

Social Value Chain Analysis: The Case of Tuna Value Chain in Three South Central Provinces of Vietnam

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Abstract

This paper presents the outputs of a Ministry of Science and Technology-funded national research project on fisheries value chain entitled “Developing Feasible and Comprehensive Policies for Sustainable Fisheries Development in Vietnam” completed in 2019. It was carried out to map the Vietnamese tuna value chain in terms of value chain description, including actors, material flows, volume, knowledge and information, relationships, linkages and trust, and values at different levels of the chain. The point of entry for undertaking this analysis was to identify specific income increasing interventions for fishers to achieve the project objective of better management of tuna fisheries and to improve socio-economic conditions of tuna fishing communities in Vietnam. Three South Central provinces of Binh Dinh, Phu Yen, Khanh Hoa were chosen for the investigation of the tuna value chain. This study was completed in four main phases, which consist of interview surveys, focus group discussions, individual key informant interviews, and a validation workshop. Four hundreds fishers, nineteen middlemen and traders, five processors, three wholesalers, and eight retailers were interviewed in the three investigated provinces during 2018. Several policy recommendations to increase the income and improve the position of fishers in the tuna value chain were proposed, which include (i) the collaboration among fishers to take advantage of purchasing input materials; (ii) the improvements on the handling and maintenance of tuna quality to increase fishers’ income; (iii) the establishment of tuna auction center to decrease financial detriment to fishers, increase their access to public and transparent market information, and strengthen their position in the chain; (iv) the formulation of savings, credit, and microfinance schemes to diversify forms of capital access for fishers; (v) the suggestion on a fair share of profits among shipowners, captains and cruise workers to reduce the vulnerability of the poor and increase the incentive for properly managing the tuna fisheries in Vietnam.

Keywords: tuna, Vietnam, mapping the value chain, South Central provinces, small-scale fisheries

1. Introduction

In most cases, international trade in fishery products has had a positive effect on local food security (FAO, 2004). It is known that fish exports are a significant source of income for developing countries. These exports can generate foreign exchange as well as create employment and income in the primary and secondary sectors. Overall, export activities likely bring out benefits to a society; however, fish exports may not result in gains for the most vulnerable population in the fishing communities (Bjorndal, Child, Lem, & Dey, 2015). Thus, appropriate policies and management strategies for the most vulnerable actors through effective fisheries management are necessary conditions to increase food security, improve the socio-economic position of fishing communities, and sustain international fish trade in the long term (FAO, 2004).

The tuna industry is one of significant fishing industries in Vietnam. Most Vietnamese tuna products are used for

export, and are among the leading fishing products of the country's seafood export. The export value of tuna products has increased from USD 484 million in 2014 to nearly USD 670 million in 2019, an increase of nearly 38% (Custom, 2019). The rapid development of the tuna industry has been contributing to local employment opportunities in the coastal provinces of Vietnam, generating foreign currency revenues for the country. Although Vietnamese tuna exports have increased over the years, the life of tuna fishers is remaining unstable and painful due to the higher cost of each voyage and lower price of raw tuna (D-FISH, 2018). In order to facilitate optimal conditions for tuna fishers, it is essential to have appropriate policies and management strategies for small-scale tuna fisheries in Vietnam, which depends on access to useful information. However, one of the most significant barriers to decision-and policy-making concerning Vietnamese small-scale tuna fisheries is the lack of reliable data and information about various facets of the tuna sector. Therefore, it is necessary to further study tuna small-scale fisheries in Vietnam in order to better understand the conditions, opportunities, and constraints of the tuna sector.

In the last few years, there has been increased interest in the seafood value chains and in exploring the linkages and the relationship between different actors and economic representatives (individuals, companies, government) in the value chains (Rosales et al., 2017). The value chain consists of various stages that are required to bring a product or a service from the initial stage to the delivery to final consumers and disposal after use (Kaplinsky, 1999; Kaplinsky & Morris, 2001). Small-scale fisheries are defined as a growing sub-sector of fisheries that employs labor-intensive technologies to exploit marine and inland water fishery resources. Its activities aim to supply fishery products to local, domestic, and international markets (FAO, 2010; Berkes, Mahon, Conney, Pollnac, & Pomeroy, 2001; Chuenpagdee, Liguori, Palomares, & Pauly, 2006; Johnson, 2006). Small-scale fisheries provide diverse and extensive networks of supply and trade linking between producers and consumers, increasing income and employment level. This system helps reduce vulnerability and increase adaptive capacities of fishers and fishing communities (Jacinto & Pomeroy, 2011).

A research on the value chain in small-scale fisheries is necessary because it provides an in-depth understanding of the characteristics of key economic actors, particular fisheries policies, and management frameworks. Also, it helps explore the challenges of small-scale fisheries due to its weak governance or competitiveness of small firms and fishers in changing markets (Jacinto & Pomeroy, 2011). Furthermore, it can discover response strategies to improve the sustainability and competitiveness of the entire value chain as well as identify the binding constraints affecting the sector in a systematic manner (Rosales et al., 2017). Finally, it provides an opportunity to find policy and management positions to support different agents and relevant stakeholders, especially for the most vulnerable population on the chain (Bjorndal, Child, Lem, & Dey, 2015; Rosales et al., 2017).

For Vietnamese tuna industry, there have been a few of studies that only concern the economic aspect of the value chain analysis (Quyen, 2018; Huy, 2018). Regarding the three aspects of economy, society and environment (Duijn, Beukers, & Pijl, 2012) used value chain analysis with sustainability as the leading principle to identify bottlenecks of the tuna sub-sector with the aim to advise CBI (Center for the Promotion of Imports from developing countries) for supporting Vietnamese tuna exporters to become successful ones in the European market. In this research, we were interested in the social facet of tuna value chain analysis, focusing on the most vulnerable actors in the chain in Vietnam. This paper presents the outputs of a Ministry of Science and Technology-funded national research project on fisheries value chain entitled "Developing Feasible and Comprehensive Policies for Sustainable Fisheries Development in Vietnam" completed in 2019. The objectives of this study were to understand better, and report on, the tuna value chain in Vietnam. In particular, our study aimed to:

- Map the Vietnamese tuna value chain to describe the main actors, product flows, volume, number of actors and employees, knowledge and information, relationships, linkages and trust, and the value at different levels of the tuna value chain;
- Identify specific income increasing interventions for tuna fishers to achieve the project objective of better management of tuna fisheries and to improve socio-economic conditions of tuna fishing communities in Vietnam.

This paper is organized as follows: after the introduction, Section 2 provides a short review of previous works on value chain analysis that lead to this research. Section 3 describes the method of this study, and the results are shown in Section 4. Finally, discussions and conclusions are presented in Section 5.

2. Related Works on Value Chain Analysis

A value chain analysis can be explained in either a narrow or broad sense. In the narrow sense, a value chain

comprises the range of activities performed within a firm to produce a particular output. The broad approach of defining a value chain examines the complex range of activities implemented by various economic agents to bring raw materials through a chain to the sale of final products. The definition of value chain includes the issues of organization and coordination, the strategies, and the power relationships of different economic agents in the chain (M4P, 2008). The concept of a value chain is usually combined with the notion of governance, which is crucial importance for fisheries because the analysis of value chains leads to the deeper understanding of social ties and traditional norms, which can be used to figure out the participation of the poor, and potential impact of value chain development on poverty reduction, food security, and fisheries management (Bjorndal, Child, Lem, & Dey, 2015; Rosales et al., 2017). Value chain analysis allows for different entry points depending on the objective of the study. Conducting a value chain analysis involves an extensive examination of what is going on between the actors in a chain, what keeps these actors together, what information is shared, and how the relationships between actors is evolving (M4P, 2008). In other words, the mapping of actors and key linkages in a chain should be the focus of the analysis. Assessing these linkages in terms of governance issue helps give out better policy recommendations (Bjorndal, Child, Lem, & Dey, 2015; Rosales et al., 2017).

