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Balancing interests of actors in the ocean tuna value chain of Khanh Hoa province, Vietnam

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ABSTRACT

The exploitation of ocean tuna has become one of the most important fisheries, in terms of foreign income generation, in Khanh Hoa province. This paper examines the structure, conduct, and performance (SCP) of the tuna value chain within a value chain governance framework to answer the research questions: (a) what is the nature of the tuna value chain in Khanh Hoa province, (b) who are the actors involved in the ocean tuna value chain? (c) What type of market structure is in place and what is its effect on product flow and market performance. Results show that actors operate in an imperfectly competitive market and earn profits from their operation, but the intermediaries receive the most in comparison to their investment expenditure. Processing companies benefit more when they buy directly from the fishermen and they face many difficulties in exporting ocean tuna.

1. Introduction

Global Value Chain (GVC) analysis, a variant of the Global Commodity Chain (GCC), is the process of following a product from point of inception to point of consumption [1–5]. Value chains encompass all activities and connections required from primary production to transformation to commercialization and end-consumers [6,7]. The actors in a value chain include input suppliers, producers, processors, marketers and consumers who are linked across global space through an integrated system supported by technical, business and financial service providers [8,9]. GVC analysis helps one to understand the wide variation of benefits derived from participation in different value chains and end markets. GVC tactic analyzes the role of leading firms in shaping integrated GCC network of sourcing firms and focus on power relations embedded in the chains.

Gereffi [3] acknowledged this power relationship existing among firms and coined the term governance of GCCs as the process of organizing activities along a value adding chain. Governance of GVCs shows the interrelationships of firms within the industry [10]. Havice and Campling [11] in their study on canned tuna value chain indicated that there was a minor difference in the definition of chain governance between scholars and economic geographers. Scholars of value chain define chain governance as the relationship of power among firms in a production network whereas economic geographers working on the environment, state that governance refers primarily to state and non-state-based institutional and regulatory arrangements shaping human–environment interactions. In spite of the differences and similarities of the definitions of governance of value chain, the term involves the process of organizing business activities to achieve division of labor and entry barriers along the chain [12,13]. Tran et al. [14] used the GVC governance framework to show the power relationship between the lead exporting firms and small-scale farmers as they attempt to improve standards in the Vietnamese shrimp industry. Governance therefore enables the definition of the terms of competition and strategies influenced by market structure, conduct and performance (SCP) in the process of acquiring maximum net benefits from value-adding activities [15].

Figueirêdo Jr. de et al. [16] extended the SCP framework to connect value chain strategies, such as product, market, technology and governance choices, to outcomes with respect to local development. In 2016, Figueirêdo Jr. de et al. [17] used the SCP to devise and evaluate strategies for value chains of the honey market in Brazil and concluded that the framework clearly identified the value chain strategies and pointed out the main links between strategies and outcomes in certain business environments. In this study, the use of the SCP framework is used to evaluate the tuna value chain strategies of the Khanh Hoa province of Vietnam. Yellowfin tuna is the third most popular species in Vietnam, and Khanh Hoa province is the largest producer of this high priced but disappearing species. Hence, it is important to evaluate the effects of competition examined in the light of SCP on the stock and

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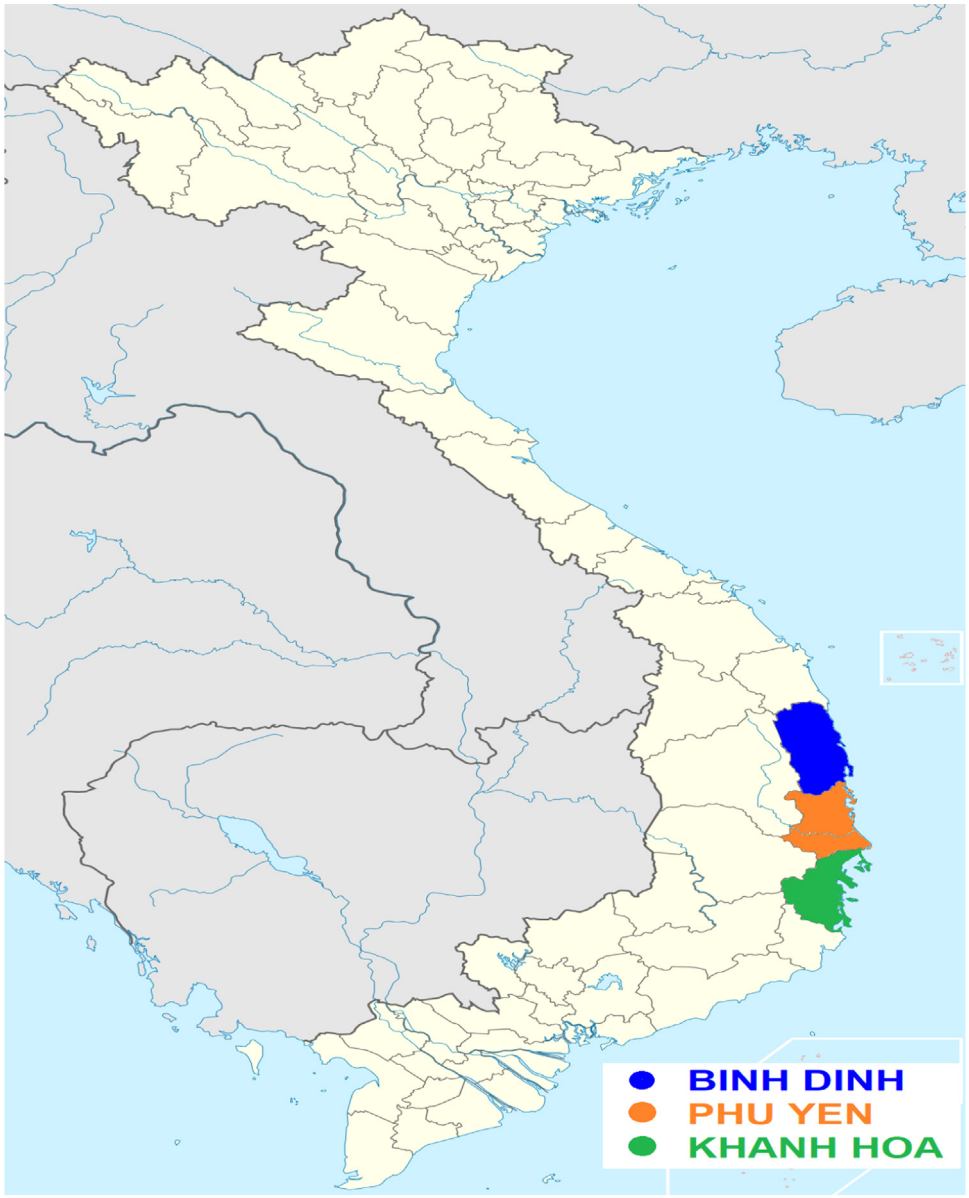

Fig. 1. Map of Vietnam in yellow showing Binh Dinh, Phu Yen and Khanh Hoa provinces, the major producers of tuna.
Source: Tuong Phi Lai, National FIP Consultant with inputs from Tran Van Hao1 and Keith Symington2

environmental conservation of the yellowfin tuna value chain.

