Fishery's Profile of Kupang, Indonesia

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Introduction

Geographically, Kupang is located in the west of Timor Island, whose maritime area is directly adjacent to Australia in the south and Timor Leste in the east. In the northern waters of the island is a marine conservation area of the Savu Sea National Park. The strategic location of Kupang leads to the establishment of a regional unit of Fisheries Monitoring, Controlling, and Surveillance (MCS) Office (PSDKP Kupang), which directly links to the Ministry Marine Affairs and Fisheries (KKP) in Jakarta. The office was established in 2017 and aims to conduct monitoring, controlling, surveillance, and law enforcement on activities related to marine and fisheries in the surrounding waters of East Nusa Tenggara Province.

A study by Sudjasta, Suranto, & Putra (2018) found that there is a potential tax loss due to errors in tonnage measurement of fishing vessels. The study reveals that there are fishing vessels that the actual size is 73% larger than that written on the license paper. Due to rampant illegal fishing activities and possible frauds in the fisheries sector in Indonesia at the time (including in East Nusa Tenggara Province), the Ministry of Marine Affairs and Fisheries (KKP) tighten the regulation by issuing several ministerial decrees and instructions to overcome these problems. In Kupang, the newly established office (PSDKP Kupang) should deal with several issues, including frauds or errors in fishing vessel licenses (vessel size's markdown or measurement errors), unreported fishing vessels and landing, and unreported fishing activities in the area. However, after almost three years, the effectiveness of the new office needs to be evaluated.

This paper aims to provide an overview of the condition of fisheries in Kupang, which include in the jurisdiction of PSDKP Kupang office, especially in terms of potential problems related to MCS encountered from 2017 to 2019. Overview and analysis are carried out by looking at the progress on compliance of the fishers' community through the data collected by the office. Furthermore, several factors are put into consideration, such as the number of catches based on fish species and fishing gears, comparison of small fishers and commercial fishers, and the dynamic of fishing vessels tonnage. These factors will be discussed in relation to potential violations of the provisions in the Indonesian fisheries act, law number 31 of 2004 junto law number 45 of 2009.

Material and Method

The data used in this paper derived from fisheries monitoring activities carried out at the fishing port in Kupang city from 2017 until 2019. The data contains in and out records of fishing vessels along with the fish landing data at the port. The data is then analyzed and divided into several sections as follows:

a. Analysis of catches landed

This analysis is based on the data of catches landed by fishers in Kupang fishing port. Total landing in 2017, 2018, and 2019 for several major species will be presented in a graph and a table. While the total catch per month in 2017, 2018 and 2019 are displayed in a graph, based on fishing gears. Meanwhile, the potential incompliance is seen by comparing the catch landed with the Gross Tonnage (GT) of respective fishing vessel among different fishing gears. The initial hypothesis is that the number of landed catches (tonnes) cannot exceed the tonnage value of the vessel. The ratio of catches and the vessel's tonnage (GT) is an indicator of the incompliance level or data error. Ratio values close to 1 indicate a potential violation of rule or error in data recording.

b. Analysis of fishing vessel's permit

Based on the law on the protection of small scale fishers (Law Number 7 of 2016), in Indonesia, those categorized as small scale fishers are the ones who fish for daily needs and only have one boat (vessel's tonnage less than 10 GT). Moreover, in this analysis, the fishers who have a vessel with a volume of more than 10 GT are categorized as commercial fishers (not an official term used in Indonesia). In this section, the information that will be displayed is a comparison of total catch and fishing days between small fishers and commercial fishers. Analysis related to monitoring, controlling, and surveillance (MCS) was carried out by the same previous hypothesis (using catches-GT ratio), to see the difference in compliance level between small scale fishers and commercial fishers.

c. Analysis of the size of fishing vessels

In 2017 the regulation was strengthened regarding the size of the fishing vessels. That is because there were some reports of frauds committed by fishers (using the old small vessel's license for the new larger vessel) to include themselves in the category of small fishers that are protected by law. For this analysis, the comparison between net tonnage (NT) and gross tonnage (GT) of a fishing vessel operated from 2017 to 2019 is the main concern. The hypothesis for this analysis is that effective law enforcement leads to shifting the ratio to be closer to the normal ratio of NT/GT (not less than 0.30). Fishing vessels that have a lower NT/GT ratio in the license may indicate measurement errors and should follow the re-measurement procedures.

