch certificates (SHTI) monthly, according to Government Regulation No. 27 of 2021, item 258 (The Government of the Republic of Indonesia 2021).

The government, in this case, the Fish Quarantine, Quality Control and Fishery Product Safety Agency (BKIPM) of the Ministry of Maritime Affairs and Fisheries, issued a policy regarding the issuance of a Certificate of Application of the Traceability System as a follow-up to the Ministry of Marine Affairs and Fisheries Regulation No. 51 of 2018 (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2018a) concerning Requirements and Procedures for Issuing Certificates of Implementation of the Integrated Quality Management Program. Meanwhile, the Certificate of Application of the Traceability System is regulated more specifically in the Regulation of the Head of BKIPM No. 170 of 2019 (FQIA 2019) concerning implementing a Traceability System in Fish Processing Units. According to the Regulation, a Certificate of Traceability System Application is a "certificate given to fishery business actors who have implemented and fulfilled the requirements for implementing a Traceability System." This certificate is valid for two years.

UPI must implement two traceability systems to obtain a Certificate of Traceability System Application, namely internal and external traceability systems. The internal traceability system referred to in the Regulation of the Head of BKIPM No. 170 of 2019 (FQIA 2019) is UPI's ability to trace the history or location of fish catches from the time they are received until they become final products ready for sale. External traceability is the ability to trace the history and location of the origin of fishery product raw materials received and the destination of product distribution, including consumers. According to the Head of BKIPM Manado, the Certificate of Application of the Traceability System owned by UPI will make it easier to find documents if there are problems with exports. In addition, this letter is also one of the requirements for UPI to obtain a Hazard Analysis Critical Control Point (HACCP) certificate. The Certificate of Application of the Traceability System is also one of the Indonesian government's responses to the fishery product export requirements imposed by the European Union.

In addition, the government also issued a policy related to Good Fish Handling Certificate (CPIB) at the supplier/collector level, which is valid for four years. The intended supplier/collector is a business entity or individual with a license to supply raw fish materials to fish processing units (UPI). CPIB suppliers or collectors are regulated separately in the Ministry of Marine Affairs and Fisheries Regulation No. 52 of 2018 (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2018b) concerning Requirements and Procedures for Issuing Certificates of Good Fish Handling at Suppliers. CPIB suppliers/collectors aim to ensure a quality assurance system and the safety of fishery products at the supplier level.

Traceability supply chain at Pondok Dadap Beach Fishing Port. The Pondok Dadap Beach Fisheries Port Technical Implementation Unit (UPT PPP Pondok Dadap) is a fishing port under the East Java Provincial Government's authority in Sendang Biru, Tambak Rejo Village, Sumbermanjing Wetan District, Malang Regency. On the island of Java, PPP Pondok Dadap is a fishing port that produces yellowfin (*Thunnus albacares*), albacore

(*Thunnus alalunga*), bigeye tuna (*Thunnus obesus*), and skipjack tuna (*Katsuwonus pelamis*). According to data from PPP Pondok Dadap, from 2017 to the end of 2021, the volume of tuna production at PPP Pondok Dadap was 10,075 kg. The average tuna landed at Pondok Dadap is caught in Fisheries Management Area 573. Fishermen at Pondok Dadap consist of local fishermen from Sendang Biru and Andon fishermen from other East Java and South Sulawesi areas. Until November 2021, there were 3,361 fishermen recorded at PPP Pondok Dadap. There are various types of fishing gear available at PPP Pondok Dadap, such as a hand line which is commonly called a lifeboat, purse seine, which is commonly called a slerek, and jukung. The total number of vessels in its fishing fleet is of 3361 vessels.