1.1. Tuna industry in Vietnam

Tuna is one of Vietnam's fastest-growing wild caught fisheries. The tuna fisheries industry contributes substantially to rural employment and regional economic development in terms of foreign income earnings. Tuna production in Vietnam has been stable and reached approximately 123,136 MT in 2016. The annual fish caught is below the maximum sustainable yield of more than 200,000 MT. Of the total fish caught in 2016, skipjack tuna contributed 93,561 MT (76.02%), yellowfin tuna 23,811 MT (19.35%) and bigeye tuna 5704 MT (4.63%) [18]. In 2016, Vietnamese tuna exports increased 12% in value compared to 2015 to generate approximately 510 million USD [19].

The central coastal provinces of Khanh Hoa, Binh Dinh, and Phu Yen (Fig. 1) are the main contributors to total tuna exports [21]. The main types of tuna fishing in Vietnam are longline, purse seine, and gillnet. Longline fisheries target Yellowfin tuna (*Thunnus albacares*) and Bigeye tuna (*Thunnus obesus*) while purse seine and gillnet fisheries catch mainly Skipjack tuna (*Katsuwonus pelamis*) and other tuna species. Longline tuna fishing occurs only in Khanh Hoa, Binh Dinh, and Phu Yen, and its main targeted species are bigeye and yellowfin tuna. In 2011, there were 2521 tuna fishing boats in Vietnam with 50 horsepower (HP) engines or higher [20] but this increased to about 4213 in 2016 [18]. Most of these fishing boats are small wooden crafts that are unable to withstand strong waves and climatic disturbances. They also lack fishing equipment and preservation or storage technologies.

Major plans are proposed to improve the tuna fishing industries through the modernization of boats and fishing gear in the central provinces [19]. Of the three major central provinces, Khanh Hoa province has the most modern fishing fleet [18]. The province is the leading producer of yellowfin tuna that sells at a higher price on the world market than the other tuna (Table 1). Yellowfin and bigeye tuna received a price that ranged from 56% to 84% above that of other tuna sold in Khanh Hoa province from 2013 to 2016. The province produced 4076 metric tons of yellowfin and bigeye tuna in 2016 that was about 14% of all yellowfin tuna nationally in that year. Exported yellowfin tuna is a high income earner and the government of Vietnam through

Table 1
Production and price data for tuna for Khanh Hoa Province, 2013–2017.

Production and price for Khanh Hoa province						
	Unit Khanh Hoa	2013	2014	2015	2016	2017
Production						
[a]YFT & BET tuna	tons	4556	5015	4634	4072	3872
Others	tons	16,949	14,620	26,081	23,499	21,735
Price at harbor (raw material)	VND /Kg					
YFT & BET tuna	VND /Kg	80,000	115,000	100,000	110,000	120,000
SKJ & Others	VND /Kg	35, 000	18,000	22,000	25,000	30,000
% difference		56.2	84.3	78.0	77.3	75.0

[a] YFT- Yellow fin tuna; BET-Big eye tuna, SKJ-Skipjack.

Table 2
Number of tuna fishing boats and power, 2011 – 2016.

Power of boats	Year					
(CV)	2011	2012	2013	2014	2015	2016
50–89	–	–	–	–	–	–
90–149	90	61	32	19	8	7
150–249	59	57	52	57	26	28
250–399	133	162	190	179	154	158
> 400	44	59	85	137	226	272
Total	**326**	**339**	**359**	**392**	**414**	**465**

*CV-boat power performance.

its fishery improvement project (FIP) places priority on increasing production of this fish but at the same time, tuna catch is on a decline; hence there is a need to evaluate the strategies to balance exports and environmental sustainability. In 2011, Khanh Hoa province had a total of 8941 fishing boats, of which 326 were tuna fishing boats, accounting for 3.7% of all boats but 12.9% of all tuna fishing boats above 50 HP in Vietnam (Table 2). In 2016, the number of tuna fishing boats had increased to 465, a 42% increase, but this made up only 11.03% of the 4213 total number of boats. There were about 30,000 fishers using longline, gillnet, and purse seine gear in boats with average engine capacities of 90 HP [22]. In 2011, there were 99 tuna longline boats, 227 tuna gillnet boats, and 26 tuna purse seine boats in Khanh Hoa province. Tuna longline and tuna gillnet boats operate mainly in Nha Trang city, while tuna purse seine boats do not often operate in Khanh Hoa's seawaters. Khanh Hoa Province has 6 main fishing harbors, and 7 large tuna traders.

The yellowfin tuna is important to Vietnamese fisheries export because of the market demand for this fish. Plans have been made under the FIP established in 2013 for the reorganization of tuna fishing and marketing in Khanh Hoa by the provincial government. However, not enough is known about the level of governance of the value chain and how the actors relate to each other to ensure that all participants benefit in the marketing process. As Gulati, Nohria, and Zaheer [23] argue, coordination and cooperation are essential in network alignment of the actions, interests, and relationships of firms, since they profoundly affect the SCP of the value chain. Ritter et al. [24] acknowledged the influence of the relationships of network participants on the SCP, functioning and performance of actors in the value chain, and implementation of network goals [25]. A number of drivers operate in the tuna market in Khanh Hoa province, and there are also plans to expand the marketing stages of intermediaries but there is a lack of information on the structure, conduct, and performance (SCP) of the market and the strategies to develop a balanced chain among the market actors to ensure resource sustainability. Furthermore, there is an absence of studies of the value chain to understand the relationship of SCP, fish caught and sustainability. Hence, this research is an effort to comprehend the market, singling out Khanh Hoa province as a case study in order to understand the level of efficiency of the market and derive useful information for decision makers on the value chain. The information gathered will be beneficial to the whole tuna marketing chain and policy makers in developing a strategy of production growth and sustainability of a disappearing species.

Therefore, it is important to nourish this present competitive advantage enjoyed by Vietnamese yellowfin tuna producers while attempting to maintain sustainability for the major tuna fishers. The export market must be developed to maintain a continuous flow of quality product and remain competitive. This requires a study of the value chain in order to understand the dynamics of products movement and market efficiency. In this light, the market in Khanh Hoa province was selected for a case study in order to understand the SCP of market participants in the tuna value chain dominated by yellowfin and bigeye tuna catch.

The objectives of the paper are as follows:

- To identify and describe the value chain for tuna with emphasis on yellowfin tuna in Khanh Hoa province.
- To describe the market structure, conduct, and performance of market participants in the distribution channel of ocean tuna and how degree of competition can be assessed through SCP framework.
- To determine how conduct and behavior affect market performance, efficiency and environmental sustainability of the tuna value chain.

2. Theoretical framework

The fishery value chain can be defined as an interlinked set of value-adding activities that convert inputs into outputs. The term *value chain* describes a high-level model of how businesses receive raw materials as inputs (captures and culture fisheries) and add value to the raw materials through various marketing functions until the products reach consumers [6,26,27]. These marketing activities are designed to enhance product flow efficiency while generating profits and improving the welfare of the participants acting along the value chain. Value chains for financially important species, such as salmon, skipjack, shrimp, and tilapia, are composed of several nodes and products that pass through longer chains to meet the consumer [11,14,26,28].

