

Traditional Fisheries Supply Chain Management in The Border Area: The Natuna Islands, Indonesia

*Budi Wardono**, Rizky Muhartono, Tenny Apriliani, Hikmah, and Armen Zulham

Indonesian Research Centre for Marine and Fisheries Socio-Economics

Abstract. Fisheries have an important role in the economic and security aspects of the border region. Fishing in Natuna is carried out by local fishermen using small vessels with simple fishing gear. The distribution system with ships was hampered due to the Natuna sea area factors and the limited number and frequency. The research aimed to find out the supply chain management of fish in the Natuna Island border area to meet local, regional and export needs. The research used a qualitative approach and snowball information. The result showed that market formation was based on the type and quality of fish caught. Production of local fishermen was sold to the Natuna market, regional markets (Pontianak and Tanjung Pinang), and export market to Singapore, Mainland China, Hongkong, and Malaysia. Type of fish with premium quality (grouper, red snapper) was exported and sold to restaurants, with oligopolistic market characteristics. The premium quality fish market share was controlled by a large trader (Tauke) who has links to islands far Natuna (Pulau Laut, Pulau Tiga, Midai and Serasan). Non-premium quality fish marketing was carried out by fishing boat owners or collectors for local consumption and regional markets.

1 Introduction

Natuna Regency is a division of Riau Islands Regency based on the Republic of Indonesia Law No.53 of 1999. Natuna Regency has a strategic position because it is on the international transportation route as a gateway for economic development in the northern part of Indonesia and directly adjacent to East Malaysia, Vietnam and Cambodia. Natuna is one of the outermost islands that has a strategic position for Indonesia. The area has the potential of marine and fisheries resources. However, it has not been utilized optimally as a source of regional economic growth and improving the welfare of local communities.

Natuna Regency's outermost development policy is a strategic decision, to anticipate the decline in the contribution of the Oil & Gas Business Field (77%) in Natuna GRDP, and to encourage an increase in the contribution of Fisheries in the Natuna GRDP from 9.9% (2016) to > 30% in the future front [1].

* Corresponding author: budiwardono@gmail.com

Natuna's economic development policy towards the aforementioned goals has been taken by the government (KKP) by eradicating IUU Fishing in WPP 711 waters, building Natuna fisheries infrastructure in the Lampa Strait, and improving the distribution system of goods and services to Natuna by adding sea toll transportation. The eradication of IUU Fishing in Natuna was expected to restore the potential of fishery resources in WPP 711, especially demersal fish, small pelagic fish, and squids so that fisheries resources can be utilized for the development of the fishing industry in Natuna.

The development of Natuna Regency as a center for marine and fisheries faces several problems in fisheries resource management including (1) the limited ability of the fishing fleet (3-5 GT), (2) the types of fishing gear used are less varied so the types of fish caught are less diverse, (3) using bombs and poisons is still rampant, (4) supporting facilities and infrastructure for fishing activities are still not optimal (landings and catchment areas are limited), (5) insufficient production facilities / available (ice, solar, cold storage, electricity), (6) human resources (HR) have not been trained especially for aquaculture cultivation and processing, (7) business management has not been well organized, (8) there is a conflict of interest between government institutions, (9) the quality of processed products is still low and processed types are very limited.

The exploitation of resources including the fisheries sector must be able to improve the welfare of local communities [2]. The oil and gas sector is very dominant in the economy of Natuna district, causing other sectors to not be able to contribute significantly to the economy of Natuna Regency. However, if the oil and gas sector is not included in the analysis, then the fisheries sector is able to become the prime mover of the economic growth of Natuna Regency. Indonesia has the jurisdiction of the sea that intersects with the three main lines of trade in Southeast Asia, which is still relatively vulnerable to pirate attacks [3]. The port is also a favorite place for most piracy and armed attacks on ships in Indonesia. The objective of this research was to find out the supply chain management of fisheries in the Natuna Island border area to meet local, regional and export needs.

2 Materials and Methods

2.1 Location and Time

The research was carried out in the Natuna district, Kepulauan Riau Province from March to December 2017. The methods used in this research was a qualitative approach and snowball information. Information related to the research objective was collected and analyzed using the snowball information approach.

The type of data used in this study was primary data and secondary data. Primary data was obtained through interviews, field observations and Focus group discussions / FGDs. Secondary data was obtained from the results of research, local and central institutions, which were related to the utilization and management of marine and fisheries resources in the Natuna Regency.