The supply chain of fisheries at Pondok Dadap Fishery Port begins with fish captured by fishermen (Figure 2). PPP Pondok Dadap fishermen are separated into two groups. The first group consists of independent fishermen or individuals who own fishing vessels and finance their fishing expeditions. In the first category, the fisherman is the boat's owner and captain, who recruits the fishing crew. Second are fishermen who do not have a fishing boat. The fisherman is operating a fishing boat belonging to someone else. The ship-owner will appoint one person to be the captain/master of the fishing boat.

Typically, ship owners at PPP Pondok Dadap obtain finance from People who have financial capital and provide capital to the fishermen (Pengambe, a local term in Sendang Biru). In the business process, Pengambe will secure a fishing boat by spending capital ranging from 15-500 million IDR to be handed over to the ship-owner. Capital requirements vary depending on the type of fishing vessel. Pengambe's terminology in the business process is "share investment." On average, fishing boats that have been bonded will be provided funds to purchase gasoline worth 2-5 million rupiah for a single journey to the sea. When the fish are sold, the capital for the gasoline will be repaid to Pengambe in the same amount. Pengambe makes a 5-10% profit from the total fish sales made by fishing vessels. The 5-10% amount does not reduce the initial capital provided by Pengambe to ship owners. If the ship owner wants to release or change the Pengambe, then the ship owner must pay the amount given by the Pengambe when the ship was first bound. There are occasions when a fishing vessel returns with few catches. Therefore, Pengambe is not always able to reap the benefits. Even exchanging funds for petrol is impossible.

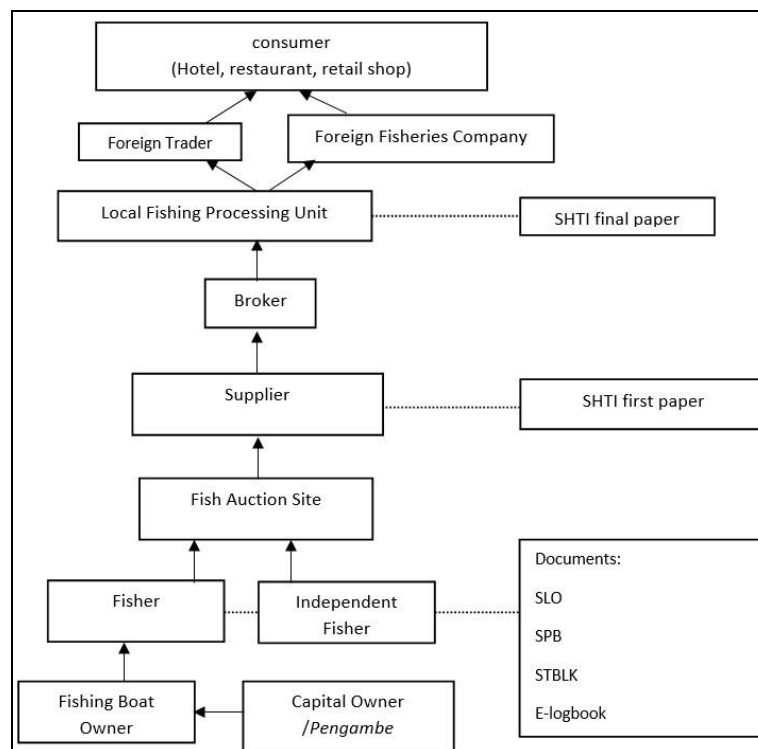


Figure 2. The tuna fishery supply chain at Pondok Dadap Fishery Port.

After sailing out to sea, the two types of fishermen would load and unload at the Fish Auction Site pier. The business system at PPP Pondok Dadap requires every fishing boat that docks and loads and unloads to sell its catch at the fish auction. The mechanism is as follows. Arriving fishing boats will get a queue number for loading and unloading at the fish auction site (TPI) dock (a queue number is provided if the number of fishing vessels that will carry out loading and unloading is large). The captain then reported to the officers at the wharf regarding administration. The fish is placed in a basket and carried on to the weighing station. The weighman will record the type of fish, the total weight, and the name of the fishing vessel. When finished, the fish is ready to be auctioned.