Value chain analysis is a process where a firm identifies all marketing support activities that add value to its final product and appraises the activities in terms of contribution to costs [29,30]. It is a diagnostic tool that helps firms to eliminate activities that are costly and substitutable, or maintain less costly ones in order to bring goods to consumers at the least possible cost [31]. Fisheries' value chain analysis involves all the activities required to bring products (whole fish, fillets, fish steaks, fish nuggets, and processed fish) to the final consumers, passing through the different phases of production, processing, and delivery [32–37]. In the case of the tuna market, it can be defined as a market-focused collaboration among different stakeholders, including wholesalers, retailers, processing plants, and exporters, who participate in marketing value-added products [32]. Value chain analysis is essential to an understanding of the structure of markets, their relationships, the participation of different actors, their conduct and performance, and the critical constraints that limit the proper functioning of the market [34] while SCP enhances the understanding of the economic efficiency existing in the value chains. Performativity analysis, with its attention to justifications and enactments, helps to trace how the value chain actors influence efficiency as they relate to one another in the process of value addition [38].

The value chain SCP framework [39–41] was extended and modified and integrated into the value chain by [16], and used by firms [42]; and to develop firm strategies for value addition [43]. A value chain includes business entities, their end markets, business transactions, supply and demand levels, and vertically and horizontally integrated firms that operate within the marketing network [44]. The SCP

framework allows one to explain market power and the push and pull factor of market participants within the value chain in attempts to maximize their welfare. It also permits dynamic analysis of the value chain, taking into consideration the behavior of firms seeking to maximize their utility from each activity [45], and facilitates the understanding of firms' positioning behavior and the strategic actions that may result in the highest performance [42]. The SCP framework serves as the basis for linking a firm's performance to its conduct, which is dependent on the existing market structure and directed by the level of governance by supporting bodies along the value chain. The SCP variables influence the efficiency of the value-adding process as it fosters the assessment of the degree of competitiveness, pricing behavior and economic efficiency. The average unit cost of a product serves as an indicator of market efficiency when compared to a base value [32]. Hence, it is important to understand the market structure and its effect on conduct and market performance.

Market structure refers to the environment in which sellers and buyers interact at the various stages of the value chain. Market structure consists of the characteristics of the organization of a market that seems strategically to influence the nature of competition and pricing behavior within the market [46]. It describes the number of market participants, product transfer, and the types of contracts, pricing decisions, and product forms in terms of the potential number of differentiated products presented to consumers. Market structure affects profit levels and pricing decisions. Studies of the retail grocery industry have established a relationship between structure and either profit [47–49] or price level [50,51]. The major elements of market structure describe the levels of competition existing at the various marketing stages and the profits that may accrue to more efficient competitive firms as the traditional SCP paradigm would suggest [52].

Market conduct or *behavior* refers to the actions of firms as they determine prices in the market [53]. It refers to the nature of competition in buying and selling and the actions of participants as decisions are made by the actors to maximize profits. Market conduct denotes how firms determine their pricing policy, sales and promotion strategies [54]. Significant aspects of firm conduct include pricing behavior, advertising, research, innovation and development, plant investment, human capital improvement, legal tactics, product choice, collusion, mergers, and contracts.

Market performance relates to the record of the industry in terms of the size of benefits that it generates for its various participants [55]. Performance also refers to the extent to which firms are able to satisfy consumer demands in the most effective way for the current period. Important aspects of performance include productive efficiency, allocative and distributive efficiency, product quality, technical progress, and profits. It refers to the effectiveness of transfer, equity, productivity, and profitability of the market [56]. In the efficiency/productivity literature, there is increased emphasis on the use of efficiency as a measure to examine economies of scale, economies of scope, and both economies of scale and scope, accounting for risk and policy implications [57]. Market performance is related to product suitability in relation to consumer preferences (effectiveness); rate of profits in relation to marketing costs and margins; and price seasonality and price integration between markets (efficiency). In the study of market performance, we center our discussion on the marketing margins, costs, and profits of tuna marketing in Khanh Hoa province.

Theoretically, the analysis of marketing costs and margins allows one to evaluate the SCP of firms operating within the value chain and the pricing efficiency in domestic markets, and gives an indication of the importance of transaction costs facing traders, fishers, and market intermediaries. The results of the analysis help in identifying and solving bottlenecks in order to reduce marketing costs. Understanding the market costs and margins of tuna marketing in Khanh Hoa province requires *a priori* study of the marketing chains or channels under question, the value addition, and a prescription of the nature of the network.

3. Methodology

3.1. Study area

Khanh Hoa Province is located in the coastal southern central part of Vietnam. There are 385 km of seashore, as well as rivers, ponds, bays, and canals along the coastline. Hundreds of coastal islands provide a natural advantage for fishing and enrich the seafood industry. Tuna longline and tuna gillnet boats operate mainly in Nha Trang city within the exclusive economic zone [58]. Tuna purse seine boats do not often operate in Khanh Hoa's coastal waters. In 2011, total production for yellowfin and bigeye tuna (by longline) was about 1950 MT, and total skipjack tuna production (by purse seine and gillnet) was about 11,000 MT [59]. The production of yellowfin and big eye declined slightly from 2015 to 2016 in spite of an increase in vessel capacity (Table 2).

3.2. Data collection

Both primary and secondary data were collected. Secondary data on production, number of vessels, and fishers were collected for the period 2010–2016 from WCPFC (2017) [22]. Data on prices and exports were collected for the period 2012–2017 from the Ministry of Agriculture and Rural Development (MARD) and the Vietnam Association of Seafood Exporters (VASEP 2017). Secondary data were also sourced from literature searches conducted from various sources.

Primary data were collected from a developed structured questionnaire. The questions were divided into socio-demographic, production, marketing, financial, economic, and ecological areas. The questionnaire was tested and corrected for errors.

The corrected questionnaires were used to administer a face-to-face survey to 39 fishers in Khanh Hoa Province from 2013 to 2014. Fishers were located using the 'snowball' technique and convenient sampling method. Most of those interviewed were contacted through key informants at fishing ports after landing. Kuldilok [60] discusses the difficulties of contacting and interviewing fishers who land at varying times and locations. The interviews allowed time to solicit additional qualitative information from respondents. The interviewees included fishers with physical records. The records of these fishers were also examined when permitted to obtain production, price and cost data. The fishers without records (25%) of the sample were asked to recall production, costs and revenues for the period 2011–2013. A shorter questionnaire, applicable to the market intermediaries, was used to interview 6 intermediaries or market intermediaries. A set of open-ended semi-structured questionnaire was used to have an individual survey of two of six processing firms. All activities in this study—namely the literature review, survey design, interviewer training, pretesting of questionnaires, and the actual field survey implementation—were carefully executed. Furthermore, survey participants were briefed on potential benefits of tuna supply, processing, and trading.

3.3. Structure conduct and performance measures

The first step was to identify various stages of the value chain using the marketing and trade sections of the questionnaires. The focus was on distribution of the value added by the actors in the value chain in conducting the market performance analysis.

