



Overview of the trawl fisheries socio-economic conditions in Indonesia after the 2nd trawl ban

April 2016

Strategies for trawl fisheries bycatch management project



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**Strategies for trawl fisheries bycatch management
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Acknowledgement

On behalf of the National Project Coordinator of REBYC-II CTI in Indonesia, we are presenting the socio-economic conditions of shrimp trawl fisheries in Indonesia, especially in industry scale at the Aru-Arafura Sea.

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This paper tries to give a broader picture of the background related to the implementation of the moratorium and the ban on trawl vessels operating in Indonesia, as well as an indication of the impact on the people who operate in the trawl fisheries sector in particular. The shrimp fishery in the Aru-Arafura Sea is also explained.

Last but not the least, we would like to thank all fishermen, crew and members of the association (HPPI) for their time and effort in sharing their understanding of the socio-economic impacts after trawl ban in Indonesia.

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Summary

This paper gives an overview of the socio-economic impact on the communities affected by the implementation of governmental policy on trawl banning in Indonesia. It has been written based on data from the Indonesia Shrimp Catching Entrepreneurs Association (HPPI) and explanations of experts and actors in particular fishers who operate trawl vessels.

It is generally known that bottom trawling operates on and touches the bottom and thereby directly disturbs the seabed habitats and benthos. This has been a serious concern. Indonesia has various types of trawlers from small and medium to large scale. Over the years modifications of different components in the trawl gears were made and different local names for these gears were given.

In Aru and Arafura Sea, trawlers permitted by the government have been largely industrial-scale fish and shrimp trawlers. The license fee paid each year has been calculated based on the size of fishing vessels (GT) multiplied by the potential productivity of fishing gear and multiplied by the benchmark prices of fish and the percentage of business scale. The percentage of business scale is grouped into small-scale fisheries (5%), medium scale fisheries (10%) and large-scale fisheries (25%). Shrimp produced in these fisheries is exported to various countries such as Japan, USA, Australia, the EU, Thailand and Taiwan Province of China. Trawl fishery has contributed greatly to the economy and the state revenue through the export and earning from foreign exchange.

The prohibition of trawling since 9 January 2015 has resulted in a gradual cessation of shrimp trawling in Aru-Arafura Sea. The trawlers have not yet been able to find alternative and adequate shrimp fishing technique. Some alternative fishing gears have been tried but they have not been in tune with the capacity of these high-power ex-trawlers. Nonetheless, in response to the government's policy on trawl ban, the attempt has been to maintain the business continuity. The trawler companies have sought to reduce operating costs by reducing operating days and cutting crew costs. Processing units are experiencing serious idle capacity and currently are largely relying only on supply from the smaller fishing ports located around the region. The production base is very weak but can still maintain limited trade relations with overseas buyers.

A potential positive impact of the trawling ban has been that small-scale fishers are now able to catch fish more easily, closer to the beaches, and the volume of catch per fisher has been increasing. The small-scale fishermen, however, need support in distribution and marketing their catches. Poor infrastructure in the fishing villages has become an obstacle in maintaining the quality of catch, and is also an obstacle for effective fish distribution. Provision of ice and coolbox has become a very important intervention to keep the catch fresh until it reaches a shelter in a cold storage.

1. Introduction

Trawl fisheries was introduced in Indonesia around 1960s from Japan. During a symposium under REBYC-I project in August 2005, the variety of local names of trawls in Indonesia was collected, based on the scale of the size of the vessel and its region (Fig. 1). The issues in the regulation of fishing activities and enforcement were also looked into. In tackling the various problems caused by the trawling, the government has tried several rules, including banning trawlers.



Figure 1: Local names and scale of trawl vessel in Indonesia.

1.1. Trawl ban phase I

The prohibition of trawling throughout Indonesia for the first time had been implemented in 1980 through Presidential Decree 39/1980: The implementation phase was ruled by Presidential Instruction INPRES 11/1982. This was as a result of the conflict other fisherman had with the trawler fishing groups as their fishery resources were heavily exploited by trawlers. The execution of the ban was done in stages that can be explained as follows:

1. Presidential Decree 39/1980 (KEPPRES 39/1980)
 - a. First stage
 - i. 1 May – 1 Oct 1980: ban on trawling in the waters around Java and Bali Islands
 - ii. By 11 January 1981: ban on trawling in the waters around Sumatera Island
 - b. Second stage
By 1 Oct 1981: number of trawlers reduced to only 1 000 units
2. Presidential Instruction No. 11/1982 for implementation of the Presidential Decree 39/1980. The banning of trawling in the waters of Indonesia came into force 1 January 1983.

Re-opening of the licences for trawl

Over time, the fishing communities began to develop fishing gears to improve its productivity while reducing the bycatch. Finally, the government accommodated the re-use of trawl in certain areas. The government issued regulations to legalize trawl fishing in certain areas as follows:

1. Shrimp trawl in waters Aru-Arafura

Presidential Decree No. 85/1982 allowing use of shrimp trawl in the Aru-Arafura Sea at the east of 130°E until the waters with a depth of 10 m isobaths with the following conditions

- a. The by-catch to be utilized;
- b. Install TED with a distance of 3 inch bars. (Minister of Agriculture number Kep 930 / Kpts / Um / 12/1982 and SK Director General Capture Fisheries No.IK.010 / S4.8075 / 82 about Installation Turtle Excluder Device (TED) on ShrimpTrawl (Pukat Udang)
- c. Terminology this fishing gear falls in the category Bottom Trawl.

2. Fish Trawl in the Indian Ocean around west of Sumatra and Aceh island.

Minister of Agriculture KEP 770 / Kpts / IK120 / 10/1996 allows Fish Trawl in Exclusive Economic Zone of Indonesia in Indian Ocean at western part of Sumatra and DI. Aceh limited to 4°N & 96°E, with requirements:

- a. Cod End > 5 cm (2 inch), not to use a trickle chain and iron sinker
- b. Use fishing vessels above 80 GT, the engine above 350 Horse Power
- c. Based at the Port of PT (Persero) Great Ocean Fisheries and Sibolga National Fishing Port (Decree of the Minister of Agriculture No. 1039.1 / Kpts / IK.120 / 10/1999)
- d. Terminology this fishing gear falls in the category mid-water trawling.