The Pondok Dadap PPP Fish Auction Place is managed by a village unit cooperative (KUD) of Mina Jaya. TPI was founded in 1983, far before PPP Pondok Dadap was established. Not everyone can participate in the auction process; only entrepreneurs/suppliers registered with KUD Mina Jaya can participate. Until early 2022 there were only ten entrepreneurs/suppliers registered as bidders. The auction process starts with an auctioneer mentioning the fish type and the fishing vessel's origin. In the opening, the auctioneer does not give the opening price, but the entrepreneur/supplier will start the opening price. The auctioneer can increase the opening price if the submitted price is deemed too low. Entrepreneurs/suppliers will compete in bidding for the highest price. The auction winner will be recorded by the auctioneer. The data is submitted to the note taker to make a note (yellow note for the entrepreneur who won the auction, white note for fishermen, and blue note for levy payments). The auction winner will be charged retribution of 1.5% of the total purchases, and fishermen will be subject to the retribution of 1.5% of the total sales. The retribution is included in the regional income of Malang Regency.

Fish purchased by suppliers at the Pondok Dadap PPP fish auction site are not directly sold to the Fish Processing Unit/Fisheries Company. However, the suppliers sell it to brokers who distribute it to UPI or fish companies in East Java and Bali. The supply chain at PPP Pondok Dadap stops until the supplier purchases the fish at the auction site. Until now, no fish processing unit (UPI) has been operating at PPP Pondok Dadap, making it difficult to validate the export destination of tuna landed at PPP Pondok Dadap. So far, PPP Pondok Dadap has only issued Initial Sheet Fish Catch Certificates (SHTI LA). However, based on investigations by PPP Pondok Dadap authorities from 13 UPIs and exporters who received tuna from Sendang Biru, the target for tuna exports from Sendang Biru/Pondok Dadap was the United States of America.

Traceability supply chain at the Bitung Ocean Fishing Port. PPS Bitung is included in the type A fishing port along with six other ports in Indonesia. The development of Bitung PPS was announced on 18 July 2001. On 10 December 2005, it was designated the Archipelago Bitung Fishing Port through the Letter of Decree No. B/2712/M.Pan/12/2005 (Ministry of State Apparatus Utilization and Bureaucratic Reform of the Republic of Indonesia 2005). PPN Bitung status increased to PPS Bitung on 6 October 2008 through the regulation of the Ministry of Marine Affairs and Fisheries number PER.19/MEN/2008 (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2008) (PPS Bitung n.d). In addition, Bitung has a Special Economic Zone (KEK), with the fisheries sector being its core. Bitung City is one of Indonesia's largest fishing industrial areas, with the dominating fishery commodities being yellowfin tuna (*Thunnus albacares*) and skipjack (*Katsuwonus pelamis*).

In contrast to PPP Pondok Dadap, in Bitung, many UPIs already act as exporters of tuna commodities. The traceability system scheme in Bitung can be described from upstream to downstream (up to export). Each export destination has a different scheme. It is due to several circumstances, including the type of tuna product that is mainly exported, the requirement for standard export documents for the destination country, cooperation with the destination country (partner country), and the destination country's monitoring system. In addition, the strategy for each destination is outlined below (European Union and United States of America).