In this study, the point of entry for undertaking the tuna value chain analysis is to identify specific income increasing interventions for fishers to achieve the objective of better tuna fisheries management and to improve the socio-economic conditions of fishing communities in Vietnam. Thus, we used the sequential steps of mapping the value chain listed in (M4P, 2008) to examine the chain as follows:

- Mapping the core processes in the value chain;
- Identifying and mapping the main actors involved in the processes;
- Mapping flows of products;
- Mapping the volume of products, numbers of actors and jobs;
- Mapping the value at different levels of the value chain;
- Mapping relationships and linkages between value chain actors;

Additionally, the governance of the chain is considered with the aim to examine the rules operating in a value chain, and the system of coordination, regulation, and control in which the value is generated along a chain (M4P, 2008).

3. Method

3.1 Study Sites

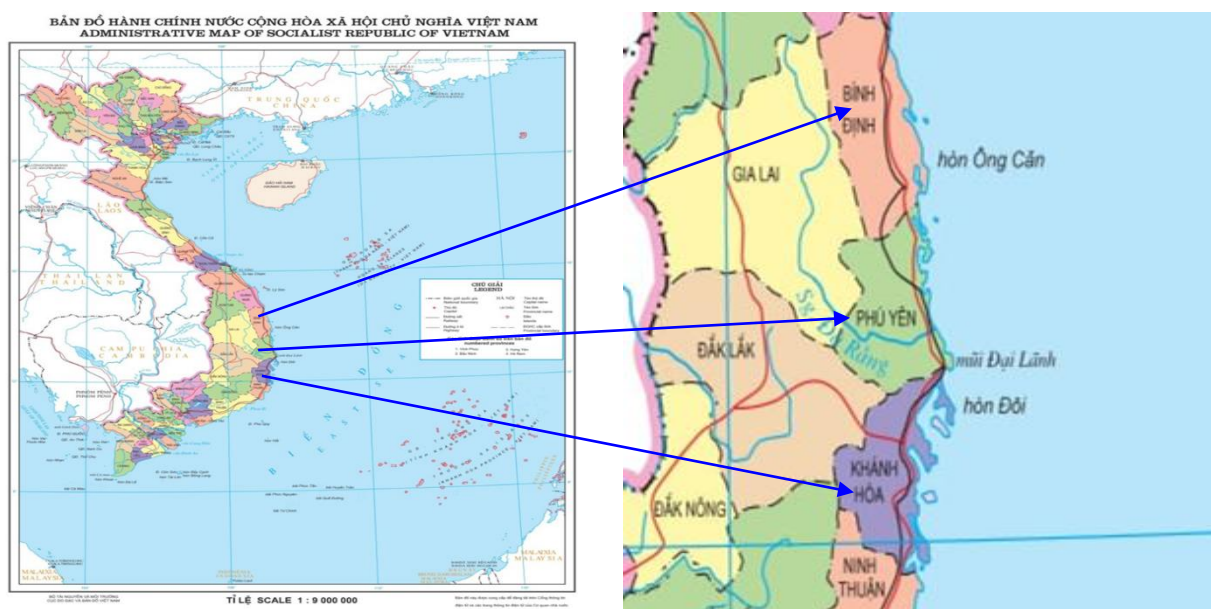


Figure 1. Fishing ground for catching oceanic tuna in three provinces of Binh Dinh, Phu Yen, Khanh Hoa (Source: The National Office of Intellectual Property, 2017)

In Vietnam, the oceanic tunas, including skipjack tuna (*Katsuwonus pelamis*), bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacores*), are mainly landed at nine provinces including Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan, Binh Thuan, and Ba Ria - Vung Tau, among which three South Central provinces of Binh Dinh, Phu Yen, and Khanh Hoa yield the highest oceanic tuna catches (Hai, 2018). Thus, we chose these three provinces for the investigation of the Vietnamese tuna value chain. Figure 1 describes the fishing ground for catching oceanic tunas of the three chosen provinces.

3.2 Data Collection

This tuna value chain study is based on both secondary and primary data. The secondary data was collected from various sources, including Vietnam Directorate of Fisheries (D-FISH), Provincial Departments of Fisheries (DoFIs) in Binh Dinh, Phu Yen, and Khanh Hoa provinces, the General Department of Vietnam Customs, Vietnam Association of Seafood Exporters and Producers (VASEP), Vietnam Tuna Association (VINATUNA), Research Institute for Marine Fisheries (RIMF), Vietnam Institute of Fisheries Economics and Planning (VIFEP), and Vietnam Academy of Agricultural Sciences (VAAS). All data on mapping tuna value chain in the three South Central provinces of Vietnam presented in this paper belongs to the full calendar year 2018. The primary data collection was done using non-random sampling through interview surveys with different actors in the tuna value chain, including fishers, middlemen, traders, processors, wholesalers, and retailers, and focus group discussions (FGDs) with three main actor groups including fishers, middlemen/traders, and processing enterprises. Key informant interviews (KIIs) were also conducted with representatives from D-FISH, DoFIs, VINATUNA, VASEP, and VIFEP.

3.3 Study Phases

The study was completed in four main phases. During the first phase, interview surveys were conducted by the research team from March to June 2018 among groups of actors along the tuna value chain. Four structured questionnaires covering both qualitative and quantitative issues were prepared for fishers, middlemen/traders, processing enterprises, wholesalers/retailers. The contents of survey questions include general information on actors, raw tuna material flows/tuna product flows, knowledge and information, tuna's volume, number of actors and employees, the value at different levels along the tuna value chain, relationships and linkages between actors, and the governance of the chain. Each actor participating in the tuna value chain was interviewed by using a separate set of questionnaires with closed-ended questions and open-ended questions. All data were coded and entered into a Microsoft Excel spreadsheet for statistical analysis, primarily comprising simple descriptive statistics. Data were analyzed using cross-tabulation in order to compare data among pairs of actors (e.g., fishers and middlemen/traders, middlemen/traders and processing enterprises). Table 1 describes the number of samples for each group of actors interviewed in the three investigated provinces.

Table 1. Number of samples for each group of actors interviewed in the three provinces.

Actor	Province			Total
	Binh Dinh	Phu Yen	Khanh Hoa	
Fisher	200	100	100	400
Middleman/trader	10	4	5	19
Processing enterprise	1	1	3	5
Wholesaler	1	1	1	3
Retailer	2	2	4	8
Total	214	108	113	435

In Phase 2, three FGDs were conducted with three main actor groups including fishers, middlemen/traders, and processing enterprises. The FGDs were directed at homogeneous groups and were conducted separately among these groups, allowing the participants to discuss issues limited within the survey structure. Furthermore, those FGDs were undertaken in order to surface issues and concerns that required depth and probing. Also, unclear answers in the survey interviews were discussed more lengthily during the FGDs. The open-ended questions discussed in the FGDs have similar contents with those questions in Phase 1. Table 2 presents the distribution of FGDs conducted in the three provinces in 2018.

Table 2. Distribution of FGDs conducted in the three selected provinces in 2018

FGD composition	Number of people in each group	Location
Fisher	12	Binh Dinh
Middleman	5	Phu Yen
Processor	3	Khanh Hoa

During Phase 3, we conducted individual KIIs with experts who are knowledgeable on the tuna value chain to complete and further clarify the results of the surveys and FGDs. The key informants were primarily the value chain enablers at both meso (e.g., associations and fisher groups) and macro (e.g., government units and agencies) levels. The study team conducted the KIIs in March 2019, following the completion of Phase 1 and Phase 2’s surveys so that the interviewers could probe for any data and information gaps from these surveys. Table 3 presents the sets of questionnaire for the KIIs.

Table 3. Sets of questionnaire utilized for the KIIs carried out in March 2019

Set	Value chain members	Number of key informants
Set A (Macro)	Representatives from government agencies such as D-FISH	1
Set B (Macro)	Representatives from local government units such as DoFIs in Binh Dinh, Phu Yen, Khanh Hoa provinces	3
Set C (Meso)	Representatives from private associations and academic institutions involved in the tuna industry such as VINATUNA, VASEP, VIFEP	3

In the last phase, the validation workshop was conducted in Binh Dinh province in June 2019 to vet research results and validate findings of the mapping tuna value chain in the three South Central provinces of Vietnam. Thirty participants attended the validation meeting, including twenty tuna value chain players, five officers of D-FISH, and five officers of DoFIs in Binh Dinh, Phu Yen, Khanh Hoa provinces.