Data collected in the form of primary and secondary data. Primary data collected included data on potential and value of marine and fisheries resources (production data, value, number of fleets, number of fishing gear, number of fishermen), business characteristics and respondents (fishing gear, catching fish, fleet size, education age), rules local management on Sedanau Island, distribution systems, supply chains, transportation costs, product value chains. While the secondary data collected were regional regulation documents, village regulations related to the regulation and management of marine and fisheries.

2.2 Data analysis

Descriptive statistical analysis was used to analyze data by describing or describing data that has been collected as it is without intending to make conclusions that apply to the general or generalizations. This analysis was only an accumulation of basic data in the form of a description. The descriptive analysis does not search for or explain each other's Quantitative Analysis Techniques, test hypotheses, make predictions, or make conclusions.

2.3 Value chain analysis

Supply Chain Management (SCM) is an integrated method, tool, or approach or method based on the spirit of collaboration [4]. SCM approaches to manage the flow of products, information, and money in an integrated manner involving parties [5]. Value-chain analysis is a strategic analysis tool used to better understand competitive advantage, to identify where customer value can be increased or decrease costs, and to better understand company relationships with suppliers/suppliers, customers and other companies in the industry [6]. The nature of Value Chain depends on the nature of the industry and varies for manufacturing companies, service companies, and organizations that are not profit-oriented.

The value chain design consisted of several processes: (1) Value Chain Mapping; value chain analysis was conducted by mapping the product value chain, where the purpose of mapping is to determine the flow of product and service inputs in the product value chain. In this research, the mapping was carried out starting from the upstream segment, midstream segment, and continued in the downstream segment. (2) Identifying value chain activities, separating activities or operations in the factory business into several business activities by grouping activities on the process into primary or support categories. (3) Identifying the cost driver for each value activity aimed to identify activities where business actors have cost advantages both now and potential cost advantages. (4) Develop a competitive advantage by reducing costs or adding value. Business actors determined the nature of potential and current competitive advantages by studying the activities of the value and cost drivers that have been identified.

3 Result and Discussion

The fisheries sector in various regions has a strategic meaning for regional development. The development of the fisheries sector in Indonesia is supported by the large potential of resources possessed and the increasing demands of the market.

The development of the fisheries sector is an emphasis on development with the aim of increasing the income and living standards of fishermen, creating productive employment opportunities and encouraging regional development. The fisheries resources in Natuna were located in WPP 711, which were mostly used by fishermen from outside Natuna using vessels > 30 GT. Local fishermen from Natuna only used motorized boats less than 5 GT. In 2016 the production of Natuna fishermen was 7.03% of the Total JTB WPP 711, this indicated that most of the fish caught in WPP 711 were landed outside Natuna such as Tanjung Balai Karimun, Batam, Pemangkat, Tanjung Pinang and Jakarta. Fish landing sites in Natuna were scattered in 48 locations in 12 sub-districts, and it has caused difficulties in monitoring the number of fish caught. This is a challenge in determining the status of resource use in Natuna.

Several fish species experienced an increase in resource potential in 2016 when compared to resource status in 2011 (Kepmen KP No. KEP.45 / MEN / 2011). Groups of large pelagic fish, demersal fish, penaeid shrimp, reef fish, lobsters and squid have increased resource potential. Nevertheless, the utilization rate was quite high, 5 groups of fish were included in

the overexploited utilization group, namely small pelagic fish, reef fish, lobster, crabs and squid; 3 groups of fish species were included in the group of fully exploited groups, namely demersal fish, penaeid and crab shrimp; only large groups of pelagic fish were still in moderate use. Based on this, the strategy for managing fish resources must be adapted to existing potential, meaning that additional capture efforts can only be made for large groups of pelagic fish, thus both the size of the vessel and the type of fishing gear that is permitted is only for large pelagic fish targets. Whereas efforts to capture other types of fish must be maintained, closely monitored to be reduced for groups of fish species with utilization rates that are already overexploited. The characteristics of small pelagic fishing businesses, the level of production is influenced by the availability of fish resource stocks and seasonal cycles [7, 8]. The seasonal cycle determines the sustainability of the pelagic fishing business.