3. The trawl-like fishing gears for small scale:

- a. Lampara Dasar in Aru-Arafura Sea at the eastern of 130°E.
Minister of Agriculture KEP 769 / Kpts / HK210 / 10/1988 about Net Usage Lampara Dasar requirements:
 - i. Not operated with two boats (pair)
 - ii. Vessels (LOA) <12m, Engine power <36 Horse Power
 - iii. Owner under a Cooperative
- b. Fishing Gear modified such as: cantrang berpalang, Jaring Arad, Otok (KEP DJPT No. IK.340 / DJ.10106 / 97 about Guidelines Kepmentan 503 / Kpts / Um / 7/1980) with the following requirements:
 - i. Mesh Size > 1 inch
 - ii. without otter boards, bobbins, trickle chain

- iii. the vessel size <5 GT, Engine power <15 Horse Power
- iv. Terminology this fishing gear falls in the category Seine Net.
Fishermen are starting to use this fishing gear around the Java Sea.

- c. Trawler in Eastern part of Kalimantan
Ministry Regulation PERMEN No.06 / MEN / 2008 about trawl (Pukat Hela) in Eastern part of Kalimantan with the following requirements:
 - i. Fishing zone 1 (1-4 nautical miles from coastline) for vessels <5 GT using trawl with Head Rope max 13.50 Ground Rope max 15m.
 - ii. Fishing zone 2 (4-12 nautical miles from coastline) for vessels 5 GT-30 GT using trawl with head rope (HR) maximum 22.50 m, Ground Rope maximum 24 m.
 - iii. Terminology this fishing gear falls in the category Trawl.

4. Fish Trawl (Pukat Ikan) in Exclusive Economic Zone of Indonesia (EEZ) in South China Sea, Sulawesi Sea, Pacific Ocean, Arafura Sea, Indian Ocean.

Ministerial regulation of PERMEN KP 11 / MEN / 2009 fish trawl in EEZ requirements:

- i. Head Rope <60m, Long Cod-end<10m, Mesh Size> 5cm
- ii. Fishing vessel made of steel / fiberglass should be greater than 100 GT or
- iii. Fishing vessel made of wood should be greater than 60 GT
- iv. Use only one (1) Ships (in line with Ministerial Decree 60 / Men / 2001)
- v. Terminology this fishing gear falls is Not Pair Trawler.

1.2. Trawl ban phase II

The new government in Indonesia (2014) started attempts to combat illegal, unreported and unregulated (IUU) fishing in Indonesian waters that often occurs due to rampant illegal fishing vessels entering into the waters of Indonesia, the misuse of the flag as well as human trafficking. The impact is most felt by small-scale fishermen when their catches come down and they have to make a longer fishing trip to locate fishing areas.

The moratorium policy is another step, purposed to fight against the proliferation of IUU fishing in the Indonesia fisheries management area (WPP-NRI) done by foreign vessels. This is also, to secure and save the fish resources nationwide as “Komnas Kajiskan” have indicated symptoms of overfishing of some fish species. This started in the decree No.45 / 2011.

Degradation of fish resources is also caused by the widespread use of trawling and the use of fishing gear that resembles a trawl by small and medium-scale fishermen. Therefore, considerations were given to the need of prohibition use of fishing gear that is less environmentally friendly by ministerial regulation number KP No. 2 / PERMEN-KP / 2015 issued on 8 Jan 2015 prohibition the use trawl (Pukat Hela) and Seine Nets (Pukat Tarik) in WPP-NRI.

Circular Paper number 72/MEN-KP/II/2016 on the restriction of use of fishing gear “cantrang” in WPP-NRI issued on 11 February 2016 gradually sets limits on its use through the following requirements:

1. Re-measurement of the size of fishing vessel (GT). If greater than 30 GT they should change fishing gear
2. Only operated in the management area under the province’s territory (12 nautical miles).
3. Limitation of selectivity and capacity: minimum mesh size > 2 inches, and head rope longer than 60 meters.

Trawl Ban phase II has had a great impact on the shrimp fishery in the Aru-Arafura Sea. The impact has been significant because the fishing industries generally use vessels constructed abroad. Under the ministerial decree Number 56 / 2014 about Moratorium, the vessels constructed abroad should be evaluated on valid legal documents and to ensure compliance for carrying out fishing activities in Indonesia. The vessels passing the evaluation process can undertake fishing activities until the end of the business license granted.

Scope of this article

This paper will describe:

1. Condition of the shrimp fishery in the Aru-ArafuraSea;
2. Conditions of the shrimp fishing industry in Aru-Arafura;
3. Impact of Trawl Ban on the shrimp industry (such as the company, crew, small fisherman, market, tax, foreign exchange); and
4. The future management of the shrimp fishing in the Arafura.

2. Overview of fisheries in Aru-Arafura Sea

Indonesian waters consist of three major ecosystems, the Sunda Shelf, Sahul Shelf and the deep sea. Sahul Shelf area of 160 000 km² covers Aru-Arafuru Sea (143 500 km²) and other waters (16 500 km²) (Bailey et al., 1987). Aru-Arafuru Sea is shallow, with depths up to 80 meters. The deeper waters are on the west side (Figure 8).