Result and Discussion

a. Analysis of catches landed

Fish Species	Catches of 2017 (tonnes)	Catches of 2018 (tonnes)	Catches of 2019 (tonnes)
tuna	230	490	364
snapper	16	21	21
mackerel	10	13	23
grouper	2	3	3
trevally	11	9	2
round_scads	29	145	294
tuna_fish	48	181	170
sardine	23	202	79
sea_bass	3	5	19
pink_ear_emperor	18	28	18
other_fish	398	796	525

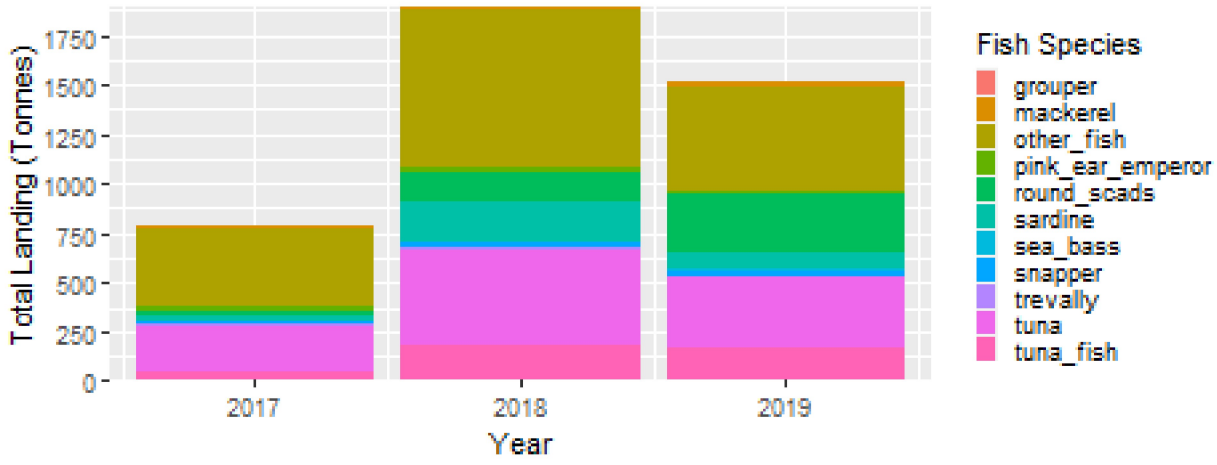

Figure 1: Total catch landing during 2017 - 2019

From figure 1, it can be seen that fish landed from 2017 to 2019 are dominated by tuna and followed by round scads, tuna fish, and sardine. Fishers in the area generally use lines (long line or pole and line) to catch tuna, while other species of fish, including demersal fish and other pelagic fish, are caught using purse seine, traps, and spears. A study by Sawon (2004) in Southern Java waters (Indian Ocean) found that longliners could catch 13 species of tuna, 11 species of sharks and rays, and 8 other fish species. The main fishing ground of Kupang fishers is in the south of Timor Island (Indian Ocean), so the character of its fishery is similar to those in southern Java Island. Due to the multi-species characteristic of fishery in Kupang, the total catch of other fish species is high. Furthermore, the picture shows that compared to 2018, in 2019, the total landing in Kupang is decreasing.