Fisheries were the most important economic activity in Natuna Regency. Most of the fishermen in the Natuna Regency depended on the fisheries sector. The fisheries business in Natuna district was micro-business. Some characteristics that characterized the fishing business in Natuna were micro-scaled businesses, namely: (1) The types of commodities were usually reef fish, and if it was difficult to get reef fish, they also catch pelagic fish. (2) The location of fishing grounds sometimes was changed following the season and weather. (3) Financial administration has rarely been carried out, so the recording of fish caught and sales were usually carried out directly to traders who were ready to receive at the landing site. (4) The fishermen did not separate family finances from business finances. (5) The entrepreneurial spirit was still small, businesses were carried out only for the fulfillment of everyday needs. (6) The fishermen still relied heavily on big traders in carrying out fishing operations. (7) The education level was relatively low, typically the fishermen did not have formal education. (8) No fishermen can have access to the bank yet, in addition to their business being "untrusted" by the bank and the difficult procedures that must be taken to get a loan. Whereas if a fisherman borrowed money from the boss/trader, the procedure would be very short and without difficult administration procedures. (9) Generally, the fishermen did not have a business license.

3.1 Agents/Collectors at Fish Landing Locations

Fishermen in Natuna Regency were micro-business units because the fishing vessels used were in the size of 1-5 GT. Thus the catch was less than the vessels from outside Natuna which have a vessel size > 10 GT. Efforts to develop the traditional fishing pattern in Natuna Regency to become a modernized fishing industry faced several challenges, including (a) The absence of a large market that is ready to accommodate the catch at an appropriate price, which was needed to motivate fishermen to capture more; (b) Many Natuna Regency fishermen have side jobs, such as gardening, so they cannot fully carry out their profession as fishermen; (c) The habit of catching in one-day fishing would certainly have implications for the amount of production; (d) Capital is an obstacle related to the operational costs of large vessels. In a fish market in Natuna, there were 3-5 fish agents that determined the price of fish sold. Agents have the power to determine prices because they usually provide loans to fishermen.

3.2 Wholesalers / Local Collectors

Similarly, agents at the level of collectors or local wholesalers also formed an oligopsonistic market structure because of the large number of traders. Collectors have a stake in determining the price of fish at the fisherman level. But it also cannot determine prices that were too different from market prices. To maintain or control the market, collectors provided

assistance to fishermen. The assistance was akin to giving working capital, thus establishing a patron-client bond between collectors and fishermen

The fish market in Natuna was divided into two categories: 1) Demersal and reef fish markets and 2) Pelagic markets. The ultimate goal of the reef and demersal fish markets was to export commodities to Singapore and Malaysia, while the purpose of the pelagic fish market was for local regional markets such as Pemangkat, and Tanjung Pinang. The price of fish commodities was determined by 4-5 large traders. Every trader has 10-20 fishermen who sold their catch. Determining the price of fish was determined by type and size, both for demersal and pelagic fish. The distribution of fish from various fishing locations to the city of Ranai (collectors' center) took 4-12 hours. This condition caused high transportation costs and caused the selling price of fish to be uncompetitive. The modes of transportation used are boats (sea lanes), and pick-up cars (land lanes).

Problems related to the aspects of business systems and marketing included: a) the cost of producing and distributing fishery products was more expensive because of the geographical position in the remote area; b) access to the fish market landed in Natuna was dominated by Tauke; c) lack of investor interest due to limited availability of infrastructure.

3.3 Retailers

At the retail level, the market structure was a monopolistic competition market, where the number of sellers is rather large but each has little influence on the market and the traded products are not homogeneous. In this case, there were quite a lot of fish retailers in the markets, around 10 retailers.

Although fisheries have a large influence, fish landing centers were located in various villages/regions scattered in almost all Natuna Districts. This condition caused high transportation costs to transport fish from the catching area to the marketing/collection location. The high cost of transportation was an indicator of an inefficient industrial network. This condition must receive serious attention from the Government.

Transportation from Ranai to the final market (consumers) was using goods ships (sea toll) and aircraft. Transportation costs for shipping fish from the islands to Ranai ± Rp. 2,000 - 4,000/kg from Batubi to Ranai by land route. The cost of shipping fish from Ranai to Tanjung Balai Karimun ranged from Rp. 500 - Rp. 1,000/kg; from Ranai to Batam Rp. 10,000/kg (with Sriwijaya Air cargo); The marketing of fish caught by fishermen was generally done through local basket/traders, traders/ wholesalers, and fisheries company (Perum Perindo). The business actor in distributing fish was different from one another.

3.4 Supply chain system in Natuna Regency

Supply Chain Management is related to the flow of material, information, and money [4]. Supply Chain Management is an approach to managing the flow of products, information, and money in an integrated manner involving parties, ranging from upstream to downstream consisting of suppliers, factories, distribution activities, and logistics services [5].