4. Results

4.1 Current Status of the Vietnamese Tuna Industry

In Vietnam, the oceanic tunas are mainly found in the offshore waters of the country’s central and south-eastern regions (Hai 2018). Although fishing activities had been carried out previously, oceanic tuna fisheries, which consist of longline/handline, purse seine, and gillnet, have been only officially introduced to Vietnam since 1994. They gain a rapid growth rate in the number of tuna fishing vessels, tuna catch, and tuna export/import, presented as follows.

4.1.1 Tuna Fishing Vessels

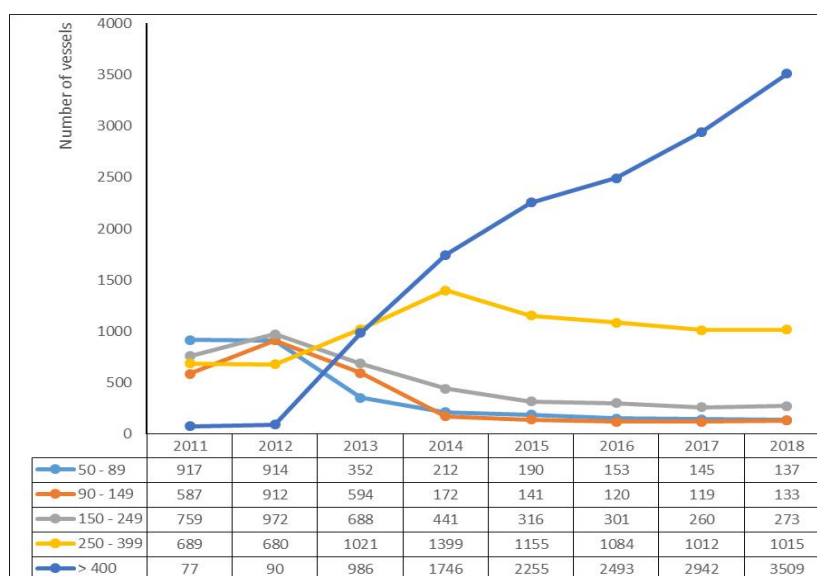


Figure 2. Number of tuna fishing vessels by capacity (in hp) during 2011-2018
Source: (D-FISH, 2018)

Figure 2 describes the evolution of the total number tuna of fishing vessels in Vietnam by capacities from 2011 to 2018. In 2018, there were 5,067 tuna fishing vessels with a capacity of higher than 50 horsepower (hp), in which 3,509 vessels with a capacity of higher 400 hp were accounted for sixty-nine percent of the total number of vessels. Vessels higher than 400 hp in capacity have a sharp increase from 77 units in 2011 to 3,509 units in 2018, whereas vessels with smaller capacities have a decreased tendency over the years. Among provinces, Binh Dinh had the highest number of vessels with 2,010 vessels, while Phu Yen ranked at the second position with 657 vessels, and Khanh Hoa, the third with 539 vessels (D-FISH, 2018).

4.1.2 Tuna Catch

Three tuna species include skipjack tuna, yellowfin tuna, and bigeye tuna caught in Vietnam’s Exclusive Economic Zone (EEZ). Figure 3 describes total tuna catches estimated by species from 2011 to 2018. Skipjack tuna are caught by purse seine and gillnet fisheries all year round while yellowfin and bigeye tunas are caught by longline/handline fishery from November to May. In general, total tuna catches increased steadily throughout the duration, and the majority catch belonged to skipjack tuna. In 2018, skipjack tuna catch was 92,005 mt, accounting for eighty-two percent of total tuna catches, followed by yellowfin tuna with 19,268 mt (seven-teen percent), and bigeye tuna with 1,684 mt (one percent). In 2018, Binh Dinh had the highest tuna catch among provinces with 52,823 mt, followed by Khanh Hoa with 19,103 mt and Phu Yen with 8,616 mt (D-FISH, 2018).

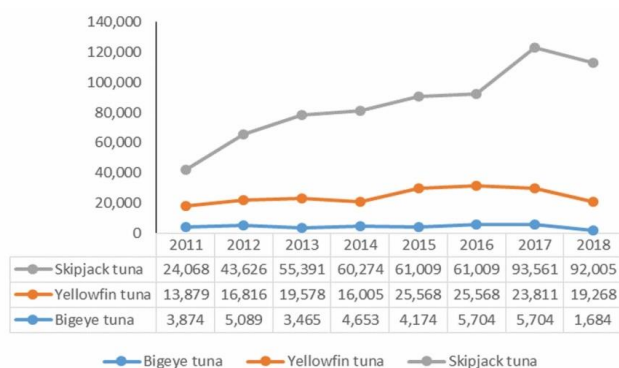


Figure 3. Tuna catches by species (in mt) caught in Vietnam’s EEZ from 2011 to 2018
Source: (D-FISH, 2018)

4.1.3 Tuna Export and Import

Vietnam’s tuna processing and export industry are growing, which contributes significantly to the country's seafood export growth. Table 4 describes the Vietnamese tuna product and seafood export from 2014 to 2018. The export value of frozen fillet tuna (code HS0304) increased remarkably from USD 193.180 million in 2014 to USD 310.315 million in 2018, an increase of 60.6 percent. Also, the export value of processed and canned tuna products (code HS16) went up by 31.8 percent, from USD 232.290 million in 2014 to USD 306.254 million in 2018. In addition, the turnover of total tuna export increased by 34.8 percent from USD 484.235 million in 2014 to USD 652.905 million in 2018. Tuna exports explained stably around 22 percent of total seafood exports during the period.

Table 4. Vietnamese tuna product and seafood export during 2014-2018 (in million USD)

Product type	2014	2015	2016	2017	2018	% increase (2014-2018)
1. Tuna with code HS03	251.944	246.123	284.181	322.558	346.652	37.6
Live tuna/fresh/frozen/dried (with code HS03, except HS0304)	58.765	43.185	43.422	49.626	36.337	-38.0
Fillet tuna (with code HS0304)	193.180	202.938	240.759	272.933	310.315	60.6
2. Processed tuna with code HS16	232.290	208.850	225.606	270.314	306.254	31.8
Canned tuna (with code HS16)	177.018	150.399	153.032	179.110	173.305	-2.1
Other processed tuna (with code HS16)	55.272	58.451	72.574	91.204	132.948	140.5
Total tuna export (1 + 2)	484.235	454.972	509.786	592.873	652.905	34.8
Seafood export	2,201.390	2,159.840	2,296.380	2,757.810	2,986.040	135.6
Tuna export/seafood export (%)	22.0	21.1	22.2	21.5	21.9	

Source: (Custom, 2018)

Vietnamese tuna products were exported to many foreign markets, of which several important ones are the US, the EU, Israel, ASEAN, Japan, China, Mexico, Canada, etc. Table 5 presents tuna export between 2014 and 2018, in which the US and EU were constantly the two leading importers of Vietnamese tuna products during the period.

Table 5. Vietnamese tuna export value (in million USD) from 2014 to 2018

Market	2014	2015	2016	2017	2018
USA	175.217	190.164	200.277	225.693	229.542
EU	135.215	97.375	115.316	141.936	158.274
Israel	20.872	17.349	26.001	44.260	62.982
ASEAN	34.985	38.366	43.394	43.862	50.058
Japan	22.564	20.426	19.361	24.396	24.808
Canada	11.958	9.931	10.09	11.769	16.042
Others	81.410	79.346	103.421	98.940	109.181
Total	484.235	454.972	509.786	592.873	652.905

Source: (Custom, 2018)

In Vietnam, the tuna catch volume is not sufficient for the processing industry. In order to have enough raw material, processors have to import tuna materials from countries like Korea, China, ASEAN, Japan, the USA, the EU, and other markets. Table 6 presents Vietnamese tuna import markets in the period of 2014-2018, in which Korea and China were the first and the second leading exporters during this duration.