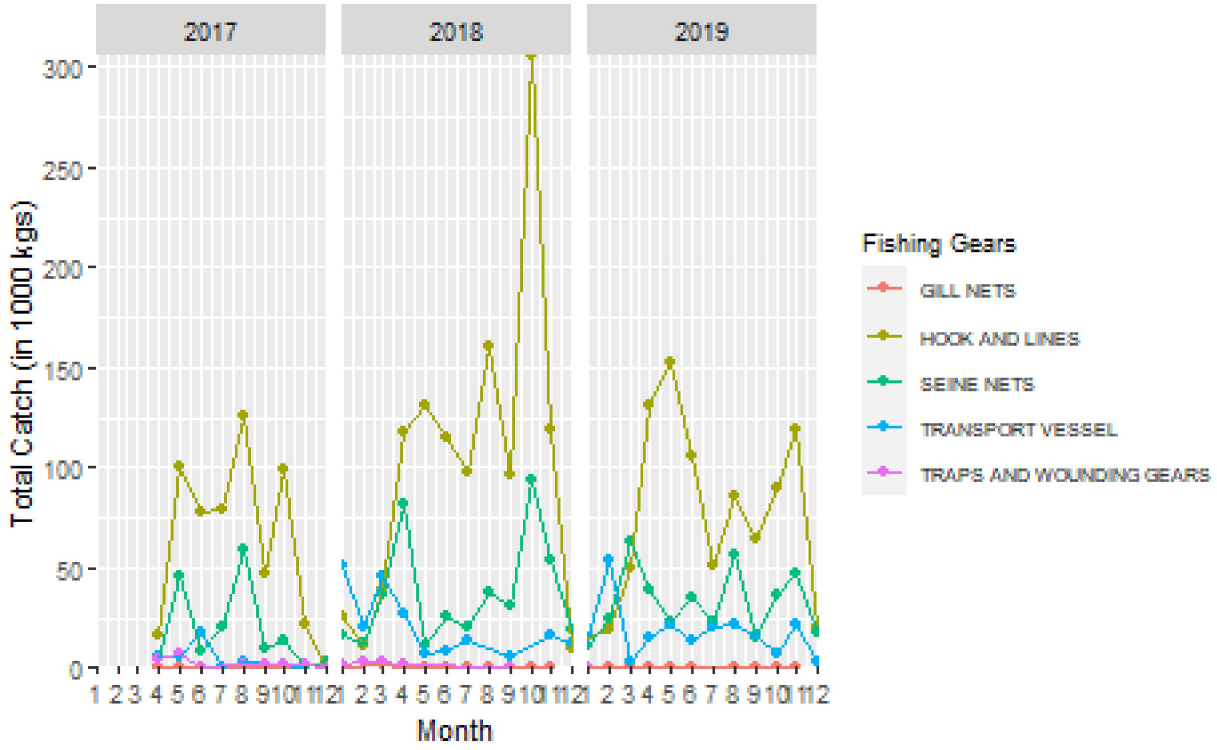

Figure 2: Total catch per fishing gears during 2017 - 2019

Meanwhile, from the data of total catch landed by each fishing gears (figure 2), the dominant fishing gear used in the area is hook and lines and followed by seine nets. According to the International Standard Statistical Classification of Fishing Gears (ISSCFG) issued by Food and Agriculture Organization (FAO) (1980), hook and lines is a category of fishing gear that includes longline, pole and line, and hand line that may target different species. The other fishing gear categories that are used by Kupang fishers are seine nets, gillnets, traps and wounding gears. From the above graphic, hook and line fishing contributes most of the catch landed in Kupang Port from 2017 to 2019. This result is parallel to the previous figure because, in Kupang, tuna are mostly caught by hook and line fishers. There are also a number of transport vessels in Kupang. Transport vessels do not have fishing gears and operated by collecting catches from one place and landing those catches in the other place.

Based on a comparative analysis between the number of catches and the Gross Tonnage (GT) of the fishing vessels (figure 3), all types of vessels show the declining trend in the catch-tonnage ratio. Normally, the catch landed by fishers can not exceed the capacity of the fishing vessels (meaning that the ratio will always < 1). But in some cases, there are fishers who have the ratio > 1. In this case, there is a potential violation of the regulation that is committed by the fishers. By looking at the above picture, gillnets fishers are the most comply, while there are a number of seine nets fishers that potentially violate the regulation.