The supply chain system of fishery commodities in Natuna Regency was divided into 2 main commodity types, namely: pelagic and demersal. The most dominant pelagic fish were tuna, tuna and skipjack, while for reef fish, they were dominated by bali kurisi, snapper and grouper.

Aspects of the supply chain system included supply chains, marketing channels, and marketing margins from each market chain. To find out the marketing costs incurred by each chain, information about the distribution system is needed.

In terms of logistics services, fish were usually sent to marketing areas outside the island using the services of marine toll boats (insulated ships) and aircraft. Marine toll vessels

servicing the route to Natuna, which were assigned to carry food, health materials and building materials, usually only carried fishery products (frozen squid, fish fillets and frozen reef fish) to Jakarta as much as 10 tons (25% of the total capacity provided). The Ministry of Transportation plans to re-route or transfer the T6 route that connects Jakarta with Natuna on the Tanjung Priok - Tarempa - Natuna - Tarempa - Tanjung Priok route, which takes 14 days (1 Voyage) in order to reduce inter-island price disparities. KM Caraka Jaya Niaga III-4 will stop in Belitung before sailing to Natuna. Naturally, this can be used as a new gap in fish marketing goals. In addition to the sea toll boat, there were also other logistic services, namely ships which usually transport fish to Tanjung Pinang and Pemangkat. For a boat with a destination in Tanjung Pinang it costed Rp. 250,000 / trip / ton, while trips to Pemangkat costed Rp. 400,000, - / trip / ton. In addition to using sea transportation, there were also air transportation services or aircraft that can fly fishery products to Jakarta (transit Batam).

Pelagic fish (tuna and skipjack) caught by the fishermen using Purse Seine, Tonda, and Purs Ulur fishing gear. Fishermen usually have trips 1-3 days a day. In the harvest season, pelagic fishers usually took 10-13 trips/times per month, while during the dry season, they took 2-4 trips per month. Fishing boats used by fishermen have a size of 1-5 GT. Fishermen sold the catch of tuna and skipjack to collectors at the landing sites on Pulau Tiga, Serasan and Selat Lampa.

The transaction price that occurred between the collector and the fisherman was determined by the collector. Usually, collectors determined the price of caught fish by adjusting prices from regional markets. In addition to selling to regional markets, pelagic fishes was usually sold directly to Ranai Market and Midai Market. The price that was set between the transaction of the collector and the processor was usually the same as the price determined by the collector to the retailer, where the collector determined the price based on the price of the fish caught.

Tauke / wholesalers sold good quality pelagic fish (tuna and skipjack) to wholesalers outside the area/city, namely to Pemangkat, Batam and Jakarta. This was because the price received by collectors from outside the city was greater than sales in the city. Besides that, large traders outside the city usually take large amounts of fish.

The supply chain for pelagic fish (tuna and skipjack) in Natuna Regency has at least 6 marketing channels. From this marketing channel at least the marketing margins and profits obtained by fishermen can be seen. If the marketing margin is too large, it can be expected that the marketing channel is ineffective. In addition to the marketing cost component, marketing margins were also largely determined by the buying prices of market players from producers related to the commodities traded. The following is a chart of marketing margins in each marketing channel (**Fig. 1**).

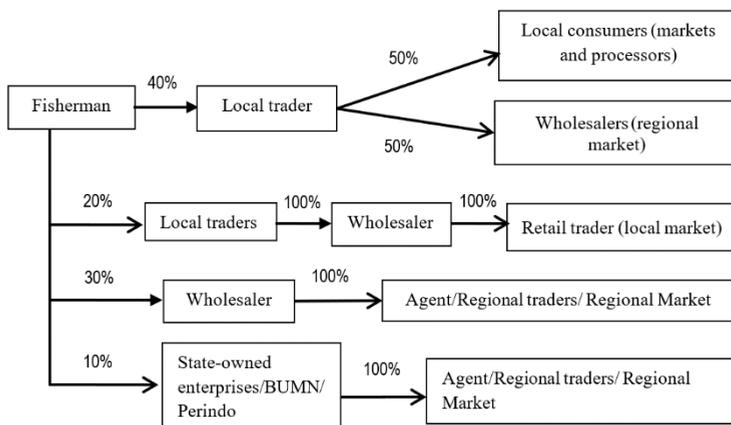


Fig. 1. Supply chain system for Pelagic fish commodities in Natuna district

The fish supply chain model used the pull process because the demand from collectors/baskets of fish must match the fish catches of fishermen, in which the numbers were not always the same [9, 10].