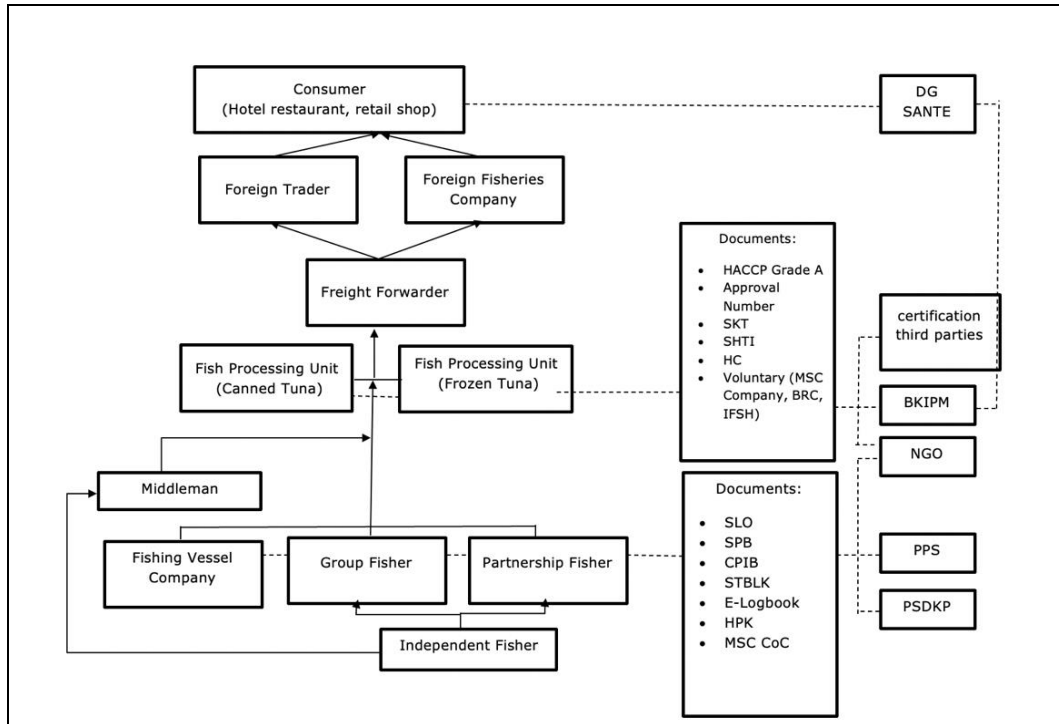


Figure 3. Fishery supply chain at Bitung PPS Port - for the European Union.

European Union. According to Lewis and Boyle (2017), the European Union has implemented regulations that only allow imports from countries that guarantee their fish and fisheries products are caught and processed according to food safety regulations equivalent to EU member states. Every imported seafood is required to have health certificates and food handling and safety data available. Since 2010 catch certificates have provided official assurance that the fish complies with applicable laws and international regulations and complies with good fisheries management. The certificate contains, among other things, information about product fishing vessels, transport vessels, scientific names, and catch areas according to FAO regulations.

The upstream supply chain of the European Union scheme is fishermen with various variations, namely independent fishermen, partner fishermen, and fisherman groups (Figure 3). Independent fishermen can join a fishing group or partner fishermen. Partner fishermen are a group of fishermen who work together with UPI to later pay their catch to UPI with an initial pre-catch financing system financed by UPI. In addition, on the upstream side, there is also a fishing boat company that will supply tuna to UPI. At this level, actors must meet traceability requirements both pre- and post-arrest, such as Operational Feasibility Letters (SLO), Sailing Approval Letters (SPB), Proof Departure Report (STBLK), e-logbooks, and Ship Inspection Report (HPK). In addition, European Union destination countries require fishermen to have a Certificate of Good Fish Handling Practices (CPIB). Some consumers ask for additional voluntary certification, such as the Marine Steward Council (MSC) Fisheries. The actors who play a role in this stage are the government, in this case, the Ocean Fisheries Port Authority, and the Directorate General of Marine and Fisheries Resources Supervision (PSDKP), which has the authority to issue certification.