The SCP paradigm [16,17,39] was then used as the basis of analysis. The authors used some elements of the SCP paradigm and integrated some concepts of the theory of institutional economics and the marketing channel approach for analysis (Table 3). SCP paradigm was employed to determine the degree of competition in the tuna industry by assessing the level of concentration using the number of participants operating at a given node in the industry to evaluate the effects on performance. The pricing behavior and resource allocation partially determine the conduct whereas performance is measured by the

Table 3
Elements of SCP paradigm related to the Tuna industry.

Elements of market structure	Elements of market conduct	Elements of market performance
Market: – Number of major actors in the value chain – -Rivalry	**Product:** – Types and quality – Triage and classification	**Value addition:** – Value-added analysis of major actors to identify where the economic value is created within a value chain for each major actor.
Business: – Characteristic business of major actors.	**Price determination:** – Price formation process	**Financial ratios:** – Costs – Margins – Profits
Competiveness: – Competitiveness in ocean tuna industry such as: barriers to entry and exit, assortment of product quality, distribution of market information.	**Exchange behavior:** – Types of information exchange	
Environment: – **Natural Environment** – Institutional environment, regulations, enforcements	**Transaction:** – Payment and transaction method.	

amount of market power and efficiency achievement. According to the SCP paradigm, there is a dynamic relationship between market structure, conduct, and performance. Market structure and market conduct influence market performance.

SCP was integrated into value-added analysis based on the total production costs, total marketing costs, and profit margins of each actor in the value chain. Following [61], the concepts of costs, margins, percent markups, and the fisherman's share of retail price were used to evaluate market performance. The formula for market share was calculated as:

$$\text{Fisher's share } (\%) = (\text{Selling price/consumer price}) * 100 \quad (1)$$

This indicates the percentage of the consumer dollar that goes to the fisher and gives an indication of the market efficiency.

The total cost of marketing can be employed as another indicator of market efficiency and can be measured by the percentage of gross margin:

$$\text{Total Gross Margin } \% = ((\text{Selling Price}–\text{Operating Cost})/\text{Selling Price}) * 100 \quad (2)$$

Theoretically, the level of markup is related to the market structure of the industry, i.e., it is higher in more concentrated industries than in less concentrated ones [62]. The markup ratio can be used as an indicator of levels of competition and innovation to enhance efficiency [63]. The percent markup can be measured as:

$$\text{Markup } \% = ((\text{Selling Price}–\text{Operating Cost})/\text{Operating Cost}) * 100 \quad (3)$$

There is limited information on the marketing costs, margins, and price spreads for tuna marketing in Khanh Hoa province in Vietnam. These ratios show the relationship between the profit margin and total cost that each actor earns. A comparison between these ratios for each actor in the distribution channel will be performed to determine which actor has a higher percentage of profit and identify reasons why the profit for each actor is distributed differently.

These two ratios will be used in the analysis:

$$\text{Profit margin to total cost ratio} = (\text{Profit Margin/Total Cost}) \quad (4)$$

$$\text{Profit margin to Operating Cost Ratio} = (\text{Profit Margin/Operating Cost}) \quad (5)$$

4. Results and discussion

4.1. Value chain governance

The tuna value chain of Khanh Hoa province, selected as a case study because of its emphasis on yellowfin tuna directed towards exports, can be partially described as “twin-driven commodity chain” (TDCC). In this instance, lead firms (processors and exporters) govern the supply network, while environmental groups/movements, NGOs work with ministries of government, producers, exporters and third-party certifiers/standards developers govern the regulatory aspects of the network [10,28]. The value chain can, therefore, be portended as the GCC and a GVC where one commodity as tuna is observed as it goes through the value chain shipped directly to Europe in whole, and exported as value added products. Through this process, there are two categories of power, relational, where exhibited, where there are complex interactions between buyers and mutual dependence [64] and hierarchical, a dominant form of governance where processors and exporters exhibit power control over market intermediaries and fishers [27]. The Ministry of Agriculture and Rural Development (MARD) handles the overarching actions of market participants along the value chain (Fig. 2). Under the Directorate of Fisheries (D-FISH) of MARD, Department of Capture Fisheries assumes the responsibility of the national management of the tuna sector. The Department of Capture Fisheries is in control of issues such as vessel registration, catch control, fishing area regulation, and traceability certificates. The Department of Capture Fisheries also supports Vietnam in the appeal to become full-member of the Western Central Pacific Fisheries Commission (WCPFC). MARD and the Ministry Industry and Trade (MOIT) work in close collaboration with WCPFC and receive information and directives on catch, sustainability, and accountability. WCPFC ensures vessel registration and resource conservation and participates in the governance of fish catch that enters the supply chain. The WCPFC monitors international regulations and works with MARD and VASEP to ensure that quality is maintained and that the flow of information and currency exchange operates efficiently. MARD is supported by two research institutions: Vietnam Institute of Fisheries Economics and Planning (VIFEP) and The Research Institute for Marine Fisheries (RIMF). The National Agro-Forestry-Fisheries Quality Assurance Department (NAFIQAD) is responsible for the quality control of tuna [65].

NAFIQAD is the only organization that can certify vessels for food safety standards for foreign markets such as EU, US and Japan. An observed weakness is that there is no national standard for the quality of the tuna, so that the quality of tuna cannot be measured according to specified standards. Furthermore, at this time the regular monitoring program of residues in quality of seafood conducted by NAFIQAD is only applied for shrimp, pangasius and bivalves (heavy metals, marine bio-toxics), but not yet for tuna. As part of MOIT, the Vietnam Chamber for Trade and Industry (VCCI)-a semi-government, semi-NGO is responsible for granting the certificate of the origin for the export of seafood products including tuna.

4.2. Producer and exporter association

The Vietnamese Tuna Association (VINATUNA), with its headquarters in Khanh Hoa Province, was established in 2010. VINATUNA

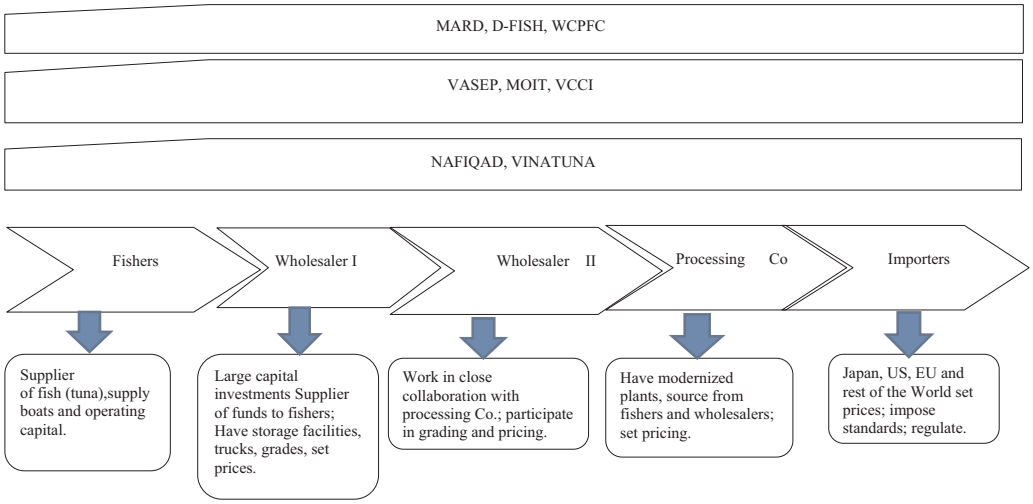

Fig. 2. The value chain of Khanh Hoa oceanic tuna.

supports the strengthening of cooperation between fishers, the government and processing plants as well as other actors in the tuna sector. Also they protect the voices, and rights of members including the advocacy at the policy level. VINATUNA supports tuna processors/exporters in marketing and exporting and provides training and awareness creation of members. However, VINATUNA does not engage in catch control or export. At provincial level three provincial tuna associations are established in Binh Dinh, Phu Yen and Khanh Hoa provinces that look after the interests of tuna fishing companies and processors/exporters in these provinces. At a national level VASEP supports exporters of fishery and aquaculture products, including tuna. Other important supporters and influencers in the value chain for tuna are directors of harbors, ice factories, cold storage facilities and the Western Central Pacific Fisheries Commission (WCPFC).