Figure 2: Aru-Arafura Sea

Arafura Sea is one of the most productive fishing grounds in Indonesia for catching shrimp and demersal fish. The high productivity of Arafuru Sea is due to the process of nutrient upwelling and nutrient inputs from the watershed. So the area is indicated as nursery ground and feeding ground. The upwelling in Banda Sea and Arafuru is formed due to the influence of the southeast wind season (Wyrski, 1961). Upwelling improves nutrient (Wetsteyn et al., 1990) and organic carbon (Cadee, 1988), which promotes the growth and biomass of phytoplankton, increased oxygen production (Tijssen et al., 1990) and the abundance of zooplankton (Baars et al., 1990). Meanwhile, the water flowing in the rivers carries nutrients from the dense forests in the interior of Papua to Arafuru Sea during the rainy season. Nutrients are also transported to the Arafuru Sea from dense mangrove forests along the western coast of Papua (Sadhotomo et al., 2003). The diversity and extensive mangrove forests in the south coast of Papua, which borders the Arafuru Sea is among the highest in the world (e.g. Huffard et al., 2012). Mangrove ecosystem is spread over three provinces: Province of Papua, West Papua and Maluku. Mangrove forests in the Aru Islands and Southeast Maluku (Maluku), respectively reached 833 km² and 18 km² (Department of Fisheries & Marine Maluku Province, 2005). High primary productivity in the sea southeast of Arafuru (especially during the June-August season) is not caused

by the flow of the river but a vertical mixing that brings nutrient-rich water from the deeper sea-water layers (Wetsteyn et al., 1990).

2.1. Overview of fisheries legal framework in Indonesia

Some of the information in this section is quoted from the Fishery Management Plan in WPP-NRI 718 as outlined in the Regulation of Ministry of Marine Affairs and Fisheries number 54/Kepmen-KP/2014 regarding the fisheries management plan of fishery management area 718.

Article 33 paragraph 3 of the Act of 1945 mandates that the wealth of the earth and the water contained in it are controlled by the state and utilized for the welfare of the people. Fish resources in Regional Fisheries Management of the Republic of Indonesia (WPP-NRI) 718 are natural resources controlled by the state and utilized for the welfare of the people. The fish resources should be utilized to support the realization of food sovereignty; especially the supply of fish protein which is very helpful for the health of the nation's children. Indonesia must ensure sovereignty and exploit fish resources in the WPP-NRI 718 for the overall prosperity of the people. Sovereignty will also contribute greatly to the potential employment on fishing vessels to reach about 15,000 people, not including labor in fish processing units and other supporting activities on land.

Article 1 paragraph 1 of Law No. 31 of 2004 on Fisheries, as amended by Act No. 45 of 2009, noted that fisheries are all activities related to the management and utilization of fish resources and the environment ranging from preproduction, production, processing to marketing conducted over a fishery business system. Furthermore, Article 1 paragraph 7 states that fisheries management includes all efforts, including integrated processes in information gathering, analysis, planning, consultation, decision-making, allocation of fish resources, and the implementation and enforcement of legislation in the field of fisheries, which is done by government or other authorities aimed at achieving viability and productivity of aquatic biological resources and agreed objectives. Based on such understanding, the management of the fishery is a very important aspect to strive for fish resources to be used sustainably.

2.2. Overview of Fisheries in Aru-Arafura Sea

WPP NRI 718 covering the Aru Sea, Arafuru Sea and the eastern part of the Timor Sea is one the main fishing ground of shrimp and fish trawlers in Indonesia. Estimation of the potential of fish resources in WPP-NRI 718 reached 13% of the potential resource of the national marine fish. The contribution of shrimp and demersal fish to the national marine fisheries production amounted to approximately 45% and 20%, respectively. Shrimp and demersal fish have long been the main target of fishing activities in WPP-NRI 718 by the fishing fleet. Illegal, Unreported and Unregulated (IUU) Fishing in WPP-NRI 718 has continued long with high intensity, resulting in considerable loss to Indonesia in terms of social, economic and ecosystems aspects, as well as fisheries management.

From the economic aspect, Indonesia has suffered losses due to IUU fishing activities in WPP-NRI 718 equivalent to around Rp. 20 000 billion per year (ATSEA, 2011). Article 6.2 of the 1995 Code of Conduct for Responsible Fisheries (CCRF), mandates that fisheries management should ensure the quality, diversity and availability of fishery resources in sufficient quantities for now and next generations, in the context of food security, poverty reduction and sustainable development. Given the high potential of fish resources in WPP-NRI 718, Indonesia should make the best effort to make sure that WPP-NRI 718 is sustainably managed to support the realization of our national goals mentioned above. At the same time, Indonesia also has to make maximum efforts so that the potential of fish resources in WPP-NRI 718 is realized by the Indonesian State and used for the greater prosperity of the community.

In this connection, the Government, local authorities of provincial and district / city concerned shall undertake the management of fish resources in WPP-NRI 718. The government, the provincial government and local government of district / city also should be together with the fisheries stakeholders in WPP-NRI 718 to ensure the realization of our national goals as described above. This is important, because according to article 6.1 of the CCRF, the right to catch fish (for businesses) must

be accompanied by an obligation to use in ways that are responsible, to ensure effective implementation of conservation measures and management of fish resources.

The preparation of a fishery management plan should be in line with the Ecosystem Approach to Fisheries Management (EAFM) developed by FAO (2003). The ecosystem approach tries to balance the socio-economic objectives and fisheries management (fishermen's welfare, justice utilization of fish resources, etc.) taking into account knowledge and uncertainty about the components of biotic, abiotic, and human interaction in the aquatic ecosystem through fisheries management and sustainability.

2.3. Fisheries management area

The Regulation of Ministry of Marine Affair and Fisheries No.18/PERMEN-KP/2014 on Fisheries Management Area of the Republic of Indonesia, WPP-NRI 718 includes Aru Sea region, Arafura Sea and the East Timor Sea. The area is part of Sahul Shelf and geographically bordered by the mainland of Papua and Banda Sea in the north, as well as directly adjacent to the 3 (three) countries, namely Australia in the South, East Timor in the west and Papua New Guinea in the east (Figure 3).

Administratively, the local government has the authority and responsibility for the management of fish resources in WPP-NRI 718 consisting of the three (3) provincial governments of Papua, West Papua and Maluku, and 8 (eight) district /city governments, including West Southeast Maluku District, Southeast Maluku regency, Southwest Maluku district, Merauke, Mappi, Asmat, Mimika Regency and Regency of Aru Islands.

