Study of fishing vessels and fish caught in the fishing port of Dobo, Aru Islands, Maluku Province

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Abstract. Dobo is the capital of Aru Islands Districts which has waters area with the potential fish resources. Geographically, that is near from fishing ground that is Aru Sea and Arafura Sea. This makes the fishing and carrier vessel was based in the Dobo Port. The composition of fishery vessels was based at Dobo Port is determine in fish caught in the Aru Islands. Increased productivity of fish caught can improve the welfare people, especially for Aru Islands people. Study of the composition of fishing vessels is based on the type, size and fishing gear. While studies of fish caught are unloaded was based on the number and type of catch. In 2018, based on the type of fishery vessel is dominated by fishing vessels become 997 units (90%). The vessels was based in Dobo Port are dominated by vessels over 30 GT are 84.31%. While based on the type of fishing gear are dominated by the squid fishing gear (43%). The fish catched are unloaded is dominated by squid (38%) in 2017 and malayan half (34%) in 2018.

1. Introduction

Indonesia is the largest archipelagic country in the world that has a large potential of marine resources in which 2/3 of the total area is sea area, the number of islands is around 7,504 islands and the coastline is 81,000 km. One of the marine areas that have very potential fish resources is the waters of the Aru Sea and Arafura.

Dobo is the capital of the Aru Islands Regency, is one of the districts in Maluku Province that has a large area of marine waters with potential for marine biological resources. Geographically, Aru Islands Regency also has a short distance to the fishing ground, namely the Aru Sea and the Arafura Sea. This is what makes the attraction for fishing fleets based in PP. Dobo Beach, Aru Islands Regency and catching fishing fleet.

Fishing vessels based in PP. Dobo is very diverse ranging from small to large gross tons (GT) sizes and uses various types of fishing gear. Several types of fishing gear are used by fishing fleets based in PP. Dobo include: Gill Net Drifting Oceanic, Small Pelagic Seine Purse, Bouke Ami, Longline / Long Line, Basic Line / Long Line, Stalling / Hand Line, and Squid / Squid Jigging.

Transporting vessel is a ship used to transport fish caught and live fish cultivated from one place to another. Transporting vessels are usually equipped with refrigeration (refreegerator) which aims to maintain the quality of fishery products to their destination. Fishery products must be treated with a cold chain so that they do not change the chemical structure and microorganisms in the fishery products transported. Whereas a live fish carrier is equipped with a hold that is designed with a circulation system.

Referring to the Indonesian Minister of Maritime Affairs and Fisheries Regulation No. 71 / PERMEN-KP / 2016 concerning Fishing Tracks and Placement of Fishing Equipment in the Republic of Indonesia's Fisheries Management Area, fishing gear (API) used by fishing vessels based in PP. Dobo is a fishing tool that is permitted to be used by fishing vessels when fishing in WPP NRI.

The composition of fishing vessels and fishing vessels based in PP. Dobo plays an important role in fishery products in the Aru Islands District. Increasing the productivity of fishery products directly and indirectly can improve welfare for people in Indonesia, especially for communities around the Aru Islands. Study on fishing boat composition based on PP. Dobo and landed fishery products in PP. Dobo has never been done so this is the basis of writing a paper with the title “Study of Fishing Vessels and
Fisheries Products in PP. Dobo Aru Islands Regency Maluku Province  

2. Methodology

Material used in this paper is the result of surveillance activities of marine and fisheries resources carried out by the Tual Maritime and Fisheries Resources Supervision Base, Dobo Working Area, especially in Supervision of compliance with the arrival and departure of fishing vessels in 2017 and 2018. In addition, references were obtained from literature studies and additional data from interviews with business actors.

The equipment used in data collection and paper preparation is a digital camera for documentation, GPS as an astronomical positioning tool, laptops, stationery, and transportation equipment.

The writing method used is to collect primary data and secondary data. Primary data was obtained from the results of supervision activities of the Tual Maritime and Fisheries Resource Supervision Base, Dobo Working Area (Wilker), particularly data on compliance with fishing vessel arrivals and departures in 2017 and 2018. Data on the recapitulation of ship arrivals and departures is then processed to obtain data on vessel composition based on the type of ship, the size of the ship, the fishing gear used and the composition of the catch of the fish by the ship based in PP. Dobo. The composition of the catch is 6 dominant catches starting from the largest. While secondary data obtained from literature study.