MARD, D-FISH, and VASEP participate in the overall governance of the value chain to ensure that standards are maintained through the adoption of best management practices (BMP) by market participants so as to minimize product rejections. The value chain is identified in Fig. 2; it is simply the chain of activities starting with the fishers, who catch and sell fish directly to the processors, or go through one or two market intermediaries before the fish reaches a processor. The processor selects and prepares the fish for export. As can be seen from Fig. 3, Khanh Hoa's ocean tuna is distributed through two channels: one goes to the export market and the other to the domestic market [65].

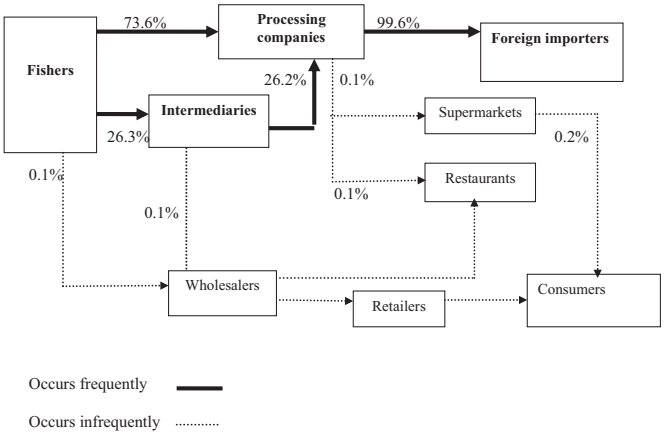

Fig. 3. The value chain of Khanh Hoa oceanic tuna.
Source: Survey (2014–2015)

4.3. Marketing and value chain analysis

4.3.1. Fishers

The fishers are the first and main actors participating in the value chain. They are numerous individuals operating and managing their own enterprises and portray characteristics of perfect competition. According to the survey results, tuna fishers from Khanh Hoa province mainly concentrate their operations in Nha Trang city, and approximately 80% of them live in the wards of Xuong Huan, Phuoc Dong, and Vinh Phuoc. They have, on average, 12–20 years of ocean tuna fishing experience, and most of them come from traditional fishing households. The average length of fishing boats is 13.5–18 m, with engine power from 90CV to 350CV. Most boats are equipped with line haulers, a compass, and communication and storage facilities. The number of boats (Table 2) with higher capacity grew at a faster rate than the boats of lower capacity from 2012 to 2016 which suggests that there is growing pressure on the fishers to expand the size of boats to increase their catch. Vessel engine power is an important factor (a proxy for capital investment) in contrast to vessel tonnage which was used by earlier researchers [66]. Each vessel has from 8 to 12 crew members, including the captain. They make 4–7 fishing trips per year at an average of 20–28 days per trip. The average catch per trip is 1.46 t, with a decreasing trend over time. For example, in 2011, the average catch per trip was 1.91 t; in 2012 it was 1.29, and in 2013 it was 1.18. Quality control is mainly based on their observation methods and their experience.

The survey results show that 5 fishers of the 39 surveyed suffered financial losses. The boats that suffered losses all complained of and operated under similar conditions of increasing fuel prices, reduced ocean tuna resources, increased number of fishing boats, abrupt climate change events, use of inefficient traditional techniques and methods, and lack of safety instruments such as GPS, echo-sounder, and radar.

In general, fishers face the greatest disadvantage and risks in price setting because of lack of market information. Transactions and payment carry high risks for fishers because of the lack of contractual arrangements. In some cases, processing companies or market intermediaries accept the products with an understanding of future payment, and there may be no payment if the market intermediaries or the processing companies experience a loss in the sale of the fish. Fishers do not have any invoice or written documentation to present to the larger firms to claim their payment for the product handed over during the delivery. Some fishers have long-term relationships with market intermediaries. Fishers' relationships may be characterized as asymmetric since the market intermediaries and processors/exporters exert oligopsonistic power in buying transactions which result in lower

prices received by fishers [67]. A command and control-based relationship with quasi-hierarchal chain governance also seems to exist [68]. The fishers are constrained from switching buyers in search of a better price because of mutual trusts, loyalty and loan obligations [69].

Fishers, however, develop attachment to certain market intermediaries or processing companies to which they sell their products. Sometimes it is not only due to loyalty; often there is only a verbal but no contractual agreement because the company or intermediaries provided capital advance in kind or cash to the fishers before they set out on their fishing trips. The loan is made without any collateral and usually with minimal or no documentation. As Miller et al. [70] has stated this social relationship produces and reproduces cooperation and ultimately governance [71].

There is an absence of vertical cooperation among actors in the chain. The majority of ocean tuna is exported in the form of frozen whole fish at low prices. There is not much value added after post-harvest. Despite the quality of Khanh Hoa's ocean tuna, it commands higher prices than that of Phu Yen and Binh Dinh.

4.3.2. Market intermediaries

These intermediaries purchase ocean tuna from fishers in large quantities and supply them to processing plants. According to the survey results, there are two types of market intermediaries in Khanh Hoa, classified as type I and type II.

Type I market intermediaries are mainly local individuals who are endowed with large capital investment. They often offer financing to fishers and vessel owners to purchase fishing boats and gear and cover other variable costs. The fishers benefiting from the credit feel compelled to sell their catch to the capital provider instead of the processing plants. There is a type of bondage [69], mutual trust or loyalty [16] existing between the fishers and the market intermediaries. Some of these market intermediaries have their own trucks with storage capacities to freeze products immediately after purchase. The number of Type I market intermediaries gradually declined in recent years because of fierce competition and decreasing profits. A number of them engage in illicit competitive behaviors like forcing the fishers to accept lower prices or attempting to lower product grades, quality, and weight of fish to increase their profit margin.

Type II market intermediaries work for processing companies on a commission basis. They are either paid a commission percentage per kilogram of ocean tuna purchased, or they receive a base monthly salary plus an additional amount grounded on their buying performance. Some of them are located in Khanh Hoa, Ho Chi Minh City, or Phu Yen. They make all the decisions related to purchasing price that are correlated to ongoing international market prices supplied by their companies or occasionally based on market scarcity and bid prices. Most of these market intermediaries are more experienced than type I because they come from traditional fishing families. Furthermore, they have developed good relationships with fishers and are able to conveniently check quality and grade the fishers's products with little interference or objection. According to the survey results, most fishers prefer the type II market intermediaries because they offer higher prices.