Table 6. Vietnamese tuna import value (in million USD) from 2014 to 2018

Market	2014	2015	2016	2017	2018
Korea	27.554	45.733	41.534	41.757	54.681
China	15.195	21.868	28.267	31.812	70.293
ASEAN	22.515	18.590	23.725	30.387	33.760
Japan	15.291	10.833	13.716	20.019	13.646
USA	19.839	13.363	10.131	12.990	24.207
EU	2.476	10.244	0.11	0.536	3.078
Other markets	81.123	94.249	99.427	132.443	182.770
Total	183.994	214.881	216.910	269.945	349.426

Source: (Custom, 2018)

4.2 Mapping Tuna Value Chain in Three South Central Provinces of Vietnam

4.2.1 Mapping Core Processes in Tuna Value Chain

We identified five core processes in the tuna value chain in the three investigated provinces of Binh Dinh, Phu Yen, Khanh Hoa, which are input provision, tuna exploitation, tuna purchase, tuna process, distribution and market. Input provision is the process of providing input materials, which are gasoline, oil, ice, fishing nets, machines, and equipment for fishers to catch tuna offshore. Tuna exploitation is the process of catching tuna by fishers, whereas tuna purchase is the process that traders/middlemen/processors buy tuna materials at fishing ports. Tuna processes are the conversion of raw tuna into frozen fillet, loin, or finished tuna products. Meanwhile, distribution and market is the process of selling tuna products to customers in export and domestic markets. These core processes are depicted in the top part of Figure 4.

4.2.2 Mapping Actors and Activities of Tuna Value Chain

The tuna value chain in the three South Central provinces of Vietnam is relatively simple. As shown in the bottom part of Figure 4, it includes four main actors described in details as follows.

1) Fishers include shipowners and cruise workers who work on tuna vessels for catching yellowfin, bigeye, and skipjack tunas. All fishers are men. The majority of shipowners are middle-aged men, are certified captains or deputy captains, and have accumulated enough experience and capital to manage all workers' activities, whereas most cruise workers are young and not professionally trained. Fishers' knowledge and understanding on tuna fisheries are mainly obtained through practice and mutual learning. In general, the education level of shipowners and cruise workers is essentially low at primary and secondary school levels; thus, it is difficult for them to

quickly access technical knowledge and information in catching and preserving tunas. Fishers are the first and also the most significant actors in the tuna value chain since they exploit and provide raw tuna to traders/middlemen/processors. However, they have a relatively low position and a small influence in the chain. They depend heavily on traders/middlemen for credit loans. Most shipowners get loans from traders/middlemen before each voyage and sell caught tunas to these lenders afterwards, which is one of the primary causes for the low negotiation power of shipowners in tuna transactions.

2) Purchasing actors include traders and middlemen who are responsible for buying raw tunas and selling them to processing and exporting companies or for domestic consumption. Both middlemen and traders have much experience in tuna transactions. Traders buy tunas directly from fishing vessels, then selling most of them to middlemen or processors and selling the remainder at domestic markets. Meanwhile, middlemen purchase raw tunas directly from fishing vessels or traders and sell them to processors. Compared to traders, middlemen’s buying volume is much bigger. Most of middlemen and traders are women. Most middlemen have matured from traders and have the closest relationship with fishers. Purchasing actors play an intermediary role in the chain; however, they have a great influence on other actors, especially fishers. They provide finance on time for fishers and dictate the classification and price of raw tunas at fishing ports.

3) Processors are responsible for purchasing raw tunas from middlemen/traders/shipowners, then processing them into frozen fillet, loin, or finished tuna products, finally selling these products to export and domestic markets. They include frozen and canned tuna companies. Frozen tuna products consist of fillet tuna meat, whole and discarded frozen tuna, frozen tuna loin with and without CO, frozen slice (steak) with and without CO, frozen cut pieces (saku, cube) with and without CO, while canned tuna products include canned food, tuna in oil, and pickled tuna. Processors are the most substantial influencers in the tuna value chain since they have high negotiation power and decide the purchasing price of raw tuna. They have the closest relationship with middlemen/traders.

4) Wholesalers/retailers are responsible for distributing, marketing, and selling tuna products. Wholesalers are commercial enterprises who order tuna products from processors and sell them to retailers. Retailers are households who sell groceries or provide machines and equipment for fishers as well as tuna products for local consumers. These actors play an intermediary role in the chain, benefiting from the difference between buying and selling prices of tuna products. In addition to main actors directly involved in the tuna value chain, there are institutional stakeholders of the chain such as fisheries administration and management in the three South Central provinces of Vietnam, D-FISH, VASEP, VINATUNA, financial institutions, non-governmental organizations, and local tuna fisheries unions. Figure 4 describes the mapping of the main actors and their activities from the core processes of the tuna value chain.

	Input provision	Tuna exploitation	Tuna purchase	Tuna process	Distribution & Market
Actors	Suppliers	Fishers	Purchasing actors	Processors	Wholesalers/retailers
Activities	Supply input: petrol and oil, ice, fishing, nets, food	Fishing and preserving tuna materials	Unloading and purchasing raw tuna from fishers and selling raw tuna to processors.	Processing raw tuna into tuna products; Exporting tuna products.	Distributing, marketing, and selling tuna products.
Institutional stakeholders of the chain: Fisheries administration and management in the three South Central provinces of Vietnam, D-FISH, VASEP, VINATUNA, Financial institutions, non-governmental organizations; tuna fisheries unions.					

Figure 4. Mapping main actors and specific activities undertaken by actors from core processes in tuna value chain
Source: (Primary Processed Data, 2018)

4.2.3 Mapping Material Flows

Mapping tuna material flows involves identifying materials at each stage of the process as they are transformed from inputs to raw and intermediate materials, and finally, to final tuna products. Mapping these flows creates a clear picture about what forms of products are handled, transformed, and transported at each stage of the tuna value chain. Table 7 depicts the process, input, and output forms of tuna material flows. Figure 5 classifies and

assesses each activity in the material flows. The assessment of each activity aims to classify it into one of three categories: (V) the activity adds the value of the chain, (N) the activity is necessary but does not increase the value of the chain, and (W) the activity is unnecessary and wasteful. The assessment results were based on the validation workshop taken place in Binh Dinh province in June 2019, which was organized to validate research findings on the tuna value chain analysis in the three investigated provinces.

4.2.3.1 Material Flows from Input Suppliers to Fishers

Input suppliers provide petrol, ice, food, etc. for fishers to go offshore, which is necessary but does not add value to the chain. Fishers catch and preserve tunas, which are necessary activities and add value to the chain. Interviewed surveys in 2018 showed that most fishing vessels are made of wood, and most cold basements used for preserving tuna materials are made of styrofoam, which is not guaranteed for keeping cold. Also, most fishers use traditional methods to catch tuna. Typically, tunas are waving underwater before being pulled on the vessels, then have their heads beaten until their deaths by a rudimentary tool, making their meat sour. Most fishers do not perform gill hook and organ removal as well as do not make the body heat of tunas decrease gradually (i.e., they put the whole caught tunas in cold basements without any processing). Furthermore, the average length of a sea trip is from twenty to twenty-five days. All of these factors have negative impacts on the quality of tuna materials at landing ports.

4.2.3.2 Material Flows from Fishers to Traders/Middlemen

The activities of purchasing tuna, unloading tuna from fishing ports to trucks, transporting tuna from fishing ports to processing enterprises are necessary but do not add value to the tuna value chain. However, that of preserving tuna from fishing ports to processors both is necessary and add value to the chain. The results of the surveys showed that some factors could negatively affect the activities in preserving tuna at fishing ports as follows:

- 1) The wharf at fishing ports have not roofs, making the quality of tunas be degraded when transporting tunas from vessels to fishing ports, especially in hot seasons;
- 2) Most middlemen do not have cold storages with temperatures from zero degrees Celsius to five degrees Celsius at fishing ports to put fresh tunas into storages immediately after purchasing;
- 3) The low quality of icing service harms tuna preservation.

4.2.3.3 Material Flows from Traders/Middlemen to Processors

Raw tunas are stored in cold storages after being transported from fishing ports to processing enterprises, which is a necessary activity but does not add value to the tuna value chain. Activities take place during the process of transforming tuna materials into tuna products both are necessary and do add value to the chain.

4.2.3.4 Tuna Product Flows from Processors to Wholesalers/Retailers

Tuna products are stored in cold storages, then sold to oversea markets by exporters and to final customers in domestic markets by retailers/wholesalers. This activity is necessary but does not add value to the tuna value chain.