Data analysis method used is descriptive method. Descriptive method is a method of writing that explains in detail the results of observations objectively then compared with the relevant literature. Vessel surveillance activities at the Wilker Dobo Base Tual PSDKP in 2017 and 2018 have been captured, so data collection and data processing will be carried out in May 2019.

3. Results and Discussions

Vessels based in PP. Dobo consists of transporting vessels and fishing vessels. The composition of fishing vessels in PP. Dobo is dominated by fishing vessels with a percentage of 90% with an average number of fishing vessels is 944 vessels while fishing vessels are 98 vessels. Fishing vessels based in PP. Dobo has increased by 12% during the 1 year period or 102 vessels from 2017 to 891 vessels to 1091 vessels by the end of 2018 (Table 1).

| Type of Vessels   | Number of Vessels in PP. Dobo |
|------------------|-------------------------------|
|                  | 2017  | 2018  | Average |
| Transport Vessels| 102   | 94    | 98      |
| Fishing Vessels  | 891   | 997   | 944     |
| Number of vessels| 993   | 1,091 | 1,042   |

Increasing the number of ships especially fishing vessels in PP. Dobo because many boat owners on the North Coast of Java have changed the Port of the Base to their Boat Capture License (SIPI). Changing the port of the port of the ship to PP. Dobo is a result of the appeal of the Minister of Maritime Affairs and Fisheries Susi Pudji Astuti so that ship owners change the fishing ground of ships to Eastern Indonesia because this region has abundant fish stocks.

Over fishing has occurred in the Western Indonesia Region as a result of excessive exploitation which has an impact on the catch of fishermen who continue to decline which has an impact on the welfare of fishermen in the Eastern Indonesia Region, especially on the North Coast of Java. Because of this the ship operators on the North Coast of Java chose PP. Dobo as a Pangkalan Port and a Port of Load Stop
because of the potential of its fish resources.

The number of fishing vessels is 102 vessels in 2017 and 94 vessels in 2018 (table 1). During the period of one year the number of fishing vessels based in PP. Dobo did not experience significant changes. This ship acts as a hauler of fishing vessels based in PP. Dobo from Dobo both distribution between regions within the country and abroad.

GT is a measure of the volume of a room that is placed under the deck plus a closed room on the deck of the ship and added to the contents of the entire room on the top deck or upper building. Gross Tonnage (GT) Definition According to Government Regulation No. 7 of 2000 concerning Maritime Affairs, Gross Tonnage which is hereinafter referred to as GT and VOLUME units of ships.

Based on the Minister of Maritime Affairs and Fisheries Regulation number PER.30 / MEN / 2012 concerning Capture Fisheries Business in the Fisheries Management Region of the Republic of Indonesia, ships over 30 GT in authority that issue Ship Permits are the Central Government (Ministry of Maritime Affairs and Fisheries), for ship size 10 -30 GT The authority that issues Ship Permits is the Governor (Provincial Government), while for vessels less than 10 GT the authority that issues Ship Permits is the Regent (Regency Government). However, based on Law 23 of 2014 concerning Regional Government that for vessels under 30 GT the authority of the permit is under the Provincial Government.

### Table 2. Composition of Fishing Vessels Based in PP. Dobo, Aru Islands Regency Based on Ship Size in 2017

| No | Month  | Central Permit (>30 GT) | Provincial Permit. (11 - 30 GT) | Provincial Permit. (≤10 GT) | Total |
|----|--------|-------------------------|---------------------------------|-----------------------------|-------|
| 1  | January | 105                     | 14                              | 14                           | 133   |
| 2  | February| 161                     | 32                              | 25                           | 218   |
| 3  | March   | 288                     | 37                              | 43                           | 368   |
| 4  | April   | 298                     | 44                              | 47                           | 389   |
| 5  | May     | 346                     | 44                              | 46                           | 436   |
| 6  | June    | 354                     | 47                              | 49                           | 450   |
| 7  | July    | 393                     | 59                              | 49                           | 501   |
| 8  | August  | 427                     | 71                              | 49                           | 547   |
| 9  | September| 490                    | 73                              | 50                           | 613   |
| 10 | October | 613                     | 77                              | 50                           | 740   |
| 11 | November| 744                     | 79                              | 49                           | 872   |
| 12 | December| 867                     | 80                              | 46                           | 993   |