In contrast to PPP Pondok Dadap, there are numerous fish processing units (UPI) in Bitung. Canned and frozen tuna products are the primary types of tuna exports to the European Union. Fishermen or ship companies with existing traceability requirements provide tuna to UPI either directly or through intermediaries who operate as middlemen between UPI and independent fishermen. Apart from requiring several documents to be exported to the European Union, the company also has an internal quality control (QC) system to determine the grading of catches. Some requirements the government sets to export tuna catches to the European Union are HACCP grade A, Approval Number,

traceability certificate, Fish Catch Certification (SHTI), and Fish Health Certificate (Health Certificate). The authority that has the authority to issue this is the KKP, in this case, BKIPM. Voluntary certification is also imposed by some consumers, such as MSC Chain of Custody (CoC), BRC, and IFSH. An independent certification third party is appointed to perform the audit. The high cost of voluntary certification makes UPI work together in associations or ask help from nongovernmental organizations to assist fishermen in obtaining the certification through an empowerment program.

Indonesia is a partner country of the European Union. The various requirements imposed for tuna export commodities are more complex than other export destination countries (Astagia et al 2022; Mursit et al 2022). Another thing that makes a difference is the government-to-government (G-to-G) monitoring system. The competent authority for the European Union in this regard is Directorate-General for Health and Food Safety (DG Sante). This institution has the authority to carry out regular monitoring every two years. If Indonesia is banned from exporting tuna commodities, DG Sante will alert Indonesian authorities, specifically BKIPM. In the supply chain, BKIPM is defined as an intermediary entity originating from non-economic actors (Atmaja & Presilla 2022). This actor plays a role in mobilizing and using resources, forming alliances, influencing the structure of rules and governance, and framing a particular issue or policy that can affect the company's strategy in a particular location (Henderson et al 2002; Levy 2008). In Indonesia, BKIPM is designated as the competent local authority by DG Sante, which has the power to issue government certification. The competent authority is given to the ministry, in this case, the KKP. The minister was delegated to BKIPM as the quality assurance manager for the fisheries sector's upstream and downstream quality assurance system.

Furthermore, BKIPM will conduct an audit of the UPI. If evidence of nonconforming standards is discovered, the UPI will not only halt the tuna export process but also reject the export process for one destination. BKIPM serves as a liaison between producers, in this example, UPI and the EU market, within the context of the certification framework. The response in the Indonesian tuna production chain to the issue of non-tariff barriers is more in compliance, indicating that the EU's standards for production supply chains in Indonesia have been harmonized (Presilla & Atmaja 2020).

United States of America. Meanwhile, in the United States of America, registered importers must provide additional information relating to the capture, landing, and tracking of products before entering the United States of America. In contrast to the European approach, which still permits the submission of catch certificates on paper, the United States of America will collect data for monitoring imported food through an electronic gateway (Lewis & Boyle 2017). The information will be verified through an audit, during which the importer may be required to provide additional product traceability paperwork.