Table 7. Process, input and output forms of material flows in the tuna value chain

No	Process	Input form	Output form
1	Preparing and going to sea for tuna catch	Supplies, fuel, fishing gear, food, ice	Tuna materials: yellowfin tuna, bigeye tuna, skipjack tuna
2	Landing fishing ports and sorting tunas	Unclassified tuna materials: yellowfin tuna, bigeye tuna, skipjack tuna of mixed sizes	Classified tuna materials: yellowfin tuna, bigeye tuna, skipjack tuna of sizes in categories
3	Transporting and processing tuna materials	Tuna intact with head, tail, and fins	Fillet tuna meat, frozen tuna, canned tuna
4	Storaging and selling tuna products	Fillet tuna meat, frozen tuna, canned tuna	Tuna products in a vacuumed plastic package
5	Consuming tuna products	Tuna products in a vacuumed plastic package	Tuna products are ready for consumption

Source: (Primary Processed Data, 2018)

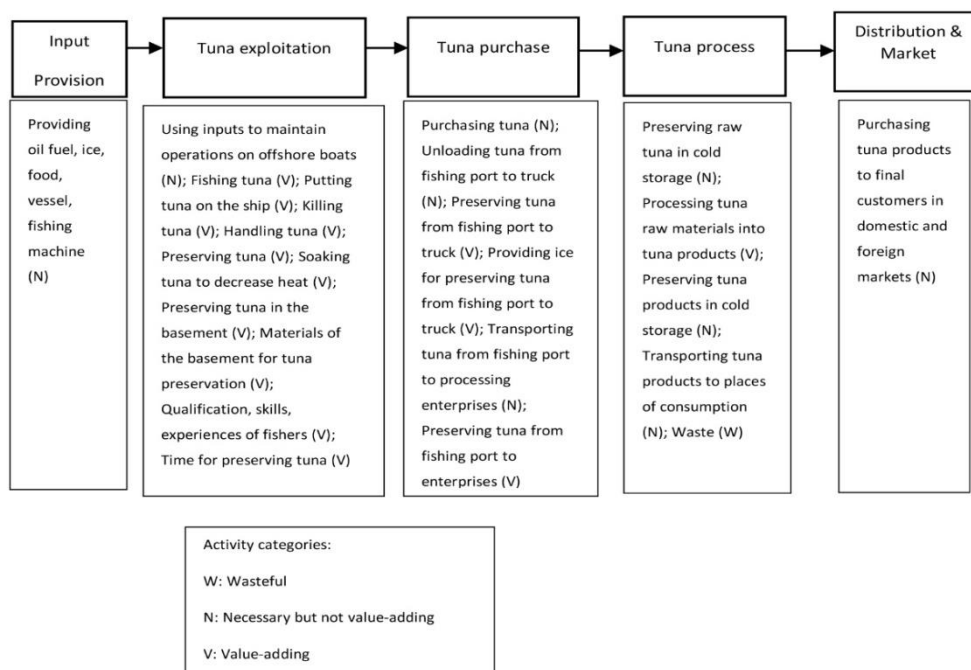


Figure 5. Mapping material flows in the tuna value chain
 Source: (Primary Processed Data, 2018)

4.2.4 Mapping Knowledge and Flows of Information

4.2.4.1 Mapping Knowledge

1) Analyze the variation in knowledge, and skills in the separate processes in the tuna value chain

For tuna exploitation, fishers contribute to the effectiveness and efficiency of the chain by catching tuna in permitted sea areas with a considerable volume and a good quality. The surveys showed that most fishers use traditional technology to catch tuna, which is based on experiences from past generations. In addition, most fishers know and enforce illegal, unreported, and unregulated (IUU) principles and Dolphin Safe fishing. For tuna transactions, most middlemen and traders have many experiences in purchasing tunas. They can evaluate various types of tunas and classify them according to quality levels and sizes. For tuna processing, processors can understand various types of tunas, quality of tuna materials, tuna processing process, and the requirements on tuna products from export and domestic markets.

2) Determine and describe standards along the tuna value chain

Technical staffs of processing enterprises apply Vietnam’s standards (Legislation, 2018) to evaluate raw tuna’s quality at fishing ports. Relying on these standards, they determine grades of raw tunas when buying them from middlemen/traders/fishers. For traders and middlemen, they assess the quality of raw tunas based on their experiences rather than clearly specified criteria. All actors in the chain are concerned about the quality of raw tunas, but at different levels. Figure 6 describes the quality criteria for raw tunas along the chain. Both fishers and middlemen/traders are interested in catching/buying raw tunas with good quality, at least attaining sensory features. Nonetheless, the biggest concerns of fishers are how to catch large volumes and obtain the highest return from each voyage, while that of middlemen/traders is how to receive the highest profit either from the price differences between purchasing raw tunas from fishers and reselling them to processors or from the commissions resulted from buying large quantities of raw tunas for processors. They are these money-oriented concerns of the two above actors that places tuna quality is at a lower priority than tuna volume. Regarding processors, they comply with Vietnamese standards for raw tunas and export market standards for processed tuna products. All processed tuna products must ensure the microbiological, physicochemical, and histamine limits. However, the final goal of processing enterprises is to achieve the highest profit from their business, so they would like to buy raw tunas at a reasonable price.

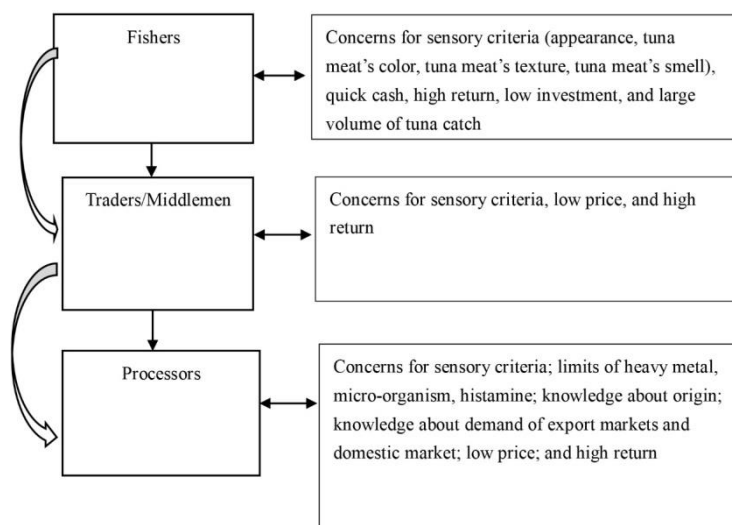


Figure 6. Quality criteria for raw tuna along the tuna value chain

Source: (Primary Processed Data, 2018)

4.2.4.2 Mapping Information Flows

Mapping information flows through the tuna value chain is to consider what information and how information flows in the chain. Figure 7 summarizes the characteristics of information flows along the tuna value chain. Four characteristics of information flows were investigated including contents, methods and frequency of information exchange, and levels of trust in sharing information. The contents of shared information include species of raw tuna, price, quantity, quality of raw tuna, and market information. However, there was a considerable difference in the proportion of contents of information shared between actors along the chain. Most fishers set the selling price as their highest priority, followed by the quantity and size of raw tuna. In contrast, most other actors place their focus on the quantity and size of raw tuna or types of tuna products since processing enterprises determine the price of raw tuna or tuna products beforehand. Regarding methods of sharing information, most fishers exchange with other actors through radios offshore and through face-to-face contacts and telephones at fishing ports. Meanwhile, other actors mainly communicate via telephones, and only meet face-to-face to deal with business problems. For frequency of information sharing, fishers communicate with each other less regular than other actors since the interested information of fishers is less complicated and fluctuated than that of other actors. While fishers only care about selling price, quantity and size of raw tuna when their ships are landed, other actors concern variations on the market of raw tuna/tuna products in order to respond promptly to business situations. In concern of trusting levels, most fishers are untrustworthy of information shared from other actors, especially the price of raw tuna. In contrast, other actors are quite confident in each others.

4.2.5 Mapping the Volume of Tuna Materials, Numbers of Actors and Jobs

4.2.5.1 Mapping the Volume of Tuna Materials

The tuna volume is closely related to mapping tuna materials. The dimension of tuna volume is added to following the tuna materials through the tuna value chain. Finding out the volume of tuna materials makes it possible to have an overview of the size of different channels within the value chain. There are two tuna supply chains, which are (i) yellowfin and bigeye tuna supply chain, and (ii) skipjack tuna supply chain. Figure 8 depicts the supply chains and mapping volumes of yellowfin, bigeye, and skipjack tunas in the three South Central provinces of Vietnam in 2018. Total yellowfin and bigeye tuna catches were 17,082 mt, and those of skipjack tuna were 63,460 mt in the three investigated provinces (D-FISH, 2018).