Based on table 2. The number of vessels more than 30 GT up to the end of 2017 is 867 vessels, the number 10-30 GT ships as many as 80 ships and less than 10 GT as many as 46 ships. The results of monitoring ship observance until the end of 2017 show that 87.31% of ships are based in PP. Dobo size above 30 GT which is a central permit ship. While the rest are vessels less than 30 GT, which are provincial licensed vessels. This shows that the Arafura Sea and Aru Sea have potential fish resources that are very potential because they are able to attract large-sized vessels to be based in PP. Dobo where the fishing ground of the ships is the waters of the Aru Sea and Arafura Sea.
Table 3. Composition of Fishing Vessels Based in PP. Dobo, Aru Islands Regency Based on Vessel Size 2018

| No | Month  | Central Permit (>30 GT) | Central Permit (11 - 30 GT) | Central Permit (>30 GT) | Amount |
|----|--------|--------------------------|----------------------------|-------------------------|--------|
| 1  | January| 282                      | 33                         | 4                       | 319    |
| 2  | February| 414                      | 47                         | 4                       | 465    |
| 3  | March  | 486                      | 56                         | 5                       | 547    |
| 4  | April  | 537                      | 68                         | 6                       | 611    |
| 5  | May    | 580                      | 77                         | 6                       | 663    |
| 6  | June   | 603                      | 82                         | 6                       | 691    |
| 7  | July   | 635                      | 91                         | 6                       | 732    |
| 8  | August | 682                      | 126                        | 6                       | 814    |
| 9  | September| 770                     | 148                        | 7                       | 925    |
| 10 | October| 793                      | 148                        | 9                       | 950    |
| 11 | November| 870                     | 147                        | 9                       | 1,026  |
| 12 | December| 921                     | 161                        | 9                       | 1,091  |

Based on Table 3. The number of vessels with a size of more than 30 GT up to the end of 2018 is 921 vessels, the number 10-30 GT ships totaling 161 ships and less than 10 GT totaling 9 ships. The results of monitoring ship observance until the end of 2018 showed that 84.42% of ships were based in PP. Dobo size above 30 GT which is a central permit ship. While the rest are ships smaller than 30 GT (provincial permit). This shows that the Arafura Sea and Aru Sea have potential fish resources that are very potential because they are able to attract large-sized vessels to be based in PP. Dobo where the fishing ground of the ships is the waters of the Aru Sea and Arafura Sea.

When compared to ships over 30 GT based in PP. Dobo in 2017 with 2018, within a year the number of ships increased by 6.22%. Ships under 30 GT also experienced a greater increase of 40% from the previous year. Increasing the number of ships based in PP. Dobo as a result of the entry of ships from the island of Java and its surroundings and change the fishing ground of the ship to catch fish in the Aru and Arafura Sea Region or in the Exclusive Economic Zone.

The type of fishing gear used by ships based in PP. Dobo is very diverse. The types of fishing gear used are grouped into 8 types of fishing gear referring to the Regulation of the Minister of Maritime Affairs and Fisheries Number 71 / PERMEN-KP / 2016 concerning Fishing Tracks and Placement of Fishing Equipment in the Fisheries Management Area of the Republic of Indonesia and the Decree of the Minister of Maritime Affairs and Fisheries Number 06 of 2010 concerning Fishing Equipment in the Republic of Indonesia Fisheries Management Area, namely purse seine, bouke ami, gill net / gill net / liong bun, stretch fishing line, trolling line, trolling line, squid fishing line, longline and longline drift / long line. The composition of fishing vessels based in PP. Dobo Aru Islands based on fishing gear types are presented in table 4.
Table 4. Composition of Fishing Vessels Based in PP. Dobo, Regency of Aru Islands by Type of Fishing Gear

| No | Type of Fishing Gear | Number of Vessel in PP. Dobo |
|----|----------------------|-----------------------------|
|    |                      | 2017 | 2018 | Average |
| 1  | Carrier              | 102  | 94   | 98      |
| 2  | Purse Seine          | 124  | 181  | 153     |
| 3  | Bouke Ami            | 15   | 9    | 12      |
| 4  | Gill Net/ Liong bun  | 178  | 191  | 185     |
| 5  | Pancing Ulur         | 14   | 3    | 9       |
| 6  | Pancing Tonda        | 2    | -    | 1       |
| 7  | Squid Jigging        | 435  | 472  | 454     |
| 8  | Bottom Long line     | 123  | 130  | 127     |
| 9  | Rawai Hanyut/Long line | -    | 11   | 6       |
|    | Total                | 993  | 1,091| 1,042   |

Composition of fishing vessels based in PP. Dobo is dominated by ships with squid fishing gear, gill nets / lion nets / liong bun, purse seine, and bottom longlines. The percentage of fishing vessel dominance based on fishing gear are 43%, 18%, 15%, and 12%, respectively (Figure 1).