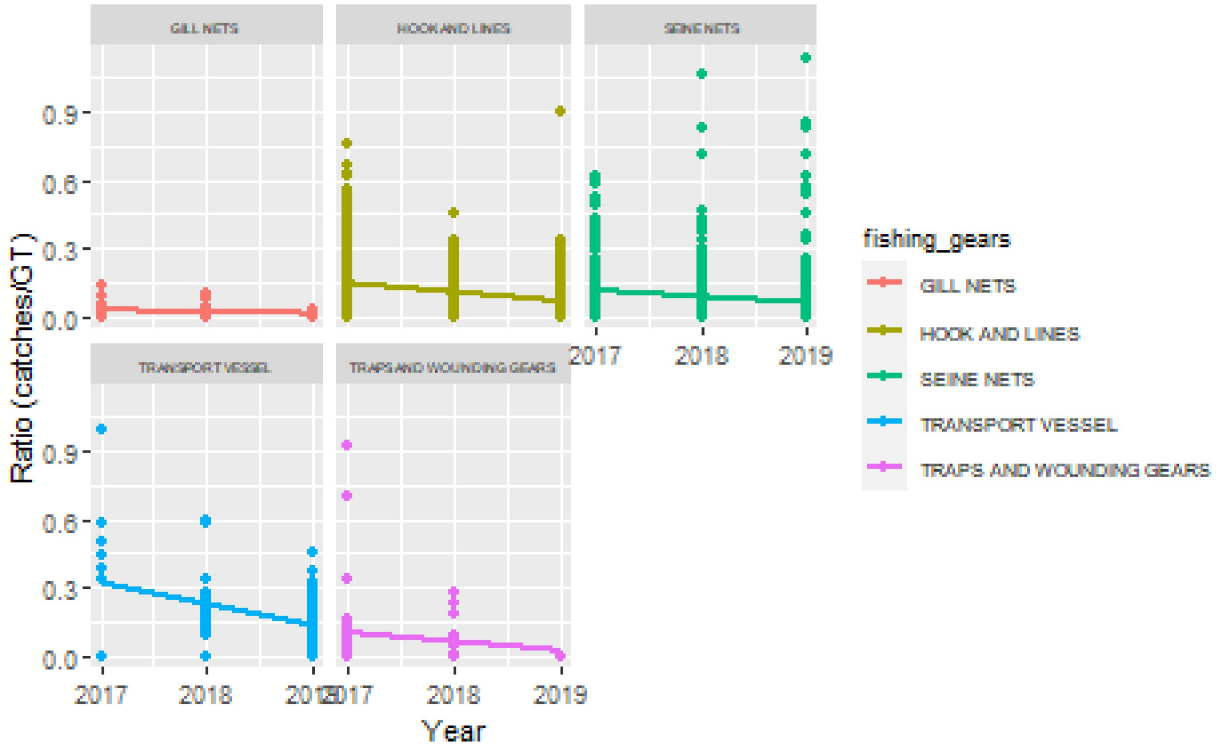

Figure 3: Catch-Tonnage ratio of each fishing gears

fishing_gears	estimate	std.error	statistic	p.value	r_squared
GILL NETS	-7.9556671	2.7879972	-2.853542	0.0050559	0.0607018
HOOK AND LINES	-2.3790212	0.1727882	-13.768422	0.0000000	0.0945215
SEINE NETS	-0.9383343	0.1818296	-5.160515	0.0000003	0.0251798
TRANSPORT VESSEL	-1.6154181	0.3504751	-4.609224	0.0000102	0.1514846
TRAPS AND WOUNDING GEARS	-0.6082135	0.4481959	-1.357026	0.1788431	0.0239652