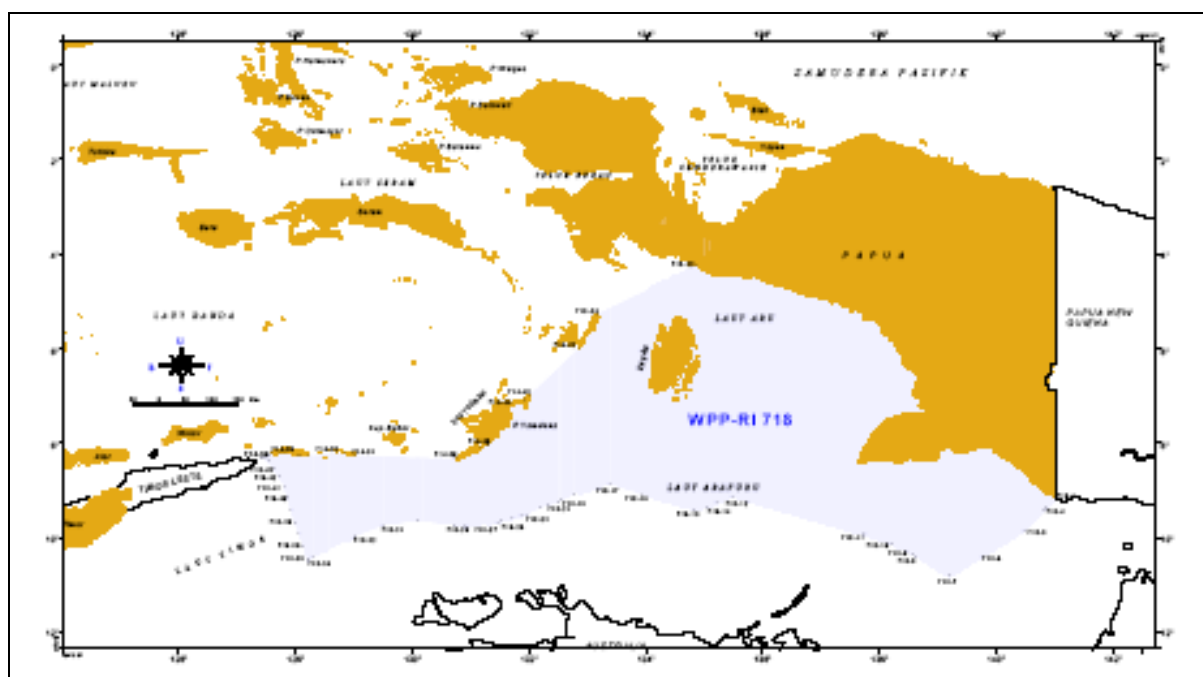


Figure 3: Geographical location of WPP-NRI 718

2.4. Fish resources in WPP-NRI 718

Fish resources in waters of WPP-NRI 718 can be classified under 7 (seven) main groups, namely:

1. The large pelagic fish;
2. Small pelagic fish;
3. Demersal fish;
4. Penaeid shrimp;
5. Coral fish;
6. Lobster; and
7. Squid.

The estimation potential of fish resources based on the Decree of the Ministry of Marine Affair and Fisheries number No. KEP.45/MEN/2011 on the potential catch (MSY) of Fish Resources in Fisheries Management Area of the Republic of Indonesia, in WPP-NRI 718 is shown in Table 1.

Table 1 showed that five (5) fish resource groups that dominate the waters WPP-NRI 718 are small pelagic fish, demersal fish, large pelagic fish, penaeid shrimp and squid. The potential of fish resources (maximum sustainable yield, MSY) is highest for small pelagic fish amounting to 468,700 tonnes / year, followed by demersal fish amounting to 284,700 tonnes / year, large pelagic fish amounting to 50 900 tonnes / year. Penaeid shrimp amounted to 44,700 tonnes / year, squid only 3,400 tonnes / year. The total potential of the five groups of fish resources have reached 99% of the potential of all the water biota in WPP-NRI 718.

Table 1: Estimation of potential fisheries resources in WPP-NRI 718

No.	Fish Resources	Maximum Sustainable Yield (thousand tonnes/year)
1	Large Pelagic Fish	50.9
2	Small Pelagic Fish	468.7
3	Demersal Fish	284.7
4	Penaieid Shrimp	44.7
5	Coral Fish	3.1
6	Lobster	0.1
7	Squid	3.4

Source: Decree of the Minister of Marine Affair and Fisheries No.KEP.45/MEN/2011

Capture fisheries production in WPP-NRI 718 based on statistical data of fisheries in 2016 is shown in Table 2.

Table 2: Fish production in WPP-NRI 718 (year 2007-2014)

Fish Production	Year (Tonnes)							
	2007	2008	2009	2010	2011	2012	2013	2014
Large Pelagic	36 860	19 677	27 390	30 563	31 072	44 078	53 217	117 039
Small Pelagic	107 067	78 957	79 165	162 064	123 462	130 604	94 718	66 356
Demersal Fish	210 449	179 286	178 796	296 883	246 255	221 103	224 974	194 498
Coral ReefFish	8 616	8 115	9 871	12 739	13 636	17 301	17 493	8 378

Shrimp	35 997	6 840	9 744	11 476	12 206	15 354	12 892	15 247
Crabs	1 247	1 146	9 813	9 261	9 927	3 457	3 223	3 563
Squid	6 786	2 996	3 820	8 555	5 881	6 727	3 934	3 082
Other	3 321	1 519	5 967	6 423	6 747	6 626	4 914	4 955
Total	410	298	324	537	449	445	415	413
	343	535	566	964	186	250	365	118

Source : Directorate of Resources – DGCF, 2016

Large Pelagic Fish

Large pelagic fish caught in WPP RI 718 include shark (*Hemigalidae*), mackerel (*Scomberomorus commersoni*), tuna (*Euthynnus sp.*), skipjack (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*). Many sharks are caught in these waters for their economically valuable fins. Large pelagic fishing areas are Arafuru Sea waters around the Aru Islands to the southern part of the Arafuru Sea waters directly adjacent to Australian waters.

