Fisheries in Merauke: linking fishermen to markets

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Abstract. The Indonesian Minister of Marine and Fisheries Regulations has given a prospect for domestic fishing vessels and Merauke as the stay over fishing port. This study found that in Merauke the capacity of cold storage was only 2,250 tons; the shortage of ice supply for fishing remains occurred; most of the fishing fleets were not equipped with freezer and; the fish-processing unit did not exist. As a consequence, 13.42% - 51.5% of fishes were thrown away to the sea after taking the swim bladder of fish (fish maw). Data and information on fisheries were collected from 23 April 2019 to 3 May 2019 in Merauke. The supply chain approach was used for policy intervention to improve the fishing business. The objective of this study was to analyze the phenomenon of fishery business in Merauke. The main conclusion of the analysis show, Merauke become a landing place for fish maw’s fishing fleets from the Arafura Sea. This study recommended that there must be an investor to organize a 100 tons ice factory as a supplier for fishing vessels. Merauke might be promoted as the center for pet food industries by using discarded fish to fill domestic market demand. Promote local traders to follow domestic and international fish trade exhibition to prepare Merauke as the business center of fish maw.

1. Introduction

The Arafura Sea is a shallow-water in Sahul Shelf. This is part of the Indonesian Fisheries Management Area (WPP718), while the other part is under Australian Fishing Zone (The Gulf of Carpentaria in Australia Northern Territory). The Arafura Sea (WPP 718 - Indonesian part) is the most fertile waters, as it receives nutrient supply from the upwelling of the current Banda Sea as well as from various rivers in inland Papua [1]. Photosynthesis process in the surface of Arafura Sea with the abundant of the nutrient has become the energy for plankton and phytoplankton to grow and makes the Arafura’s WPP 718 ecosystem could support the life of various types of fish in the area. This phenomenon, however, does not occur in the Australia Northern Territory’s part of the Arafura Sea [2].

Research results of [3-6] mentioned that fish population in the Arafura Sea included: red snappers (Lutjanidae), emperors (Lethrinidae), trevallies (Carangidae), threadfin bream (Nemipteridae), barramundi (Laditae), white prawn (Penaeidae), barred Spanish mackerel (Scombridae), mangrove crab (Portunidae), snakehead fish (Channidae), tilapia fish (Chichilidae), Johnius macropterus (Sciaenidae), Pennahiya macrocephalus (Sciaenidae), Eleutheronema tetractylum (Polynemidae), Lebtopramanilleri, Rhinoprenespontanedus, Trichirussavala (Trichiuridae), Plotosuscanius (Plotosidae), Arius spp (Ariidae), Thryssaspp (Engraulidae), Cynoglossusheterolepis (Cynoglossidae), Mugil cephalus (Mugilidae), Dasyatisspp (Dasyatidae).

The fish potential of the Arafura Sea and Timor Sea (Australia Fishing Zone) has been exploited by Taiwan and Thailand fishing fleets since the 1960’s using the Australian license [4]. In 1990, fish-
catching in those areas was more intensive in line with the growing fishing fleets from Japan, Taiwan, and Thailand [3]. This led to the Australian Fishing Authority announcement that the demersal fishes status: red snappers (Lutjanidae), emperors (Lethrinidae), trevallies (Carangidae), and threadfin bream (Nemipteridae) are already overfishing [1].

Commercial fishing in WPP 718 (Arafura Sea) has been done since 1960 by fishing vessels from Thailand, Taiwan, South Korea, China, and the Philippine [7]. In the period of the 1980s – 1990s, shrimp trawls from Thailand operated illegally in the Arafura Sea [8], while Hezel [9] reported that there were around 3,000 Thailand vessels that were illegally catching fish in the Arafura Sea. In 1990, however, the Indonesian government allowed the use of fishnet and made the shrimp trawl fleets operated in that area were growing. At the same time, the government also permitted bottom longline fleets from Tanjung Balai Karimun to operate in the Arafura Sea.

The establishment of the Ministry of Marine and Fishery Affairs in 1999 has led to the issuance of government regulation no 54/2002 on fishery business, to change the existing fishing license system which was previously based on the type of fish to be based on catching tool. Therefore, the number of foreign fishing vessels operated in the WPP 718 in the Arafura Sea becomes more and more uncontrollable although the license system has been changed. Foreign vessels were doing illegal fishing by falsifying fishing documents [10].