Although the trend of the catch-GT ratio is declining over the years for all categories of fishing gears, r squared values show a low correlation between the ratio and years. However, the declining trends indicate that the establishment of PSDKP Kupang office increases the compliance of fishers in the area.

b. Analysis of fishing vessel's permits

The comparative profile of total catches per month between small fishers and commercial fishers (figure 4) shows that there was an increase in total fish landing from commercial fishing vessels in 2018 and 2019. This can be an indication that there is a transition of small scale fishers to commercial fishers. The decline of the total catch landed by small fishers occurred in 2017, afterward the level of the total catch landed by small fishers has stabilized. Meanwhile, for commercial fishers, there was an increase in the number of fish landed. This happens because with the more frequent law enforcement (especially related to the monitoring of the vessel's size), many fishing vessels that were previously categorized as small fishers then entered into the category of commercial fishers. This analysis needs to be ascertained by comparing data on the number of vessels in the category of small and commercial fishers from time to time. According to the data from PSDKP Kupang office, in 2017, there were 382 vessels categorized as small fishers vessels and 218 vessels in the commercial fishers category. Furthermore, in 2018 there were 256 small fishers and 446 commercial fishers. Lastly, in 2019 the number of small fishers become 103 and 285 for commercial fishers (PSDKP

Kupang, 2020). It appears that there has been a decline in the number of small fishing vessels over time, while commercial vessels have been temporarily increasing in 2018 and then dropped again in 2019.

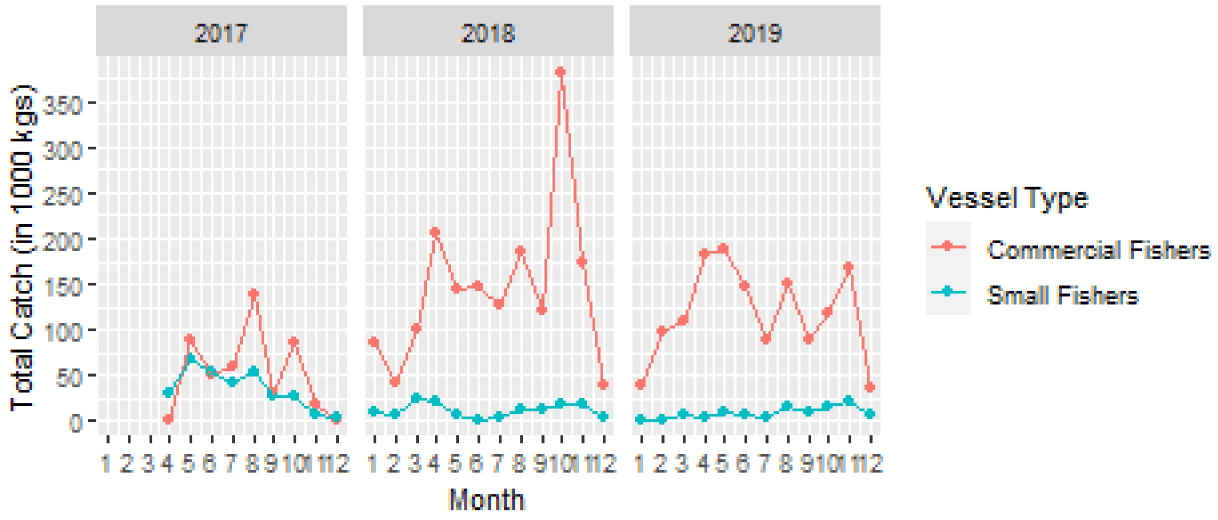

Figure 4: Total catch per vessel type during 2017 - 2019

Based on fishing days data (figure 5), the average fishing days for the most fishers in Kupang is between 2 to 13 days. Meanwhile, when compared between small fishers and commercial fishers, the fishing days of commercial fishers are slightly longer than the small fishers. This is because due to larger vessel sizes, commercial fishers are able to accommodate their fishing trip a little bit longer.