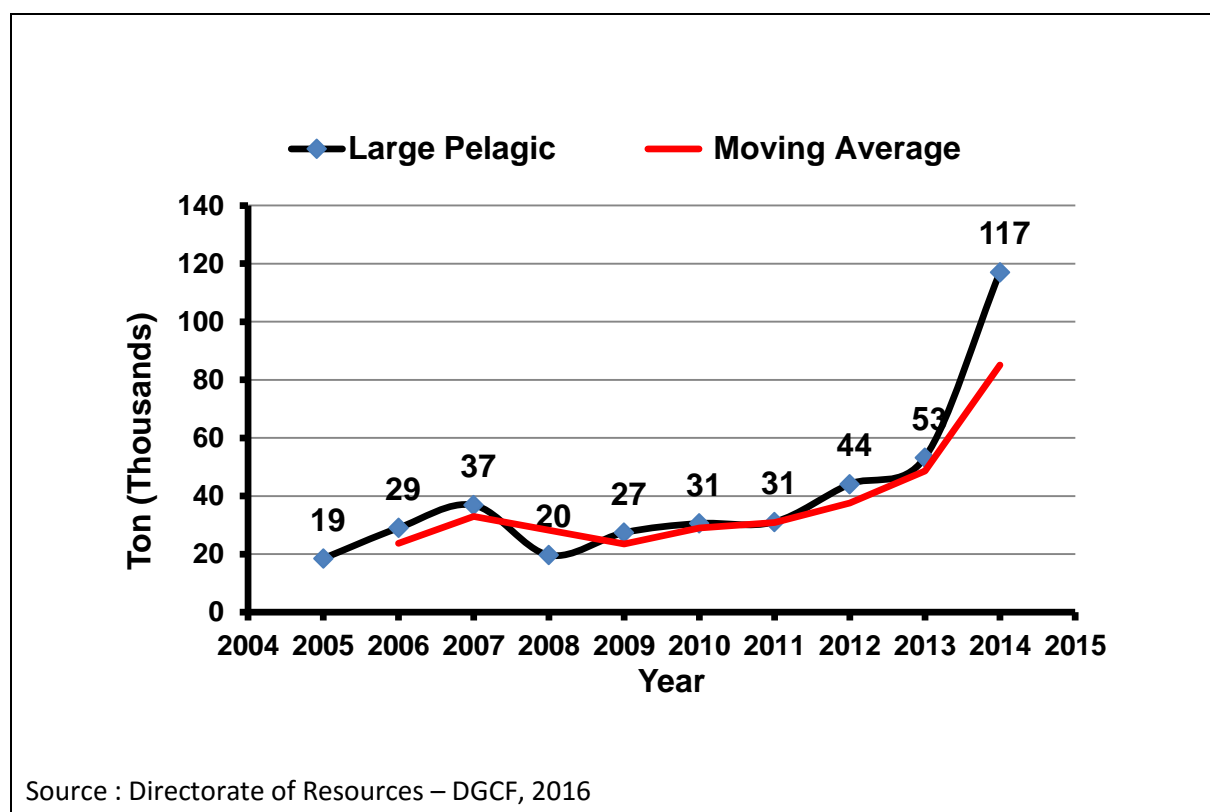


Figure 4: Catch of large pelagic fish in Aru-Arafura Sea (2006-2014)

Figure 4 shows the annual production of large pelagic fish in WPP-NRI 718 during the period 2006-2011. Production has decreased sharply in 2008, and increased again in the following year until the year 2014.

Small Pelagic Fish

Small pelagic fish caught in WPP RI 718 include *Caranx spp.*, *Decapterus ruselli*, *Megalaspis cordyla*, *Formio niger*, *Cypselurus spp.*, *Hemirhamphus spp.*, mackerel (*Rastrelliger spp.*), *Rastrelliger kanagurta*,

Sardinella fimbriata and *Upeneus vittatus*. The small pelagic fish catch during the period 2007-2011 is shown in Figure 5.

Figure 5 shows the small pelagic fish annual production in WPP-NRI 718 during the period 2006-2011. Production has decreased in 2000, and increased again in the following year until the year 2010. In year 2011 production has decreased again until year 2014.

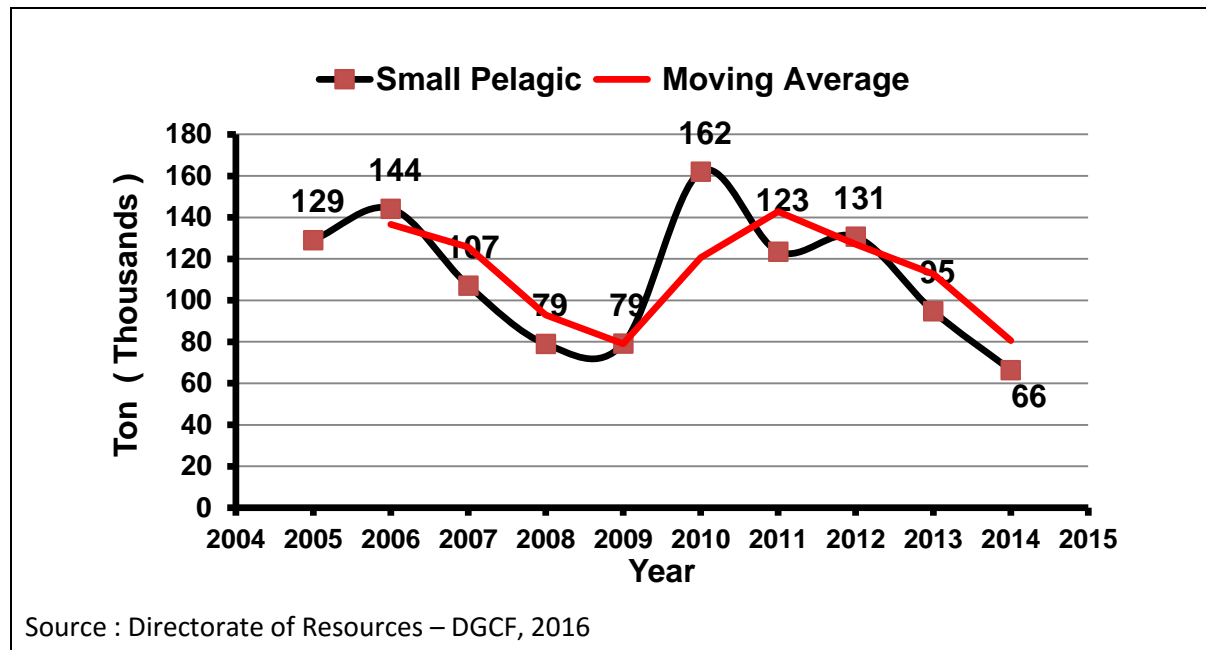


Figure 5: Catch of small pelagic fish in Aru-Arafura Sea (2006-2014)