1) Supply Chain and Mapping Yellowfin and Bigeye Tuna Volume

Yellowfin and bigeye tunas are caught by fishers in the Central sea of Vietnam by long-line/hand-line fisheries, then are directed to four different channels served for export and domestic markets. The surveys showed that the processing factor of yellowfin and bigeye tunas is 1.7, i.e., 1.7 kilograms of raw yellowfin and bigeye tunas are processed into 1.0 kilograms of finished tuna products and 0.7 kilograms of by-products of tuna. In other words, one-hundred percent of fresh yellowfin and bigeye tunas are processed into fifty-nine percent for processed tuna products and forty-one percent for by-products. Four different channels of yellowfin and bigeye tunas are presented as follows:

- Channel 1 (fishers-processors-export markets): Products of this channel are whole tunas with guts and gills removed for exporting to Japan by airplane. Processors choose yellowfin and bigeye tunas with the best quality (A or B grades, as shown in Figure 8), but only with a small volume, for getting acquainted with the Japanese market. Exporting whole yellowfin and bigeye tunas to Japan are not so feasible at present since most fishers use traditional and out-of-date methods to catch and preserve tunas. In 2018, the yellowfin and bigeye tuna volume of this channel accounted for a tiny portion, at only one percent, of that of all channels, about 171 mt. Although this channel has the highest value of a product unit compared to others, its export value is low because just a small amount of raw yellowfin and bigeye tunas meet the strict requirements for exporting to Japan.
- Channel 2 (fishers-traders/middlemen-processors-export markets): Yellowfin and bigeye tunas with C grade are processed into frozen tuna fillets (HS 0304 code) to export to the US, the EU, Israel, ASEAN, Japan, Canada, China, Mexico, and other markets. There are eight types of frozen tuna fillets, including tuna loin, tuna loin CO, tuna steak, tuna steak CO, tuna cube, tuna cube CO, tuna Saku, and tuna Saku CO. In 2018, the export volumes of frozen tuna fillets were about 9,566 mt, accounted for fifty-six percent of total yellowfin and bigeye tunas in the three investigated provinces.
- Channel 3 (fishers-traders/middlemen-processors-wholesalers/retailers-domestic markets): Products of this channel are tuna fillets catering to hotels, restaurants in domestic markets. Its sale volume, about 342 mt, accounted for two percent of total amount of yellowfin and bigeye tuna.
- Channel 4 (fishers-traders/middlemen-processors-wholesalers/retailers-domestic markets): Products of this channel are by-products of tuna processing such as tuna plasticizers, tuna ribs, tuna eyes, tuna bones, tuna heads, consumed in domestic markets. Its sale volume explained forty-one percent of the total volume of yellowfin and bigeye tunas (about 7,004 mt).

2) Supply Chain and Mapping Skipjack Tuna Volume

Skipjack tunas are caught by fishers in the Central sea of Vietnam by purse seine and gillnet fisheries, which can be divided into two different channels, serving for export and domestic markets. The surveys showed that the processing factor of skipjack tuna is 1.5, i.e., 1.5 kilograms of raw skipjack tunas are processed into 1 kilogram of finished products and 0.5 kilograms of by-products. This means that one-hundred percent of total raw skipjack tuna catches are produced into sixty-seven percent for finished products and thirty-three percent for by-products. Total skipjack tuna catches in Vietnam only meet fifty percent of the total demand of tuna materials for domestic processors. The remainder of the demand is imported from Korea, China, ASEAN, and other countries (Custom, 2018). Two main paths of the supply chain of skipjack tuna are described as follows:

- Channel 1 (fishers-traders/middlemen-processors-export markets): Four kinds of finished skipjack tuna products for export whose total volume is about 68,400 mt, including canned food, tuna in oil, pickled tuna, and frozen tuna, explained fifty-seven percent of total skipjack tuna products.
- Channel 2 (fishers-traders/middlemen-processors-wholesalers-retailers-domestic market): ten percent of total skipjack tuna products, about 12,000 mt, are domestically consumed. All by-products of skipjack tuna (mainly tuna heads and tuna bone), about 39,600 mt and sold to fish sauce and animal feed processing facilities in Vietnam, explained thirty-three percent of total skipjack tuna products.

4.2.5.2 Mapping Number of Employers and Employees

Figure 9 describes mapping the number of employers and employees at each phase in the tuna value chain. The estimation of the number of employers and employees related with each actor of the chain was based on the secondary data from (D-FISH, 2018) and the surveys in 2018, as presented below:

- For fishers, the total number of employers is 3,206 persons, inferred from the total number of vessels in three investigated provinces (D-FISH, 2018). The number of employees, which are captains and cruise workers, is 25,169 persons, estimated based on summing of the products of the number of vessels in each tuna fishery with the corresponding average number of persons on every vessel. The total number of tuna fishing vessels of those provinces is 3,206 vessels, including 2,275 vessels for longline/handline, 693 vessels for purse seine, and 238 vessels for gillnet (D-FISH, 2018). Meanwhile, the average number of on-board workers per vessel for longline/handline, purse seine, and gillnet is respectively 5.5, 15.0, and 9.5.
- For traders/middlemen, the total number of employers is 130 persons, including 98 traders and 32 middlemen in the three provinces (D-FISH, 2018). Based on the surveys, the average number of employees associated with a trader and a middlemen is 6 and 16 persons, respectively. Thus, we estimated that the total number of employees is about 1,100 persons.

• Regarding processors, the total number of employers is 14, inferred from the total number of processing enterprises (D-FISH, 2018). The surveys showed that the average number of employees in each enterprise is 720 persons. Thus, we estimated that the total number of employees is 10,080 persons.

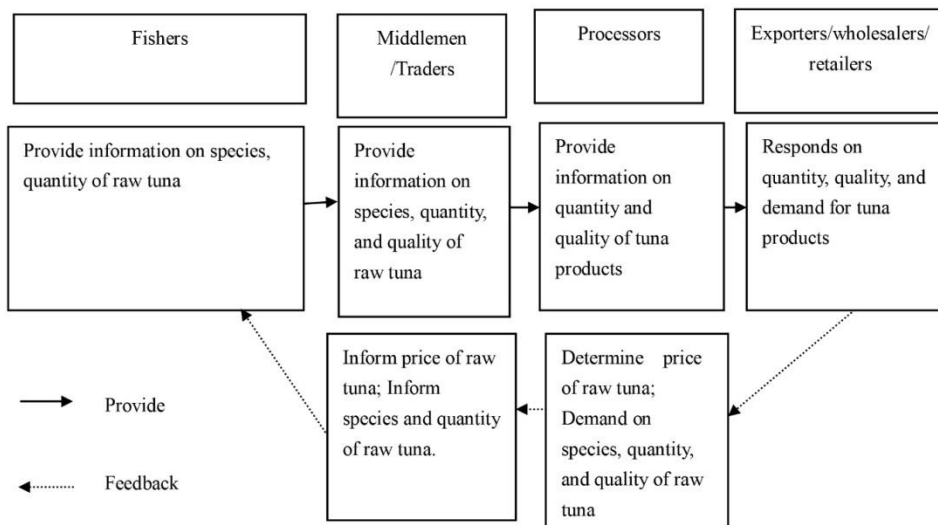


Figure 7. Characteristics of information flows in the tuna value chain
Source: (Primary Processed Data, 2018)

	Input providers	Fishers	Middlemen/Traders	Processors
Employers		3,206	130	14
Employees		25,169	1,100	10,080

Figure 9. Mapping the number of employers and employees in the tuna value chain
Source: (Primary Processed Data, 2018)