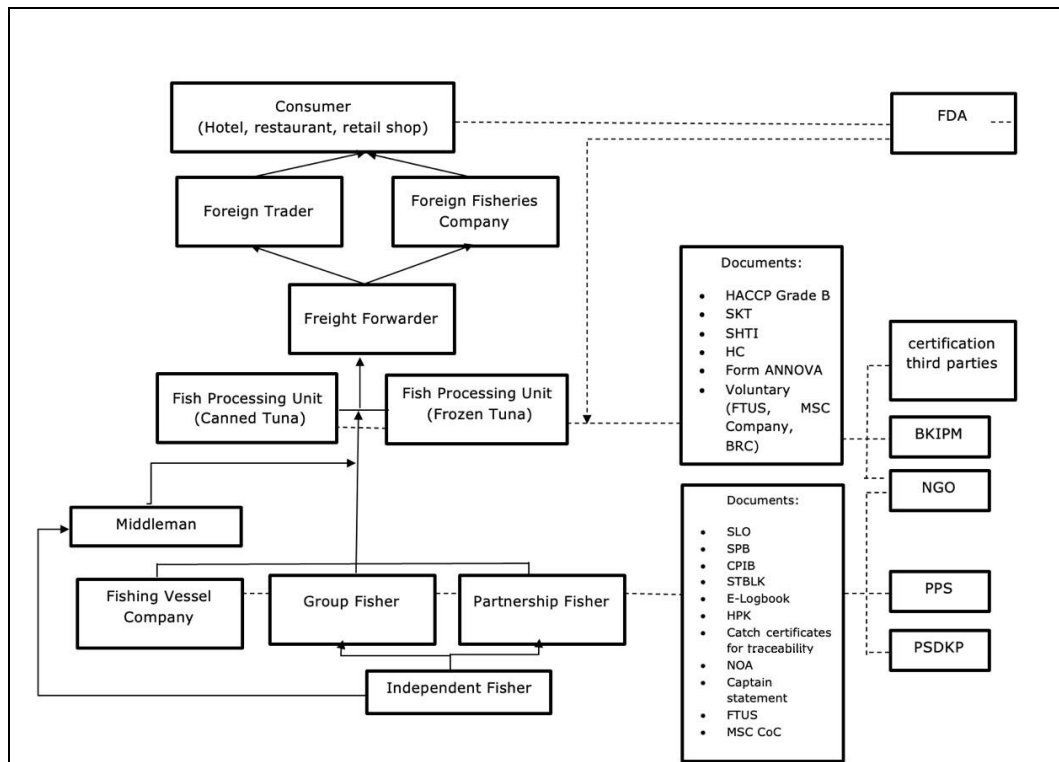


Figure 4. The tuna fishery supply chain of PPS Bitung Harbor – for the United States of America.

The upstream supply chain from the United States of America system is nearly identical to the destination country scheme of the European Union, consisting of fishermen with many variations, such as individual fishermen, partner fishermen, and fisherman groups (Figure 4). Independent fishermen can join a fishing group or partner fishermen and a fishing boat fishing company that will supply tuna to UPI. Requirements imposed by the government through PPS and PSDKP include SLO, SPB, STBLK, e-logbook, and HPK. In response to United States National Oceanic and Atmospheric Administration (US NOAA) provisions, the government added Fisheries Certificate of Origin (FCO) requirements by adding a captain's statement (NOAA 2023).

Canned and frozen tuna are the most extensively exported varieties globally, particularly to the United States of America (Sunoko & Huang 2014; Suhana 2020). As in the European Union scheme, a middleman actor acts as an intermediary between fishermen or ship companies that already have traceability requirements to supply tuna to UPI. Government requirements for exporting tuna catch to the United States of America at the UPI level are HACCP grade B, an approval number, a traceability certificate, and a health certificate. The authority that has the authority to issue this is the KKP, in this case, BKIPM. Some consumers also use voluntary certifications such as Fair Trade US and the Marine Steward Council (MSC) CoC issued by third-party certification. Models for gaining voluntary certification, such as MSC, must collaborate with the Indonesian Pole and Line/Hand Line Fisheries Association (AP2HI), which some UPIs also carry out as a cost-reduction measure.

The monitoring system with the destination the United States of America is business to business (B to B). Even though there is a competent authority for the United States of America under the Food and Drug Administration (FDA), the FDA will undertake an audit of the company directly, bypassing the Indonesian government, if a standard violation is discovered in its monitoring system. In addition, if non-conforming standards are discovered, the UPI export procedure will be halted.

Differences in the traceability system at PPS Bitung and PPP Pondok Dadap. As previously explained, the fundamental distinction between PPS Bitung and PPP Pondok Dadap is the management authority. PPP Pondok Dadap operates under the East Java Maritime Affairs and Fisheries Service, whereas PPS Bitung operates under the Ministry of

Maritime Affairs and Fisheries. Both are port fisheries technical service units led by a port head. These ports apply the same administrative services, starting from SPB, SLO, CPIB, and SHTI. The distinction lies in the technical service provided for document and supply chain management.