Demersal Fish

Demersal fish caught in WPP RI 718 include *Arius spp.*, *Psettodes erumei*, *Caranx sexfasciatus*, *Caesio caerulaurea*, *Pampus argenteus*, *barramundi (Lates carcarifer)*, *Lethrinus spp.*, *Upeneus sulphureus*, *red snapper (Lutjanus sp.)*, and *Trichiurus spp.* Fishing ground of demersal fish in WPP-NRI 718 is shown in Figure 6.

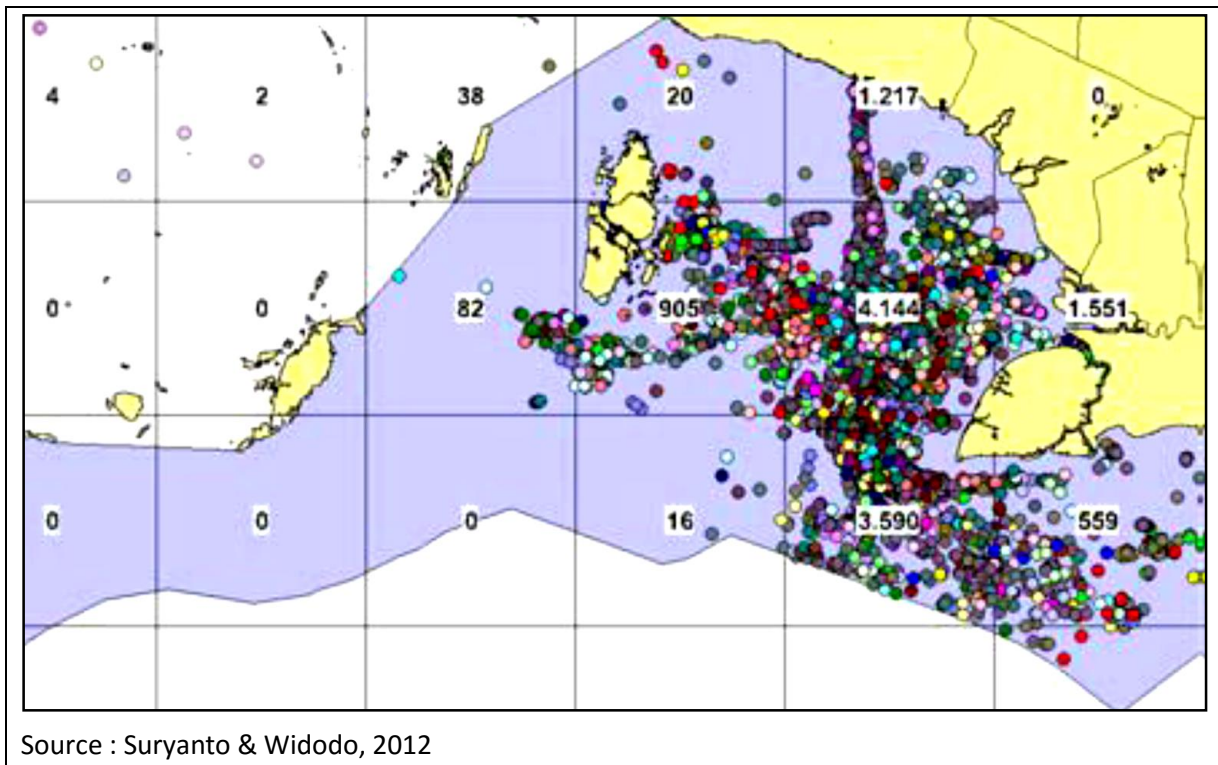


Figure 6: Demersal fish fishing grounds in Aru-Arafura Sea (2012)

Figure 7 shows that the demersal fish production in the waters of WPP-NRI 718 in the period range between 170,000 – 290,000 tonnes per year. The catch is much lower than the estimated maximum sustainable catches, amounting to 539,100 tonnes per year. Demersal fish production growth in the period 2007-2014 as shown indicate possibility of increasing fishing pressure on demersal fish.