Fishing activities of foreign vessels in the Arafura Sea did not give benefit to the improvement of Indonesian fishery industry development [8]. In 2014, the government issued the Marine and Fishery Ministerial Regulation No. 54/Permen-KP/2014 regarding moratorium of foreign vessel permit which was extended by Ministerial Regulation No. 10/Permen-KP/2015. Also, following the 2014 Ministerial Regulation No 57/Permen-KP/2014, fish transshipment was banned.

Those regulations opened the opportunities for domestic fishing vessels and Papua traditional fishermen are catching the fish in the Arafura Sea for demersal fish as well as prawn for Papua traditional fishermen. Part of those domestic vessels landed their fish at several fish landing places and the Merauke Fishing Port in Maro River, Merauke. Therefore, the objective of this study was to analyze the phenomenon of the fishery business in Merauke.

2. Materials and Methods

2.1. Source and period of data collection

Data were collected during the survey of a program on partnership finance and marketing fish products in Merauke District, Papua. The respondents were fishermen from the following villages: Samkai, Payum, Kamahedoga, and Gudang Arang. The survey was conducted from April 23 to May 3, 2019.

2.2. Data analysis

Data were analyzed using simple statistics. The results are presented in the tables below. The analysis was using descriptive and prescriptive techniques [11-13]. The descriptive analysis explained the phenomenon fisheries business in Merauke, while prescriptive analysis was used to formulate the business development strategy.

3. Results and Discussions

3.1. The performance of fishing vessels in the Arafura Sea

Before foreign vessel moratorium was enforced in 2014, foreign vessels operated in the Arafura Sea using the Indonesian flag, particularly prawn trawl vessels that operated in 1967. It was around 120 vessels of 100 GT – 350 GT. In 2007 prawn trawl vessels that have a licence in the Arafura Sea were 479 vessels [14]. The fish trawl fleet was started in 1987. It was 113 vessels of 100 GT – 300 GT and 41 vessels of 40 GT – 50 GT. The numbers of bottom longline fleets from Tanjung Balai Karimun were unrecorded.

The abundant fish in the Arafura Sea encouraged fishing vessel operators to increase the fleets illegally by duplicating the license and the number, however, was unknown [15]. In 2001, according to
Resosudarmo [10], there were 7,000 vessels of > 50 GT in the Arafura Sea, 85% of them operated illegally. The landing bases of these vessels were Merauke, Wanam, Tual, Dobo, Benjina, and Ambon.

The enforcement of fisheries and marine ministerial regulation no.54/Permen-KP/2014 which was extended by regulation no.10/Permen-KP/2015, made all foreign vessels stop their operations in all Indonesian territory, including in the Arafura Sea. Consequently, various related facilities such as cold storage, ice plants, oil, and gas distribution facilities owned by fishery companies in Wanam, Tual, Dobo did not operate anymore, and Merauke become their landing base alternative for fishing vessels with cold storage facilities of 2.250 ton only (part of them was not run yet) while ice plant was not available.

Table 1 shows information on domestic fishing vessels operating in the Arafura Sea. The fishing fleets of 5 GT – 30 GT were the fishing fleet with landing base in Merauke, Wanam, and Timika. These fleets operated 20 days using gill net to catch demersal fish of weight that ranging from 5 kg to 10 kg per fish, aiming to collect swim bladder fish (fish maw). Each fish only has 1 fish maw, and the weight of dried fish maw was ranging from 40 - 50 grams.

Meanwhile, vessels with > 30 GT mostly operated in 30 days. These fleets used oceanic gill net, Boeke ami, Liong bun seine, handline, and squid fishing net. These fishing fleets with > 30 GT were from Dobo, Probolinggo, Karangsong-Indramayu, Benoa, Muara Angke, and Nizam Zachman Jakarta. And choose Merauke as a logistic hub for fishing and transit fish port for Ambon, Probolinggo, Karangsong, Muara Angke, Nizam Zachman, and Benoa. Fishing vessels with > 50 GT that operated in the Arafura Sea were mostly already facilitated with a cooling room to preserve the fish. As it catches demersal fish and squid, it did not depend on cubical ice stock anymore.