In the demersal fish group, the most frequent fish to be caught was grouper. Fishermen catch groupers by using fishing rods and traps. Fishermen usually took a trip to the sea for a day or one-day fishing. In the harvest season, fishermen usually took trips 9-11 times per month, while during the dry season they took trips 4 times per month. The boat used for fishing has a size of around 1-5 GT.

For tuna fishermen, in the harvest season they usually took trips as much as 10-13 times per month, while in the dry season, trip as much as 2-4 times per month. The trips being one-day fishing. The ship used by the tuna fishermen has a boat size of about 1-3 GT. Fish sold are usually living or fresh fish.

The catches of fish (groupers and snappers) by fishermen were sold by large traders (tauke), which specifically required the supply of live groupers and live snapper. The price that was set between the fisherman's transaction and the tauke was determined by the tauke merchant. Whereas the fish sold to basket traders were usually determined by the merchant who received the grouper. The fishes bought by the basket traders were fresh groupers, and the price was very different from the live grouper. The price of live grouper was at least Rp 100,000, - / kg while for fresh grouper was around Rp. 35,000, - / kg. The marketing channels for live groupers were from fishermen to large traders (tauke) with the capacity to maintain live fish (Fig. 2).

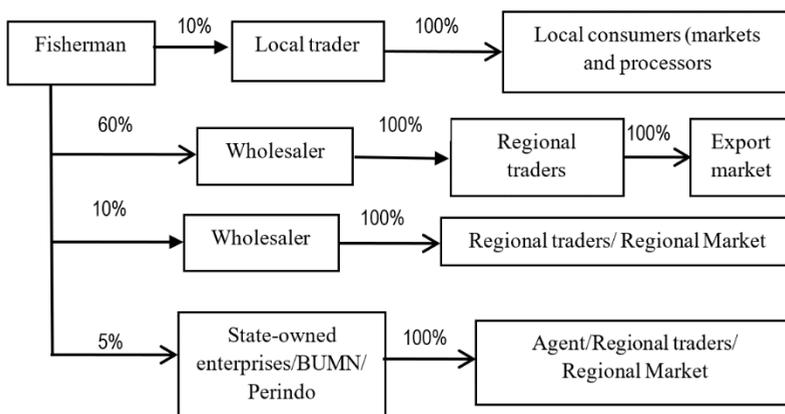


Fig. 2. Supply chain system for Demersal fish commodities in Natuna district

Supply chains are emphasized in terms of product flow and transformation, information and financial flows from the raw material stage to the end-user [11]. Supply chain management is the integration between planning, coordination, and control of all business processes and activities in the supply chain to meet the needs of consumers with the lowest costs [12]. SCM on information flow, information technology enables demand and supply data to be quickly obtained and can increase the level of detail of a product [13].

Fisheries business actors in Natuna (Tauke, Cooperative, and Perindo) have not been able to synergize optimally. The current form of synergy was only limited to the business relationship between Perindo and the Cooperative. Wholesaler (Tauke) has a stronger relationship with the fishermen partners, which was known as patron-client partnership. Fisheries business activities were carried out by large traders (Tauke) from Natuna to Batam through the Lampa Strait Port or through the Airport in Ranai. Furthermore, fish were exported to destination countries (Singapore, Hong Kong and Malaysia).

Regarding the issue of sustainability, fishing activities in Natuna were based on the management of fish resources policy in WPP 711. Efforts to increase the amount of production and the value of production of fishermen's catches must consider the potential of existing fish resources.

Major business actors were expected to benefit from fishing activities in Natuna. The main business actors consisted of fishermen and crew members, fisheries products, traders, business supplies, workshops and other supporting facilities. The direct and indirect income was a source of regional economic growth. The impact expected was that the economy would grow bigger and grow faster. Economical fishery commodities (reef and demersal fish) were the main source of income. The export of fish was carried out from Batam using ships and aircraft.

4 Conclusion

Fishing activities in Natuna were based on the management of fish resources in WPP 711. Efforts to increase the amount of production and the value of production of fishermen's catches must consider the potential of existing fish resources. Major business actors such as fishermen, crew members, producers, traders, etc. were expected to benefit from fishing activities in Natuna. The direct and indirect income was a source of regional economic growth. It was expected that the economy will grow bigger and grow faster. Economical fishery commodities (reef and demersal fish) were the main source of income for the fishermen. The export of fish was carried out from Batam using ships and aircraft.

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