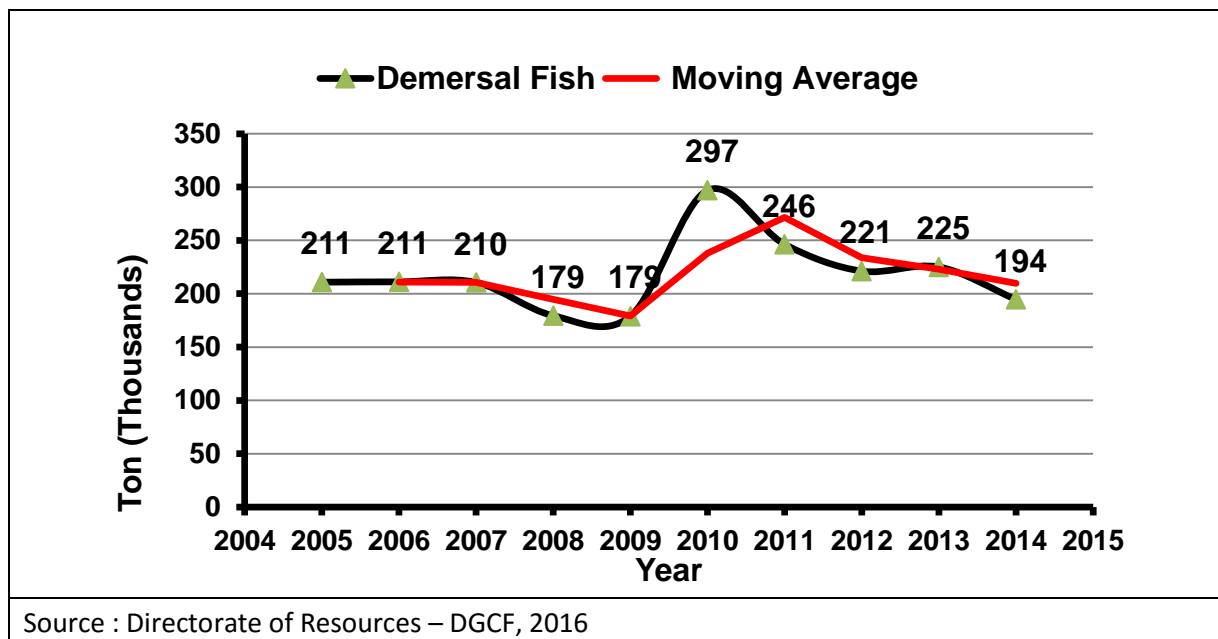


Figure 7: Catch of demersal fish in Aru-Arafura Sea (2006-2014)

Coral Reef Associated Fish

Coral fish caught in the waters of WPP RI 718 include the yellow tail fish (*Caesio cuning*), Napoleon (*Cheilinus undulatus*), grouper (*Epinephelus spp.*) and *Siganus spp.* The coral fish catch during the period 2007-2011 is shown in Figure 8.

Coral reef fish production during the period 2007-2011 ranged between 8 000 and 12 000 tonnes per year. The catch was relatively small and biomass of the stock was still quite good. At that time reef fish stocks have not been prioritized as a commodity that is taken into account in fisheries management in WPP-NRI 718.

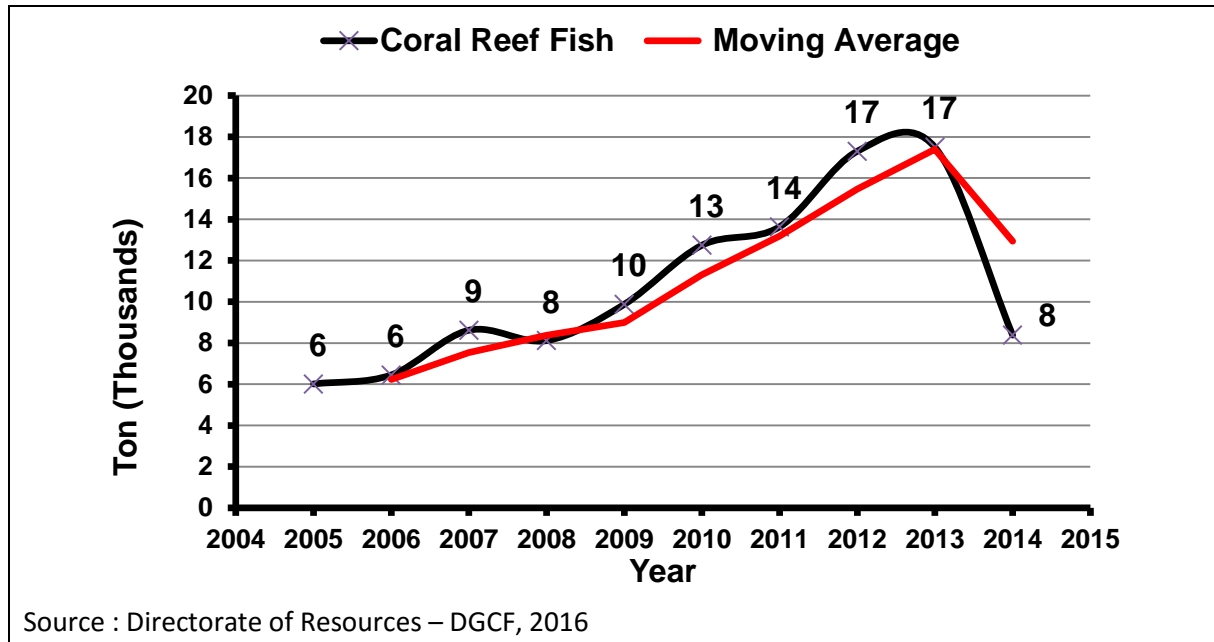


Figure 8: Catch of coral reef fish in Aru-Arafura Sea (2006-2014).

Shrimp

Crustaceans that have been caught in WPP-NRI 718 include penaeid shrimp, tropical rock lobster (*Panulirus ornatus*), crab (*Scylla serrata*) and crab (*Portunus pelagicus*). Penaeid shrimp is the main target of commercial fishing because the shrimp is a major export commodity with high value.

Production of shrimp in WPP-NRI 718 in 2011 was ranked sixth in terms of volume in the whole WPP-NRI. The main catches in 718 WPP-NRI include banana shrimp (*Penaeus merguensis*) and tiger shrimp (*P. monodon*). Banana prawn are found in waters adjacent to mangrove forests, while the black tiger shrimp is more common in the waters covered with seagrass. Fishing ground of shrimp in WPP-NRI 718 is shown in Figure 9.

Shrimp production in WPP-NRI 718 for the period 2007-2011 ranged between 7 000-38 000 tonnes per year. A drastic reduction of the catch of shrimp from 2007-2008 probably due to more and more poaching by shrimp trawlers that fish without permission so that the production is not accounted for in the Fisheries Statistics in Indonesia. Purwanto (2013) estimated that in 2011 there were 731 similar units of GT 130 shrimp trawlers operating in WPP-NRI 718 with catches reaching 48 370 tonnes. The number of vessels fishing for shrimp consisted of 267 licensed vessels (SIPI) and 464 vessels without license (No-SIPI). Shrimp catches of vessels which have a license (17 678 tonnes) and unlicensed vessels (30 672 tonnes).