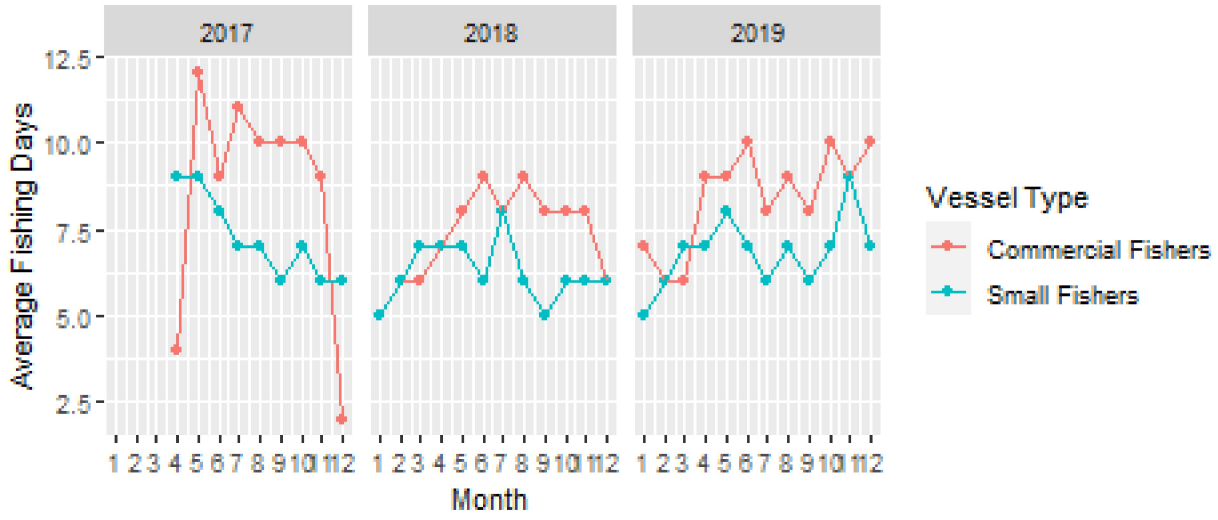

Figure 5: Fishing days per vessel type during 2017 - 2019

Similar to the comparative analysis between the number of catches and the Gross Tonnage (GT) in each fishing gears category, both small and commercial vessels show the declining trend in the catch-tonnage ratio. By looking at figure 6, there are two commercial fishers that have ratio value more than 1 (represent by the two dots above 1 in commercial fishers graph). Therefore, those two vessels potentially have violated the regulation.