4.3.3. Processing/Exporting companies

The authors investigated and approached two processing companies: Hoang Hai Co. and Ben Vung. These are the two largest ocean tuna purchasing companies in Khanh Hoa province. They are important actors in the value chain. At present, in Khanh Hoa province, there are six processing companies that purchase ocean tuna from fishers or market intermediaries. They export high-quality whole ocean tuna to overseas counterparts, and some of the tuna are processed into fillets or smoked and sold in the domestic or export market. In addition, they sell about 0.2% of their tuna to restaurants and supermarkets in the domestic market.

The processors exhibit quasi-hierarchical type of governance over the fishers and market intermediaries [68]. The processing companies have a high degree of control over market intermediaries type II and the fishers, but a relational type of governance with type I market intermediaries and a more balanced, interdependent and cooperative relationship with other competitors for the same tuna product [64]. The fishers and market intermediaries have less information on market prices, product quality and standards as the processors.

The export market receives the bulk of the products, but only 0.4% is sold at the domestic market. Most of the products going to the domestic market are the B class that does not meet export standards. Fishers distribute their ocean tuna products through two channels: 73.6% directly to processing companies and 26.3% to market intermediaries. Market intermediaries supply processing companies. Processing companies purchase ocean tuna products from fishers and market intermediaries (Fig. 3). This means that the tuna entering the processing plants is of high quality.

4.3.4. Foreign importers

The last major actors in the ocean tuna value chain are the importers. According to the survey results, Khanh Hoa's ocean tuna products are exported to over 105 major overseas markets, mainly in the USA, the EU, and Japan. These actors take the lead in regulatory matters and assume the authority to make decisions on behalf of other actors. In particular, they impose strict regulations on ocean product quality, standards, traceability, and other supply and processing conditions. When it comes to yellowfin, the results are less clear and this species cannot fully connect to the world tuna market [72]. The level of market integration generates various and sometimes opposite effects depending on the stage of the value chain [67,73] and price transmission [74].

4.4. Market structure and competitive situation in the ocean tuna market

4.4.1. Degree of product differentiation

Quality differentiation of Khanh Hoa's ocean tuna products is based on size, weight, quality (freshness levels, scratches, etc.), and color. The quality of ocean tuna is appraised based on the fishing region sourcing the product and other factors such as biological and morphological characteristics of the tuna, age, technologies employed in harvesting and post-harvest handling, and killing techniques. Using rods to stab the fish, market intermediaries and processing companies usually classify the fish into three grades. First-grade tuna has an average weight of 30 kg or more and is of good quality. Second-grade has an average weight of 20–30 kg, weighs more than 30 kg but is scratched, or may be a downgraded color such as “chocolate color fish” or "infected alum fish." Third-grade tuna has an average weight lower than 20 kg. Normally, first-grade ocean tuna is exported directly to overseas markets after purchasing, pre-storage, and packing.

This product differentiation strategy only partially assists in product standardization. This strategy is only helpful if the exporters and processing plants can differentiate one tuna supplier's product from the other [68].

4.4.2. Barriers to entry into the market

The survey results show that the barriers to entry for fishers include capital requirement, operating costs, fishing ground competition, and equipment required to meet quality standards demanded by increasing regulations. Barriers faced by market intermediaries include lack of supply, capital requirements, and competition with more capital-endowed market intermediaries, and processing companies. Khanh Hoa province presently has six processing companies specializing in the purchase of ocean tuna that can influence the level of competition and decisions of both fishers and market intermediaries. However, the companies also face a number of barriers, such as competitive pressure, lack of supply of raw materials, import procedures and documentation, stringent regulations and quality standards from importing countries,

the issue of product traceability, and other conditions of supplying a quality product for the export market.

There are large numbers of fishers who have few capital requirements. There is little barrier to entry but the fishers face problems with access to fishing grounds and the type of size fish imposed by the WCPFC. The market intermediaries are fewer in numbers and their numbers have been at a decline. The number of processors and exporters remained at six for the last five years.

4.4.3. Access to market information

The majority of fishers surveyed, 56.4%, reported being able to access market information easily. About 33.3% of fishers find it rather difficult to access market information and 10.3% find it very difficult to access information. Approximately 54.5% of fishers revealed that they received market information from their friends, and around 31.8% through conversations with other fishers who declared that they sourced information from the radio. In addition, a few of the fishers are able to access market information from the general public media or processing companies or market intermediaries.

Processing companies and market intermediaries access fish supply market information from fishers, the general public, and other sources, such as websites, journals, or communication media.

4.5. Market conduct and behavior

The process of price setting: in an industrial context pricing is the essential category of conduct [16,40] since the other factors such as promotion, production technologies and vertical and horizontal linkages, in the case of tuna, are of less importance, or irrelevant. Pricing is an element of business strategy, but it is not a valuable option for fishers since they operate in a price taker market. However, for the other stages of marketing, prices are essential in the evaluation of conduct and performance. Tuna prices have trended upward from 2010 to 2016, and this signifies that there may be an excess demand situation in the tuna export market. The fluctuation in monthly purchasing prices and the trend for ocean tuna are shown in Fig. 4. There is a difference in the purchasing price between the processing companies and market intermediaries from 6000 VND/kg to 12,000 VND/kg.

The survey results show that 99.6% of Khanh Hoa tuna is exported to the US, the European Union, Japan, and other countries around the world. Exporters depend on the international market price for selling their tuna products.

Processing companies base their pricing decisions on the daily asking price of importers, the prevailing price among fishers, and that of the market intermediaries whose prices are usually fixed. The processing companies play a major role in price setting and control. They access market information and begin price negotiations before the boats arrive at the ports; sometimes market intermediaries negotiate the selling price with the fishers through their relatives by phone call or through personal contact.

In recent years, the local ocean tuna supply has not met export demand. Therefore, there is stiff competition between processing companies themselves and between processing companies and market intermediaries for the fishers' products. The purchasing price is buyer driven and is based on buyers' evaluation of fish weight, age, color, quality, an absence of blemishes, fishing methods, preservation technologies, and the length of storage. The longer the storage period, the lower is the price. As the survey results show, the buying price of ocean tuna varies by class: a classification of 2 receives half the price of class 1, and class 3 only a third of the price of class 1.

The processing companies do not aggressively seek market share expansion, and there is not much need to establish advertising and promotion campaigns, since demand for tuna far exceeds supply in global markets. There is no need for price manipulation in an attempt to increase market share. The processing companies work in close collaboration with importers and more or less agree to the prices offered by the importers. Khanh Hoa's ocean tuna is exported using an alternative foreign brand name and certification on the world market because the processors are unable to meet the strict food safety and quality standards imposed by importing countries. At present, Vietnam has not been named as a full member of the WCPFC, a necessary condition for market expansion through branding.