Table 1. Number of fishing vessels operated at Arafura Sea landing based in Merauke after implementing fisheries ministerial regulation 54/Permen-KP/2014

| Fishing Vessel Tonnage (GT) | 2015 | 2016 | 2017 | 2018 |
|-----------------------------|------|------|------|------|
| 5 GT – 30 GT                | 26   | 32   | 230  | 263  |
| 31 GT – 50 GT               | 4    | 8    | 61   | 58   |
| 51 GT - 100 GT              | 4    | 24   | 158  | 219  |
| 101 GT - 120 GT             | 0    | 4    | 36   | 54   |
| 121 GT - 150 GT             | 0    | 9    | 79   | 134  |
| 151 GT - 200 GT             | 1    | 3    | 42   | 54   |
| 201 GT - 300 GT             | 0    | 0    | 1    | 1    |
| Total                       | 35   | 80   | 607  | 783  |

3.2. Merauke’s fish maw product
The domestic fishing vessels 5 GT – 30 GT, based in Merauke, Wanam and Timika were the fleets producing fish maw of demersal fish (croaker fish), which received the highest priced [16]. Fish maw (the dried swim bladders of fish) is traded to Hong Kong and Southern Chinese Markets [17] and Taiwan [16]. Local fish maw traders send their product to the global market via Jakarta, Surabaya, Singapore, and Kuala Lumpur. Global fish maw trade has grown in line with the changing demand to the dried seafood market [18]. Other report mentioned that fish maw was also used for health and pharmaceutical purposes [19].

The reasons of why Merauke fishermen to produce fish maw were: their fishing fleets of 5 GT - 30 GT had difficulty to keep fresh fish quality due to limited ice supply to preserve fish, whereas their vessels do not have cooling facilities; the coastal gate price of fresh fish for demersal fishes in Merauke was ranging from Rp. 4,000 to Rp. 12,500 per kg. If the fishermen can catch fishes around 112.5 kg the value will be around Rp. 450,000 to Rp. 1,406,000. Meanwhile, the price of 1 kg of fish maw from those demersal fishes of 112.5 kg in Merauke was ranging from Rp. 9.5 million to Rp. 15 million per kg. This
price difference is the main reason for the fleets to produce fish maw. Another reason was Merauke fishermen had difficulty to sell the fresh fish because the company that purchased the fish was mostly close as a result of foreign vessel’s moratorium policy. Also the price of fresh fish from Merauke in its destination markets (Surabaya, Jakarta, Makassar) was not competitive because of a high transportation cost. On the contrary, selling fish maw was much easier because there were 40 to 50 buyers (wholesalers) with high price offer. The volume of fish maw from Merauke fishermen increased annually from 3.2 tons (2015) at the beginning of the moratorium, to 145.6 tons in 2018 (Table 2).

**Table 2. The volume of Merauke’s dried fish maw**

| Month     | 2015 | 2016 | 2017 | 2018 |
|-----------|------|------|------|------|
| January   | 151  | 265  | 490  | 21,590 |
| February  | 233  | 1,698| 1,043| 761   |
| March     | 305  | 1,197| 598  | 11,466|
| April     | 202  | 1,913| 603  | 10,283|
| May       | 270  | 1,181| 641  | 17,140|
| June      | 364  | 394  | 98   | 14,114|
| July      | 231  | 737  | 1,067| 8,176 |
| August    | 257  | 315  | 662  | 8,562 |
| September | 261  | 896  | 561  | 9,524 |
| October   | 412  | 1,017| 433  | 11,146|
| November  | 320  | 714  | 662  | 13,165|
| December  | 186  | 952  | 662  | 19,635|
| Total     | 3,192| 11,279| 7,518| 145,562|

Table 1 and Table 2 show the increase of fish maw production related to the increase in the number of vessels operated in the Arafura Sea. The increase was also related to the limited ice available to preserve fish as well as limited capacity of cold storage in Merauke. Meanwhile, the fish catch of Merauke fishermen in 2015 was 2,676 tons and 2018 was 31,772 tons.

From one fish can only obtain one fish maw with an average dried weight of 40 grams. To produce 1 kg of fish maw required around 25 fishes with weight around 112.5 Kg. The price of Gulamah (*J. macropterus*) fish maw in Merauke was around Rp. 9.5 million to Rp. 15 million per kg. During the interview, it was found that the cheapest fish maw price was around Rp. 4.5 million per kg. The existence of 36 – 50 traders of fish maw in Merauke was an important to supply chain to Hong Kong, Southern China, and Taiwan markets.