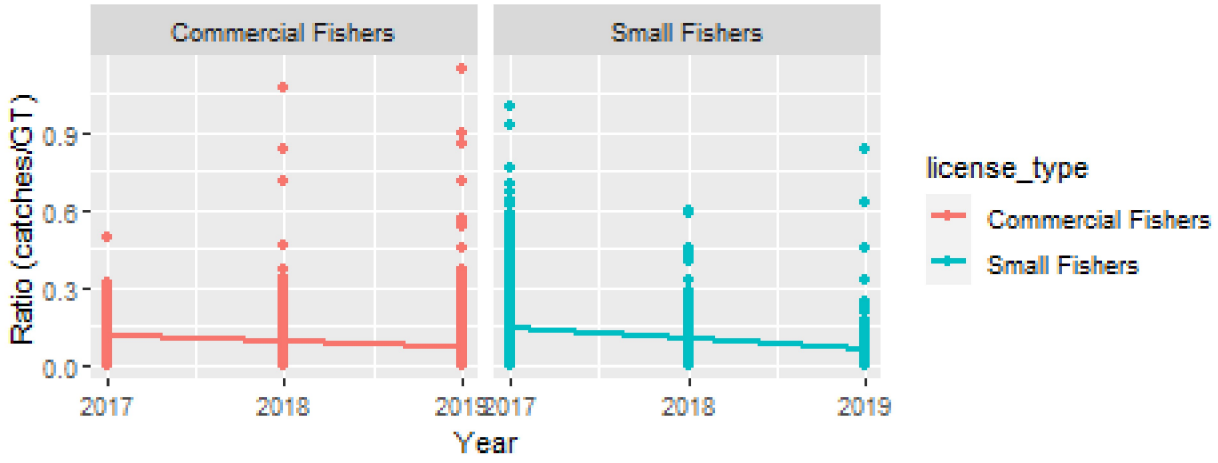

Figure 6: Catch-Tonnage ratio of each vessel type

license_type	estimate	std.error	statistic	p.value	r_squared
Commercial Fishers	-1.114964	0.1450321	-7.687703	0	0.0254077
Small Fishers	-1.204500	0.1776011	-6.782049	0	0.0483155

From the above tabel, very low r squared values indicate that there is no significant correlation between the ratio and years, both in commercial fishers and small fishers categories.

c. Analysis of the size of fishing vessels

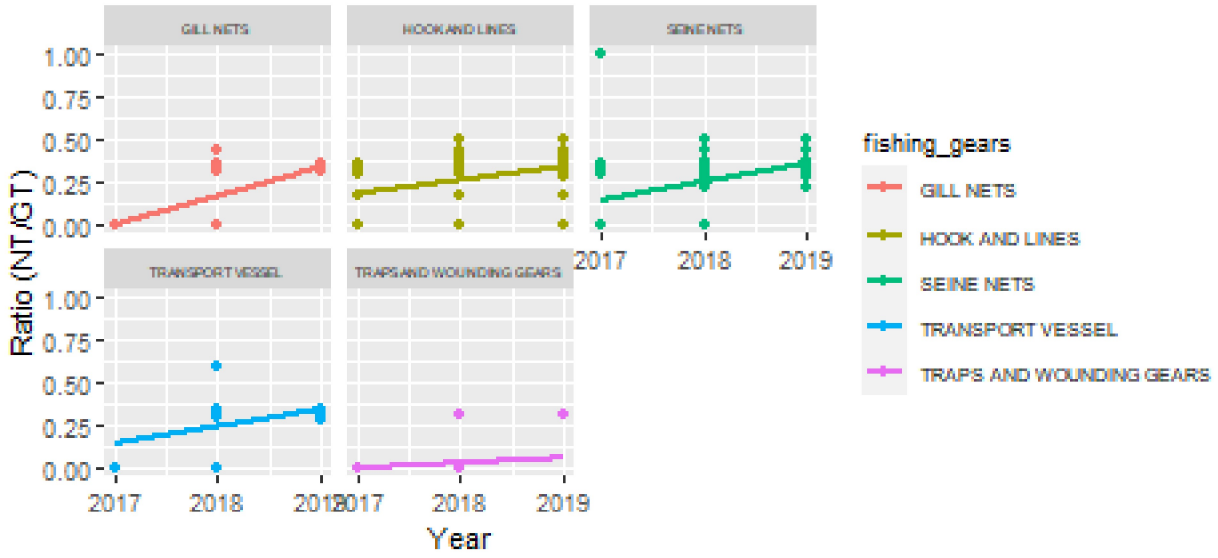

Figure 7: NT/GT ratio of each fishing gears

According to Tupper (2013), the gross tonnage (GT) is a volume measurement of a vessel based on all enclosed spaces and representing the overall size of a vessel. While the net tonnage (NT) is based on the volume of cargo plus passenger spaces multiplied by a coefficient, so it represents its carrying capacity.