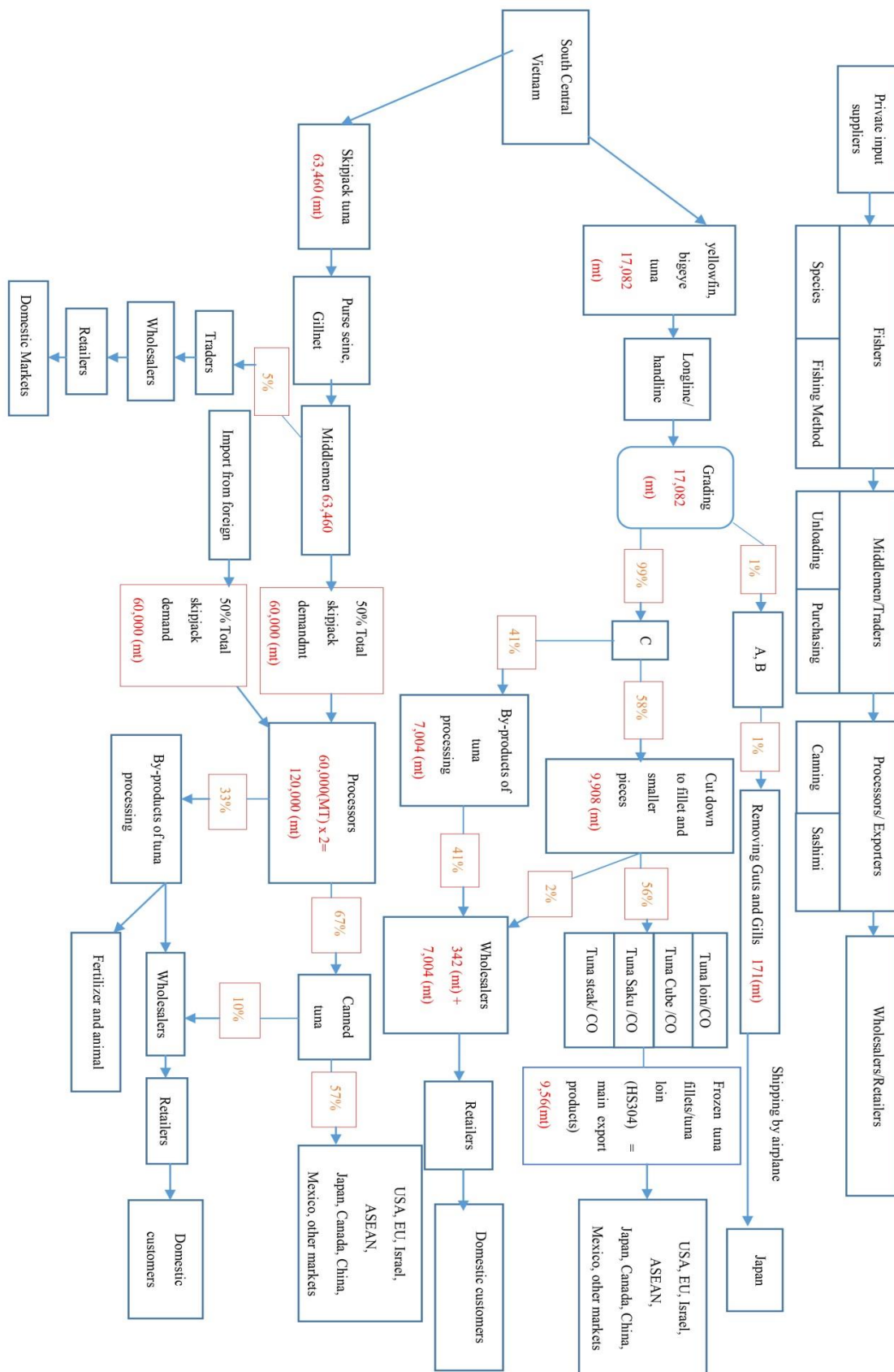


Figure 8. Supply chains and mapping volumes of yellowfin, bigeye, and skipjack tunas in the three South Central provinces of Vietnam in 2018

4.2.6 Mapping the Value at Different Levels of the Tuna Value Chain

The indicator of value mapping is the price of tuna at each process level. Figure 10 describes mapping the value added through the chain obtained by the surveys in 2018. Traders/Middlemen only add small values to the prices of purchased raw tunas, VND 5,000 per kilograms (or 4.5%) for yellowfin and bigeye tunas and VND 3,000 per kilograms (or 10.3%) for skipjack tunas. Meanwhile, processors add much higher values to the prices of processed tunas, VND 241,000 per kilograms (or 209.6%) for yellowfin and bigeye tunas and VND 48,000 per kilograms (or 150.0%) for skipjack tunas.

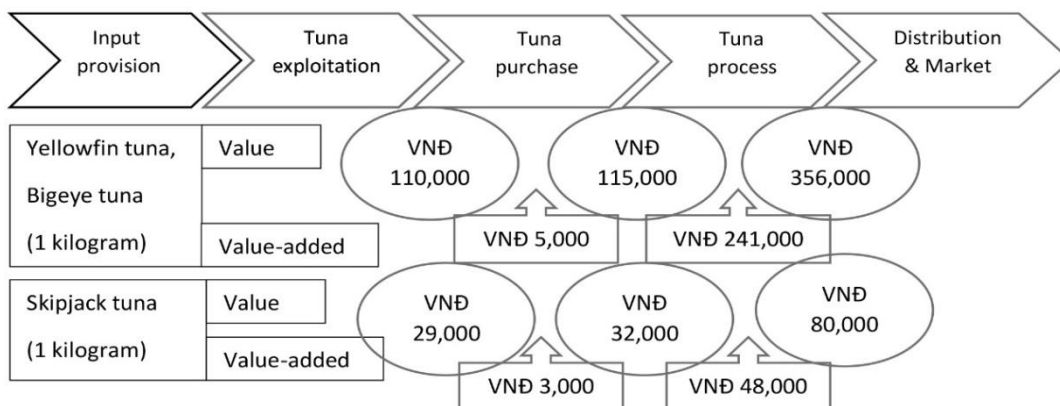


Figure 10. Mapping the value added through the tuna value chain
Source: (Primary Processed Data, 2018)

4.2.7 Mapping the Relationships and Linkages between Actors along the Tuna Value Chain

4.2.7.1 Mapping the Relationships between Actors

Figure 11 depicts the relationships between actors along the tuna value chain. Fishers/shipowners have a persistent relationship with input providers, which is a regular, long-term exchange relationship without signed contracts. Most fishers individually buy input materials from providers at retail prices, making the input expense increased compared to purchasing collectively at lower prices. Similar to the above relationship, the one between fishers and traders/middlemen is also persistent without sale contracts (i.e., there is no legal bidding on commitments on species, price, quality, and quantity of raw tuna). Besides, there is a credit/marketing relationship between fishers and traders/middlemen, i.e., the latter give the former access to capital while the former provide the latter with a certain supply of raw tuna. On the contrary, the relationship between traders/middlemen and processors is persistent yet with sale contracts involving detailed commitments on raw tuna. Similarly, processors and retailers also have persistent relations with sale contracts with wholesalers. Finally, retailers have both of persistent and spot market relations with final customers.

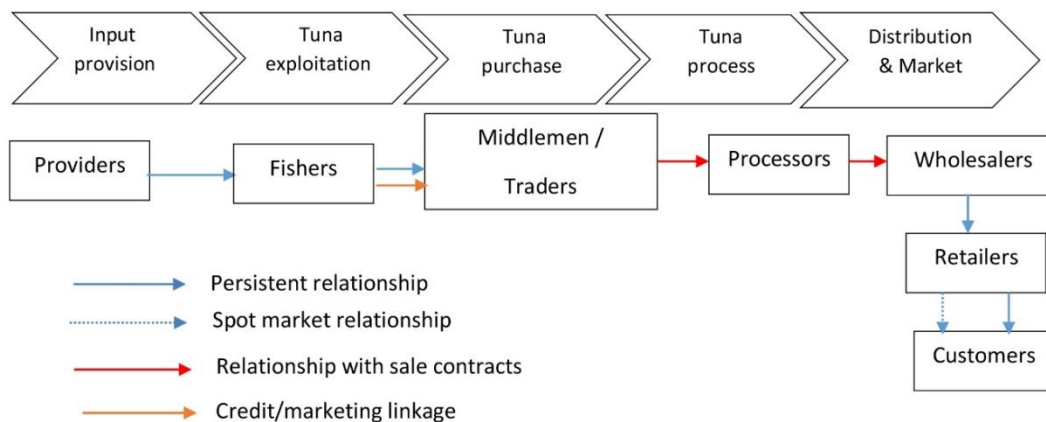


Figure 11. Mapping relationships between actors along the tuna value chain
Source: (Primary Processed Data, 2018)

4.2.7.2 Mapping the Linkages between Actors along the Tuna Value Chain

The linkages between actors along the chain can be categorized into vertical and horizontal linkages. Vertical linkages are the relationship between actors along the chain, for example, verbal agreements between fishers and traders/middlemen. On the other hand, horizontal linkages are the relationship between actors at the same level of the chain, for example, shipowners communicate with each other, or processors liaise with each other on the regular basis. In the following descriptions, we focus on fishers since they are of the most interest in this study.