With current quality of infrastructures in Merauke, the fresh fishes (that its maw has been taken) was thrown into the sea (wasted) to ease the burden of the vessel and cost-efficiency. In 2015 the volume of wasted fish was around 13.42% from 2,676 tons; in 2016 was 16.12% from 7,873 tons and in 2018 was 51.5% from 31,772 tons. Those wasted fish could not be utilized as there are no industrial scaled fish processing facilities in Merauke.

### 3.3. The supply chain of fish business in Merauke

The above explanations show that there was an economic potential lost in the fish business supply chain system in Merauke, due to the lack of supporting facilities in the fast-growing processed fish trend. Supply chain analysis, as mentioned [20] is aimed to identify the key point of intervention along the chain and to recommend specific policy to support fishing activities in the Arafura Sea, and improve the competitiveness of fish products in the market.
Fish business supply chain system in Merauke comprised of 4 chains: fish catching in the sea, fish landing place, distribution and transportation, and fish market. Table 3 presents information on supply chain condition and required policy breakthroughs.

The first column of Table 3 indicates the Merauke’s fish business supply chain system, followed by the existing condition of each chain in the second column, while the last column elaborates the improvement needed by each business supply chain in Merauke.

The existing condition revealed in Table 3 showed the shortage of ice supply, a limited number of vessels with refrigerated room/box, limited capacity of cold storage and ice plants as well as processing facilities were the driving factor of fishing vessels fleet in Merauke taking fish maw to maximize profit from catching fish business. Consequently, the fresh fish which its swim bladder has been taken were thrown out into the sea because the average price of those fish was as low as Rp. 4,000 – 12,500 per kg. If those fish were processed to become salty fish, however, the average price in the local markets was Rp. 10,000 per kg.

| Supply Chain | Existing condition | Improvements needed |
|--------------|--------------------|---------------------|
| Chain 1: fishing activities at Arafura Sea | Shortage of ice supply | Build distribution points to supply ice for fishing. |
| | A limited number of vessels with refrigerated room/box | Encourage to build refrigerated room for fishing vessel > 30 GT & cool box for ice to vessel < 30 GT. |
| | Number of vessel fishing in the Arafura Sea increase | Control the number of fishing fleet operate in the Arafura Sea |
| Chain 2: landing site | The limited capacity of ice plant | Build commercial ice plant to supply ice 100 tons of a day |
| | The limited capacity of cold storage | - Build 200 tons commercial cold storage with processing facilities. |
| | Limited number of processing facilities | - Operate the available cold storage facilities with the fishing operator under joint venture or contract scheme |
| | No regular schedule for freight forward to deliver fish at the landing site | Build processing facilities through rent and leasing incentive policy to investors |
| | Limited information on space or quota of fish for freight delivery | Display regular schedule of fish freight to destination port |
| | Local traders have no access and information on the export market. Fish maw exports were conducted by Jakarta & Surabaya exporters. First fish maw export to Singapore (286 kg) from Merauke delivered in December 2018 by a local trader. | Display information on the space or quota offered for fish on freight delivery to destination port. |
| Chain 4: fish market | | Involve local traders follow national and international fish trade exhibition/fair |
The last column of Table 3 is the suggested policies to utilize all parts of the fresh fish after their maw has been taken. Develop ice supply distribution point, build a refrigerated room for fishing vessel > 30 GT, build and operate commercial ice plant to supply ice 100 tons a day, build fish processing facilities, display information for freight forwarder services and local trader to follow national and international fish trade exhibition. Those processing facilities were built to produce import substitution products utilizing the 13.42% - 51.5% wasted fresh fish to produce pet food.

4. Conclusions
The Minister of Marine & Fisheries Regulation number 54/Permen-KP/2014 and 57/Permen-KP/2014 causing the new phenomenon in fish business in Merauke. These rules have given a great opportunity for domestic fishing fleets to catch demersal fish and shrimp for local fishermen in the Arafura Sea. Meanwhile, Merauke with limited fishing facilities selected as a landing place of fish maw’s fishing vessels operated in the Arafura Sea. The production of fish maw in Merauke steadily increase from 3.1 tons (2015) to 145.6 tons in 2018 in line with the changing demand to dried seafood markets.

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