Indonesian Ministerial Decree Law Number 8 of 2013 stated that the NT of a vessel could not be less than 30% of its GT, therefore the minimum NT/GT ratio of fishing vessels in Indonesia is 0.3. From the analysis of the NT/GT ratio on different fishing gears (figure 7), it shows that the ratio is increasing over the years for all of the fishing gears categories. It means that since the establishment of PSDKP Kupang office, there is an improvement in the compliance of fishers.

fishing_gears	estimate	std.error	statistic	p.value	r_squared
GILL NETS	3.240321	0.2595645	12.483681	0.0000000	0.5529415
HOOK AND LINES	2.596391	0.1186704	21.879006	0.0000000	0.2086080
SEINE NETS	3.562083	0.1392306	25.584042	0.0000000	0.3883278
TRANSPORT VESSEL	2.753686	0.4084646	6.741554	0.0000000	0.2763694
TRAPS AND WOUNDING GEARS	3.356667	1.1413519	2.940957	0.0043493	0.1033988

Analysis using r squared shows that the strong correlation between NT/GT ratio and the year is in the gillnets category (0.55).

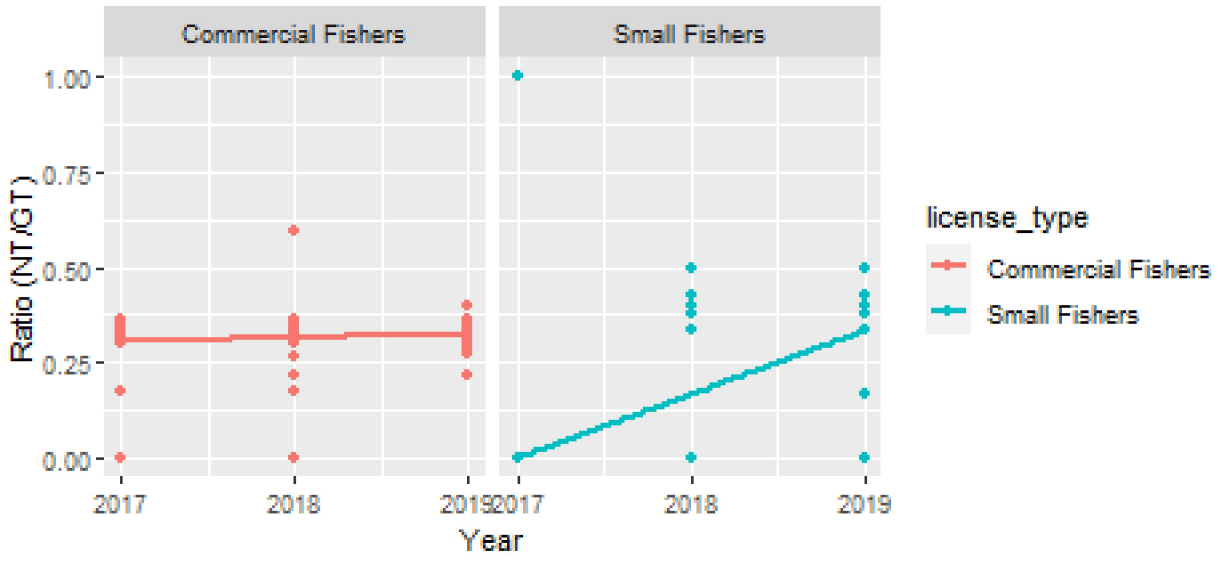

Figure 8: NT/GT ratio of each vessel type

The linear model of the relationship between NT/GT ratio and year categorized by vessel type (figure 8) shows progress in small fishers category (indicated by the steep trend), while in the category of commercial fisher, the trend is relatively flat. The reason for this is because before law enforcement was tightened, many commercial fishers are mistakenly categorized as small scale fishers. After the enforcement, the errors are revealed, and the vessel size on the license is restored to the actual size of the vessel.

license_type	estimate	std.error	statistic	p.value	r_squared
Commercial Fishers	1.689129	0.2672382	6.320687	0	0.0173177
Small Fishers	2.947713	0.1001290	29.439156	0	0.4889048

From the statistical test using r squared value, the correlation between the NT/GT ratio and the year is stronger in small fishers category (0.48), compared to 0.017 in the commercial fishers category.

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