In concern of vertical linkages, three features, including the nature and existed duration of the linkages, and the degree of mutual trust between actors are examined with emphasis on the differences between fishers and other actors. Regarding the linkage nature, most fishers have verbal agreements with input providers and traders/middlemen due to their long-term relationships while other actors have formal written contracts with each other. Mentioning the linkage duration, the relationship between fishers and their partners are rather short, whereas that between other actors are quite long. For example, fifty-five percent of interviewed fishers have the relations with traders/middlemen less than three years while ninety-five percent of middlemen keep the relations with processors from three years to ten years, and even over ten years. In terms of the mutual trust, most fishers have little trust on the other actors whereas the remaining actors have a high trust with other actors. One of the main reasons for explaining the little confidence of fishers is the buying habits of traders/middlemen, e.g. buying raw tuna in whole buckets, manipulating prices and tuna sizes or grades. Consequently, fishers are ready to change their old partners if obtaining more benefits from new ones.

In concern of horizontal linkages, the relationships between fishers can be divided into the one between shipowners and the interrelation of shipowners and their crew members. Regarding the relationship between shipowners, most shipowners are gathered and organized themselves in local fishing groups, each of which comprises from five to ten shipowners, which are usually relatives or neighbours who have close relationships. They support each other in finding fishing grounds, harvesting tuna, and dealing with difficulties and risks when being offshore. Many shipowners in the chain are the members of fisheries organizations such as VINATUNA and local fisheries associations. Mentioning the interrelation of shipowners and their crew members (i.e., captain and cruise workers), shipowners receive forty percent of total returns while crew members keep the remainder in which captains obtain 1.5 times as much as cruise workers. Thus, cruise workers receive the smallest return among fishers. Based on the average number of on-board workers per vessel presented in Section 4.2.5.2, it can be estimated that the proportion of the total return given to each cruise worker is 10.0%, 3.9%, and 6.0% for longline/handline, purse seine, and gillnet fisheries, respectively.

4.2.8 Governance

The tuna fisheries belongs to the general management of fisheries in Vietnam. The governance of the tuna value chain in Binh Dinh, Phu Yen, and Khanh Hoa provinces is found to be regulated by both national and local governments. At the national level, D-FISH, under the supervision of the Ministry of Agriculture and Rural Development, issues policies on fisheries management in general and on tuna fisheries management in particular. At the provincial level, the Departments of Agriculture and Rural Development and the DoFIs in the three investigated provinces deploy fisheries management policies to local fisheries stakeholders.

5. Discussions and Conclusion

5.1 Discussions

Many of upgrades or recommendations made in the tuna value chain analysis in the three South Central provinces of Vietnam are targeted to the improvements of Vietnamese tuna fisheries management, and are drawn from collected information about the tuna fisheries which has never been fully documented before, presented as follows:

- The research results show that the awareness level of fishers is still low and scattered. They still stand alone in the chain, and each individual buys input materials such as gasoline, oil, necessities, etc. at retail prices in the markets. Therefore, the production cost is often relatively high, having negative impact on the economic efficiency of each voyage. Thus, our value chain analysis (VCA) recommends that fishers should cooperate with each other to take advantage of purchasing input materials in bulk at cheaper prices;
- Several main reasons lead to the degradation of the quality of raw tuna, and affect fisher's income summarized as follows: (i) fishers use fishing vessels with backward facilities and traditional fishing method; (ii) the duration for one voyage from 20 to 25 days is so long; (iii) some logistics services at fishing ports are not guaranteed such as lack of cold storages, poor quality of icing services, etc. Thus, the VCA suggests the following corresponding measures: (i) upgrading vessel facilities and fishing techniques, and organizing short-term training courses for

fishers to improve the handle and preservation of raw tuna; (ii) buiding logistics service fleets to buy raw tuna offshore (in addition to providing logistics services for tuna fishing vessels) to avoid preserving raw tuna on vessels for a long time; (iii) enhancing the quality of logistics services such as ship building and repairing service, icing service, cold storages at fishing ports. These recommendations help improve the handling and maintenance of fish quality in order to meet high demands of export markets, increase the quality and selling price of tuna, reduce post-harvest losses and resource waste, and increase income for fishers.

- Fishers are the most disadvantaged actors in the chain because of the following reasons: (i) fisher is the price taker and receive the smallest return compared to other actors; (ii) traders/middlemen usually buy in buckets, manipulate the size and price of raw tuna at fishing ports, causing significant financial detriment to fishers; (iii) fishers do not have access to public and transparent market information; (iv) fishers lack mutual trust and strong linkage with other actors. Our VCA exhibits that it is necessary to establish a center for tuna auction transactions with the primary functions of determining the exact quantity, quality, size and price of raw tunas as well as bidding for buying and selling them. The center is expected to regulate the standards on raw tuna and the amplitude of price fluctuation.
- The credit-driven relationship between fishers and middlemen/traders can be considered as both beneficial and exploitative. On the one hand, traders/middlemen provide financial assistance on time for fishers before each sea voyage. On the other hand, this relationship can be exploitative as fishers may be forced to overfish to manage their debt, or it worsens the poverty situation as fishers are price takers and obtain the smallest return in the whole tuna value chain. Buying in buckets and manipulating the size, and price of raw tuna regularly taking place at fishing ports are the consequence of this relationship between fishers and middlemen/traders. Whatever fishers harvest is used primarily to pay off their debts, allowing traders/middlemen to claim the classification and set the buying price of raw tuna. Therefore, savings, credit, and microfinance schemes should be appropriately investigated and developed for fishers.
- Results of the VCA show that the profit sharing scheme between shipowners and their crews is not reasonable as each cruise worker earns the smallest margin among fishers with 10.0%, 3.9%, and 6.0% of the total return for longline/handline, purse seine, and gillnet fisheries, respectively. More importantly, cruise workers do not know explicitly on the harvested volume and the total sale and return of each voyage, and are not satisfied with the lump sum paid by shipowners. The long offshore stay with high working intensity as well as the significantly inferior income compared to shipowners make cruise workers feel unfairly treated. Thus, there should be a mechanism or policy to ensure a fairer share of the profit between cruise workers and shipowners in order to reduce the vulnerability of the former and increase the incentive for properly managing the tuna fisheries in Vietnam.

5.2 Conclusion

This paper presents an analysis on the tuna value chain in the three South Central provinces of Vietnam in 2018. We have investigated how the actors in the chain operate, what happens between the actors, what relates the actors together, what information is shared along the chain, what linkages exist, and how the relationship between actors evolves. Due to the major participation of fishers, who are usually the poor, in the tuna fisheries, this value chain analysis can also be used for the identification of the role and position of the poor in the chain and the potential impact of value chain development on poverty reduction. Based on the analysis, a number of policy implications for tuna fisheries management with the aim to increase the income and improve the position of fishers were proposed, which include (i) the collaboration among fishers to take advantage of purchasing input materials in large quantities at lower prices; (ii) the improvements on the handling and maintenance of tuna quality to increase fishers' income through the upgradation of vessel facilities and fishing techniques, the organization of short-term training courses on fishing and preserving raw tuna for fishers, the establishment of logistics service fleets to buy raw tuna offshore, and the enhancement of the quality of logistics services at fishing ports; (iii) the construction of a tuna auction center to decrease financial detriment to fishers, increase fisher's access to public and transparent market information, and strengthen fisher's position and the linkages between fishers and other actors; (iv) the investigation and development of savings, credit, and microfinance schemes to make fishers have access to a variety of capital sources; (v) the intervention to propose a fair share of profits among shipowners, captains and cruise workers which provides an incentive to properly manage tuna fisheries.

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