Processing companies sometimes also encounter difficulties in receiving payment for their products because of lack of adequate documentation and letters of credit. Agreements made without sound documentation are likely to face risks related to exchange rate changes and the use of a base stable currency. In other cases, processing companies export the products on a consignment basis to foreign companies, but after delivering the goods, importers claim that the product price changed and the product value was reduced during shipment.

4.6. Market performance

4.6.1. Fishers

Table 4 gives an overview of costs and profit margin analysis among actors in the Khanh Hoa ocean tuna value chain. The market share of the final market price, markup margins, margin to total cost ratios, and returns on investment costs ratios are used as indicators of market performance and are provided in Table 4.

During 2011–2013, the average total cost per fishing trip for fishers was ($1.00 = 20,000 VND) 123,940 VND/kg, including variable costs (59.4%), labor (32%), depreciation (3.5%), maintenance and insurance (3.8%) and other (1.5%). However, the trend in the fishers's profit margin was negatively related to the average selling price. In 2011, the average selling price was 95,513 VND/kg and the average profit margin of fishers was 13,138 VND/kg. The average selling price rose 141% to 134,872 VND/kg in 2012 compared to 2013 but the average profit fell to 21%. The average selling price rose 170% to 162,308 VND/kg in 2013 compared to 2011, but the average profit fell 39%, down 4993 VND/kg (Table 4). In general, as the survey results from 2011–2013 show, the average selling price was 130,897 VND/kg, and the average profit margin was 6957 VND/kg. There was a significant increase in the

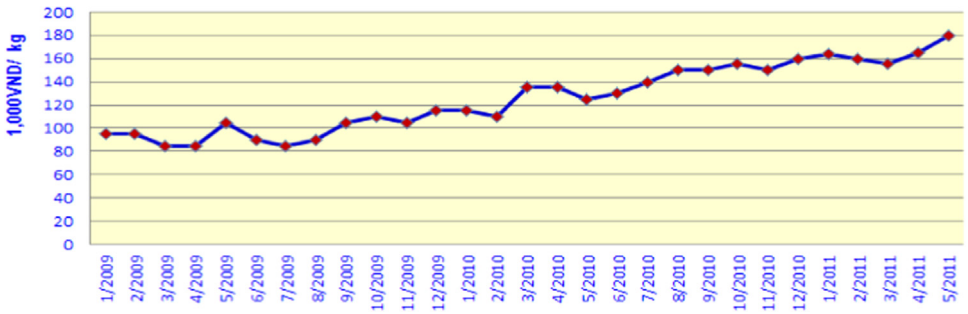

Fig. 4. Vietnam international average market prices received by of oceanic tuna in the period of 2009 − 5/2011.
Source: Hoang Hai Co., Ltd.

Table 4
Average cost and profit margins of the major actors in the value chain, 2011–2013.
Source: Survey by authors

Unit: VND/kg				
Items	**2011**	**2012**	**2013**	**The average over the past three years**
a. Fishers				
The average total costs per a fishing trip	82,374	132,131	157,315	123,940
The average selling price	95,513	134,872	162,308	130,897
Margin profit	13,138	2741	4993	6957
b. Intermediary				
The average purchasing price	95,513	134,872	162,308	130,897
The average operating costs	410	579	697	562
The average selling price	102,236	147,523	173,059	140,940
Margin profit	6313	12,072	10,055	9480
c. Processing companies				
Buying directly from fishers				
The average buying price	95,513	134,872	162,308	130,897
The average operating costs	48,248	56,106	67,508	57,287
The average selling price	198,938	227,101	272,001	232,680
Margin profit	55,177	36,123	42,186	44,495
Buying from intermediary				
The average buying price	102,236	147,523	173,059	140,940
The average operating costs	48,248	56,106	67,508	57,287
The average selling price	198,938	227,101	272,001	232,680
Margin profit	48,454	23,472	31,435	34,453

Table 5
Performance ratio, marketing margins and efficiency ratios of participants in the tuna marketing chain, Khanh Hoa province, 2011–2013.
Source: Survey by Authors

ITEM	**2011**	**2012**	**2013**	**Average**
a. **Fishers**				
Fishers market share %	48.01	59.39	59.67	55.68
Gross Margin %	15.95	2.07	3.14	7.06
Mark-up %	108.28	68.38	67.58	81.41
Margin to total cost %	15.76	2.03	3.08	6.29
Profit to operating cost ratio	–	–	–	–
a. **Intermediary**				
Fishers percent market share	51.39	64.96	63.62	59.99
Gross Margin %	6.58	8.58	6.21	7.12
Mark-up %	7.04	9.38	6.62	7.68
Margin to total cost %	6.58	8.91	6.17	7.22
Profit to operating cost ratio	15.39	20.85	14.43	16.89
a. **Processing**				
Buying directly from fishers				
Fishers percent market share	48.01	59.39	59.67	55.67
Gross Margin %	51.99	40.61	40.33	44.31
Mark-up %	108.28	68.38	67.58	81.41
Margin to total cost %	38.38	18.91	18.36	25.22
Profit to operating cost ratio	1.14	0.64	0.62	0.80
Processing				
Buying directly from intermediary				
Fishes percent market share	51.39	64.96	63.62	59.99
Gross Margin %	48.61	35.04	36.38	40.01
Mark-up %	94.59	53.94	57.17	68.57
Margin to total cost %	32.20	11.53	13.95	19.23
Profit to operating cost ratio	1.00	0.42	0.60	0.67

average selling price during the time period. The fishers' share of the international price increased from 48.01% in 2011 to 59.67% in 2013, but the margin to total cost ratio fell from 15.76% in 2011 to 3.09% in 2013 (Table 5).

4.6.2. Market intermediaries

For market intermediaries, the main costs were the transaction fees and average operating costs. As the survey results show, their average costs were 562 VND/kg and the average profit margin was 9480 VND/kg. Market intermediaries of type I received on average 59.99% of the final market price—a small gross margin but an extremely large profit to operating cost ratio. The operating cost to profit ratio fell only slightly, from 15.39 in 2011–14.43 in 2013. The market intermediaries were providing a service, but making sure that their returns on investment remained stable while those of other market participants continued to decline (Table 5).

4.6.3. Processing firms

Processing companies mainly buy ocean tuna for export purposes. Normally, if they buy first-grade ocean tuna, they export it immediately after careful quality checks. The remaining grades (second and third) are either exported or sold on the domestic market after being processed into fillets or smoked fish.

Table 6 shows that the processing companies exported when the average price was 232,680 VND/kg, and the average operating cost was 57,287 VND/kg, generating a margin of 44,495 VND/kg when they bought fish directly from the fishers. When the processing companies bought from the market intermediaries at a price of 130,897 VND/kg, their margin was 34,453 VND at a price of 140,940 VND/kg. Table 5 shows that the processing companies had higher profit to operating cost ratios when sourcing products directly from fishers than from market intermediaries.

4.7. Comparison of market performance of actors

Tables 4–6 illustrate the division of the average value created and the average profit of each actor in the value chain when fishers supplied tuna directly to processing companies. Fishers captured a higher proportion of value created (56.3%) than processing companies, but earned a low margin of profit (6957 VND/kg). Processing companies, by contrast, captured a lower proportion of value created (only 43.7%), but earned huge average profit margins (44,495 VND/kg).