Figure 1. Percentage Graph of Fishing Vessels Based at the Dobo Fishing Port

In 2017, ships using 14 fishing vessels with 14 fishing vessels decreased in number by the end of 2018 to 3 vessels. The use of fishing gear tonada by ships based in PP. In 2017 there were 2 ships Dobo and at the end of 2018 there were no vessels using the fishing gear.

Ships based in PP. Dobo is dominated by ships that operate squid jigging fishing rods. During the period of 1 year there has been an increase of 37% from the original 178 ships in 2017 to 475 vessels at the end of 2018. The increase in the number of ships was caused by ships from Java that moved the port base in PP. Dobo as a result of over-fishing exploitation of fishing in the Java Sea. Aru Sea and Arafura Sea have the potential of fish resources, especially squid which is abundant enough to be an attraction for ships with squid fishing gear in Java to be able to get abundant catch.

Longline basic fishing gear / long line is used by ships operating in the Aru Sea and Arafura Sea and based in PP. Dobo at the end of 2017 numbered 123 ships and experienced an increase over the period
of 1 year to 130 vessels at the end of 2018. The percentage increase in the use of fishing gear was 7%. The addition of vessels with long line fishing gear is ships that move port bases to PP. Dobo While the use of longline drift / long line fishing gear which was not originally used by ships based in PP. In 2017 Dobo became 11 vessels that use fishing gear until the end of 2018.

The catch of fishing vessels based in PP. Up to the end of 2017, Dobo was 40,378,191 kg of fish of various types, while at the end of 2018 the number of catches landed in PP. Dobo as much as 79,141,113 kg of fish of various types. The average fishery products landed in PP. Dobo every year amounted to 59,762,652 kg or ± 60 tons of various types of fish (Table 5).

Table 5. Composition of Capture of Fishing Vessels Based in PP. Dobo, Regency Aru Islands in 2017 and 2018

| No | Month   | Number of Fish Catch for Vessel Based in PP. Dobo (kg) | 2017  | 2018  | Average |
|----|---------|-------------------------------------------------------|-------|-------|---------|
| 1  | January | 1,660,051                                             | 8,701,784 | 5,180,918 |
| 2  | February| 1,674,869                                             | 5,300,279 | 3,487,574 |
| 3  | March   | 2,806,049                                             | 12,295,209 | 7,550,629 |
| 4  | April   | 5,286,844                                             | 5,173,153 | 5,229,999 |
| 5  | May     | 3,332,907                                             | 2,637,265 | 2,985,086 |
| 6  | June    | 1,501,338                                             | 1,018,453 | 1,259,896 |
| 7  | July    | 952,747                                               | 1,994,752 | 1,473,749 |
| 8  | August  | 1,566,545                                             | 2,640,250 | 2,103,397 |
| 9  | September| 2,449,107                                            | 3,818,704 | 3,133,905 |
| 10 | October | 5,270,282                                             | 17,738,473 | 11,504,378 |
| 11 | November| 5,988,031                                             | 9,928,322 | 7,958,177 |
| 12 | December| 7,889,422                                             | 7,900,469 | 7,894,946 |
|    | Total   | 40,378,191                                            | 79,147,113 | 59,762,652 |

Fishery products landed in PP. Dobo has increased from 2017 until the end of 2018. The percentage increase in the amount of fishery products until the end of 2018 which was landed is almost 100% compared to the catch landed in 2017 or double the catch of the previous year. This has a positive correlation with the increase in the number of fishing vessels that are based in PP. Dobo The number of fleets in operation affects the amount of fishery catches, the more the number of fleets in operation the fisheries produced will also increase. This also shows that the stock of fish resources in the waters of the Aru Sea and Arafura Sea is abundant as a fishing ground location for vessels based in PP. Dobo

Fluctuations in the average catch of tuna in the Aru Sea and Arafura Sea landed in PP. Dobo over the past two years is known to be the highest in a row achieved in October, November, December and March (Figure 2).
Fishery products landed in PP. Dobo very most low in June amounted to 1,259,896 kg in October it was suspected that the condition of the waters was in a fairly suitable condition as well as the availability of plenty of food for fish so that it was used by immigrating fish to find food.