At the Bitung Ocean Fishery Port (PPS), the port authority is not directly involved with traceability at UPI. In Bitung PPS, there are many UPIs and other UPIs which are close to PPS. However, if there is a problem with traceability, the PPS authority will be involved in tracing backward. PPS Bitung deals directly with the issuance of CPIB and SHTI, as well as fishing vessels that will carry out fishing operations, especially regarding administrative documents that must be prepared before departure and upon arrival. Regarding the processing of these documents, there is such a thing as ship management. Ship owners assign them to prepare the documents needed to obtain SPB, SLO, SLTBK (arrival), and SHTI. During fishing activities, some of the ship's management prepares the logistics for onboard operations. Specifically, for SHTI Initial Sheet (LA) arrangements it is not necessarily handled by the ship's management, but it might be handled by middlemen/brokers who sell the fish to UPI. According to information obtained from a tuna broker/middleman in Bitung, not all UPI around Bitung PPS require SHTI LA, but when SHTI is present in the catch, UPI wants to pay a greater price for its tuna.

Meanwhile, at the Pondok Dadap Fishery Port (PPP), there is a slightly different mechanism related to document services and the supply chain from that at Bitung PPS. The supply chain at PPP Pondok Dadap only reaches suppliers because, until now, there has been no UPI at PPP Pondok Dadap. PPP has the means to ensure that every fish from Pondok Dadap PPP has a good SHTI, which suppliers may employ when delivering fish to UPI. The Pondok Dadap PPP authority has stationed officers at the dock area for loading and unloading fishing boats. Every ship that will load and unload must first report its arrival to make STBLK (arrivals), then include the completed logbook and other supporting documents. The clerk will then verify. These documents are then forwarded to the PPP Pondok Dadap integrated service office to verify catches by PSDKP, whose job is to issue Fish Landing Verification Result (LVHPI). After the LVHPI is published, the officer at the integrated service office will issue the SHTI Initial Sheet.

The fundamental difference regarding the management of SHTI LA at the two fishing ports lies in the service provided. At PPS Bitung, SHTI LA was not immediately taken care of but was waiting for a request from the ship owner/master/ship handler, who came to take care of the required documents. In PPP Pondok Dadap, the port authority directly takes care of the SHTI document requirements, regardless of their necessity. So that when suppliers need SHTI LA, the port authority will immediately issue it because the requirements have been met. Until now, PPP Pondok Dadap has never issued an SHTI Derivative Sheet (LT) because there has been no request from UPI. Based on our interview with officer from Pondok Dadap Coastal Fishing Port, UPIs that receive tuna from PPP arrange their SHTI LT at fishing ports close to the UPI, such as PPP Probolinggo, PPN Prigi, PPP Muncar, and PPN Pengambengan.

Conclusions. The traceability system created by the Indonesian government focuses more on documents. Documents must be completed by Indonesian tuna exporters starting from pre-catch to the post-catch and ending at the processing unit. The tuna fisheries traceability scheme is an inseparable part of the tuna supply chain, even before the tuna is landed at the fishing port. At every stage in the supply chain process, traceability documents must be fulfilled for the tuna products to be properly recorded and certified. Tuna products mostly exported to foreign countries (United States of America and European Union) are frozen and canned. The most basic differences between the supply chain and traceability schemes found in the Pondok Dadap Fishery Port (PPP) and the Bitung Ocean Fishing Port (PPS) are as follows. First, the supply chain scheme at PPP Pondok Dadap only reaches the supplier or middleman because there are no fish processing units in the port complex or around the port. At the same time, at PPS Bitung, the landed tuna is immediately distributed to fish processing units. Secondly, PPP Pondok Dadap has a fish auction place, where all tuna landed there must first enter the place before being bought by a supplier or middleman, while PPS Bitung does not have a fish

auction place. Third, there is no difference in the traceability scheme at PPP Pondok Dadap and PPS Bitung. It is just that PPP Pondok Dadap implements shorter technical services for traceability documents such as SHTI, whether the document is needed or not by fishery business actors.

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