Table 6 shows the division of the average value created and the division of the average profit margin of each actor in the value chain when the processing companies purchased ocean tuna from fishers and market intermediaries. Fishers captured a relatively large proportion of value created (56%), but earned the lowest margin of profit (6957 VND/kg). Market intermediaries captured the lowest proportion of value created (4.3%), but earned a higher profit margin than fishers (9480 VND/kg), had a higher average profit margin to costs ratio than fishers (7.2%) and earned the highest average profit margin on the average increasing costs ratio (1687.6%). Processing companies only captured a portion of value created (39.4%), but earned the largest average profit margin (34,453 VND/kg); they had the highest average profit margin on the average costs (17.4%) but received a lower than average margin of profit on the average operating cost ratio than market intermediaries (60.1%).

The market analysis results show that fishers, who are the principal actors, pay high costs for fishing trips and take more risks in terms of costs, but receive the lowest margin to cost ratios. They have to face capital pressures due to increasing input costs such as fuel, fishing gear, labor, and other operating costs. In addition, the market price for the ocean tuna received by the fishers is extremely unstable. Therefore, they always feel anxious and their quality of life is negatively impacted. In contrast with fishers, except for small transaction costs, market intermediaries have virtually no other costs. Their profit to return to investment is on average 21 times higher than that of the processing companies when buying from fishers. They capture the lowest proportion of value created (4.3%), but receive the highest average margin of profit on the average returns to investment cost ratio (1687.6%). Compared to other actors in the value chain, the market intermediaries

Table 6
The division of the average margin profit of each actor in the value chain from fishermen, middlemen and processing companies, 2011–2013.
Source: Survey by authors

Major actors	The average operating costs (VND/kg)	The average total costs (VND/kg)	The average selling process (VND/kg)	The average margin profit (VND/kg)	The average margin profit/The average costs (%)	The average margin profit/ The average operating costs (%)
Fishermen	–	123,940	130,897	6957	5.6	
Middlemen	562	131,459	140,940	9480	7.2	1687.6
Processing companies from the Fishermen	57,287	188,185	232,680	44,495	23.6	77.7
Processing Middlemen	57,287	198,227	232,680	34,453	17.4	60.1

face less risk. The processing companies make pricing decisions based on international market price, and they also earn the largest average profit margin. However, in order to participate in the value chain, they must invest heavily in capital infrastructure which includes factory buildings, cold storage facilities, fish processing equipment and tools, and marketing research. In addition, they also face many risks due to import market fluctuations, trade barriers, and strict regulations involving standards, quality and traceability. There is also the risk of product rejection. In general, based on the average profit margin on the average increasing costs ratio, market intermediaries are the most beneficial actors in Khanh Hoa's ocean tuna value chain. It must be noted that the percent markup, margin to total cost ratios, and profit to operating cost ratios are all on a decline, but the profit to operational costs ratio for the market intermediaries is relatively constant.

5. Conclusion

The results of this Khanh Hoa ocean tuna value chain analysis show that the Ministry of Agriculture and D-FISH participate and influence the governance of the tuna value chain. MARD, D-FISH and VASEP attempt to push exports, and improve the value chain of tuna while WCPFC strives to ensure resource conservation and management through the registration of vessels and therefore influence the governance of the total value chain. The major actors in the value chain activities are regulated through these supporting bodies or agencies and the international importers as they impose standards and quality requirements. These requirements and regulations affect the conduct and performance of actors along the marketing chain but all the actors reveal that they earn positive profits from their operations. The study also showed that supporting governance bodies affect the structure, conduct and performance of the actors along the value chain.

The fishers are numerous, and are operating under a situation that mimics a price taker market where they are forced to accept the prices of market intermediaries and processors. The fishers take little cooperative or collective initiative to enhance their market situation. They are forced to modernize and increase vessel capacity while the fish caught are on a decline, and the fishers remain dependent on the market intermediaries and processors for capital infusion into their businesses. Their products are believed to be homogeneous unless they are graded by the market intermediaries. Hence the fishers as price takers have little influence on prices even after triage by the market intermediaries. However, there is pressure on them to upgrade and increase the amounts of capital as is seen in the increase rates of growth in power capacity of the boats over time.

The market intermediaries are fewer and seem to operate in an imperfectly competitive price maker market and receive the most net returns in comparison to their investment expenditure. They do the grading of the product and set prices based on product differentiation. The market intermediaries compete among themselves for fish to supply all processing companies, especially those that try to source their fish directly from the fishers. Processing companies, in turn, face many difficulties in certification of product origin, quality and standard enforcement, and other risks.

The market intermediaries benefit in terms of having the highest profit to additional cost ratio among the marketing participants. This is similar to the finding of Purcell et al. [75] that the relative share of the end market value they received was negatively related to product end-market value.

The SCP framework, especially with the current performance measures, may produce inconsistent results and as the study shows structure of the market may seem to vary at different value chain nodes and the conduct and performance fluctuate throughout the value chain. At the fishers level perfect competition characteristics may dominate while at the market intermediaries and processor levels the oligopsonistic traits are more visible. That is at the fishers level the market characteristics are different from that of the market intermediaries and are also different from that of processors and exporters. This is in agreement with Agarwal and Shankar [38] who stated that the proper choice of variables in modelling SCP may be the answer. As indicated by the profit to operational cost ratios, the fishers and processors receive lower benefits in relationship to costs than the market intermediaries. The SCP was used to show power relationships and governance along the value chain [60]. However, a more detailed analysis suggests that the profit margin as an indication of performance may be misleading if the volume of products handled at the various nodes are considered. The processors handle larger quantities of products than the market intermediaries and the market intermediaries handle larger quantities than each fisher. When one multiplies the total quantity handled by the margin the highest performance might be skewed towards the processors.

There are lessons to be learned in that Khanh Hoa province is a major contributor to the export market of the high price yellowfin tuna and the results are applicable to other provinces in Vietnam. One of the major weaknesses of the study is that the fishers were asked to recall information for three years. This might result in a large standard deviation.

Vietnamese authorities must issue clear requirements and standards for ocean tuna, which will be used as a basis for regulation and evaluation of product quality and price setting during purchasing, selling, and exporting. Thus, the actors operating in the chain can share the balance of benefits together, creating a fairer market and providing support for fishers.

District officers who control tuna marketing should consider the construction of a fish auction market under the strict management and control of authorities in the Hon Ro port of Nha Trang. In the auction market areas, they need to invest in synchronic development of infrastructure facilities for preserving fish safely, fish quality assessment, setting prices and purchasing fish, and improving and facilitating selling convenience. The fish auction market would prevent the fishers from selling their fish before they arrive on shore and assist in grading and pricing decisions for fishers and other market participants.

The government needs to work closely with the various actors along the marketing chain to ensure resource sustainability. At the same time the government should set up a data bank that will enhance the transparency of information systems so that the actors in the value chain can see the association between local and global markets and keep up with changes in the requirements of ocean tuna import markets

and the regulations and standards of the fisheries industry.

Standards and procedures for grading the fish should be set by VASEP and made available to all actors. Even if the amount of tuna harvested is less than the maximum sustainable yield, efforts should be made to monitor the catch in order to conserve the fisheries.

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