In October to December the waters around the Aru Sea and Arafura is affected by the west monsoon, namely high rainfall accompanied by strong winds. It is suspected that in the western monsoon waters around the Aru Sea and Arafura contain high abundance of plankton as a food source for small fish and food for large fish so the fish gather in that location and the existence of tuna caused by adequate water conditions and kete Eating lots of food for tuna will increase catches [2].

[7] the season of fish in each year is a period (month) where the amount of catch is greater than the average catch during that period of the year. In 2017 the average number of fishery products landed in PP. Dobo as much as 3,364,849 kg. Estimation of fishing season in the Aru Sea and Arafura Sea in 2017 is in the April, October, November and December periods.

The average amount of fishery products landed in PP. Dobo in 2018 amounted to 6,595,593 kg. Estimation of fishing season in the Aru Sea and Arafura Sea waters in 2018 is in the January, March, October, November and December periods.

The fishing season in 2018 is longer than the fishing season in 2017. This shows that the fishing season is affected by weather changes and the addition of fishing efforts, namely the addition of a fleet of ships operating and based in the area of PP Dobo.

Types of fishery products that are landed in PP. Dobo in 2017 which were dominant in a row were squid, flying fish, bloated, grappled, shark and snapper each with a percentage of 38%, 29%, 14%, 9%, 5% and 5% of the total captured and loaded fisheries products (Figure 3). The types of fish that dominate
the fishery products that are landed as well as those contained in PP. Dobos in successive measurements are 10,355,022 kg; 7,932,511 kg; 3,792,674 kg; 2,408,130 kg; 1,499,942 kg; 1,466,032 kg.

Squid is the dominant fishery product produced up to the end of 2017 this has a positive correlation with the type of squid fishing gear used by fishing vessels based in PP. Dobo is dominant. The high number of fishing vessels operating in the Aru Sea and Arafura Sea has also led to higher catches of squid landed in PP. Dobo Aru Sea and Arafura Sea have very abundant squid resources so that the catches obtained are also very high.

Types of fishery products that are landed in PP. Dobo in 2018 which were dominantly successive were fly fish, mackerel, squid, tuna, manyung and lemuru, each with a percentage of 34%, 22%, 21%, 9 & 8% and 6% of the total captured and loaded fisheries products (Figure 4).

![Percentage of Fishery Product Types Landed in PP Dobo at 2018](image)

Figure 4. Percentage of Fisheries Results by Fisheries Based in PP. Dobo 2018

Species of fish that dominate the results of fisheries that are landed or contained in PP. Dobo 2018, in a measure of weight in a row is 16,493,200 kg; 10,652,195 kg; 10,283,942 kg; 4,117,331 kg; 3,696,105 kg; 2,672,566. The percentage of flying fish is the highest percentage, which is 34%. Fly fish is a type of fish that has a group of catches so it is easy to catch.

The dominant composition of fishery products is strongly influenced by the type of fishing gear that is dominantly used to catch fish in an area. Based on the assessment of the type of fishing gear that is dominantly used by fishing vessels operating in the Aru Sea and Arafura seas and based in PP. Dobo is a gill net and purse seine. This fishing gear is suitable for catching types of flying fish. This indicates that the stock of flying fish in these waters areas is still abundant. Pelagic fish stocks are very sensitive to environmental changes, especially the spatial distribution of salinity generated by monsoons [6].

4. Conclusions

Based on the results of the discussion of the Study of Fishing Vessels and Fishery Products Landing in PP. Dobo Maluku Province can be concluded that the composition of fishing vessels based in PP. Dobo is dominated by fishing vessels with a percentage of 90%. Types of squid fishing gear, gill nets / lill nets / liong bun, purse seine, and basic longlines. Number of ships based in PP. At the end of 2017, Dobo numbered 993 ships consisting of 102 transport vessels and 891 handling vessels. In 2018, the number of vessels will increase by 12% to 1042 fishing vessels consisting of 94 transport vessels and 997 fishing vessels. The fleet based at the Dobo Fishery Port is dominated by vessels over 30 GT which are ships with a central permit of 87.31% in 2017 and 84.31% in 2018. There is a positive correlation between the dominant types of fishing gear and fishery products landed on PP. Dobo Increasing the number of ships operating in the region will also increase fisheries landed. Increasing the number of ships moving port base port leads to PP. Dobo is positively correlated to the number and types of fish caught landed. The potential of fish resources in the fishing ground area, namely the Aru Sea and Arafura Sea, is very large and the stock of resources is still high causing an increase in the number of catches landed in PP. Dobo
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