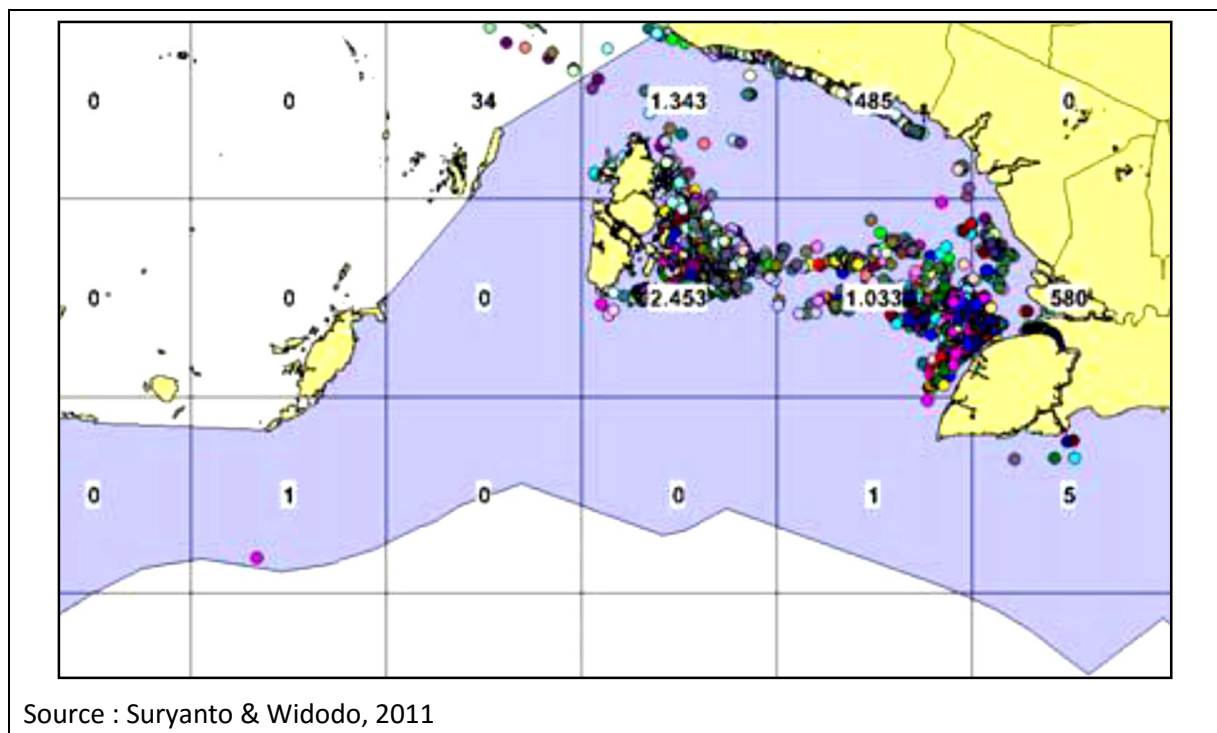


Figure 9: Shrimp fishing grounds in Aru-Arafura Sea (2012)

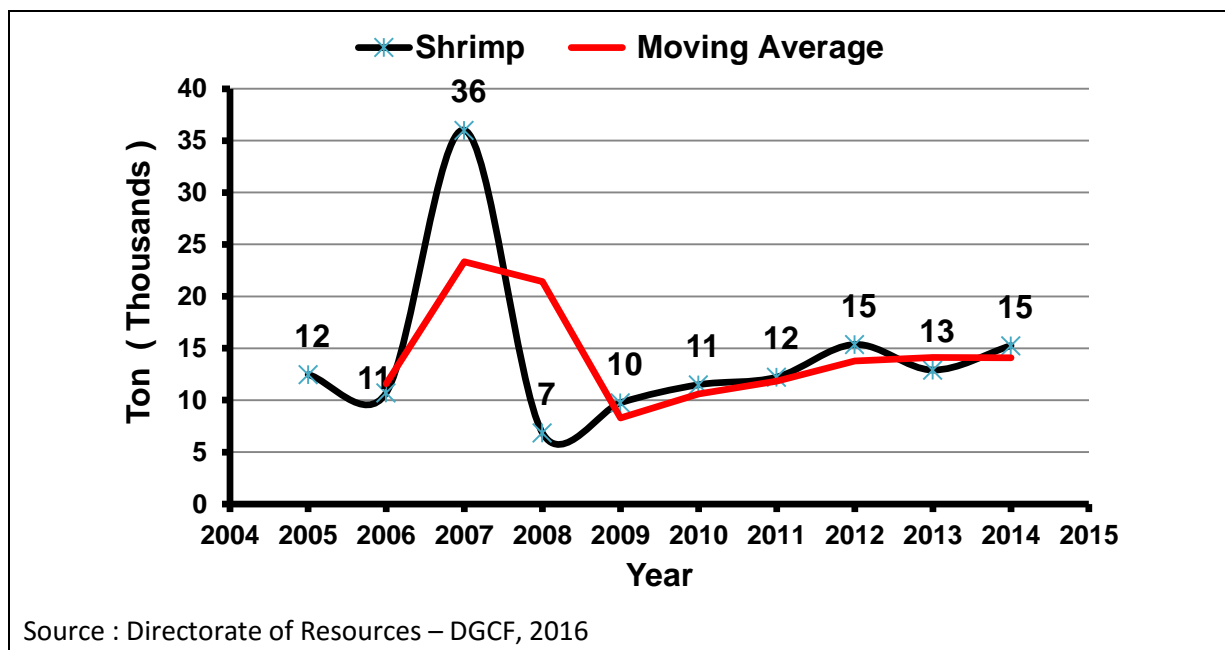


Figure 10: Catch of shrimp in Aru-Arafura Sea (2006-2014).

Purwanto (2013) estimates that the potential for sustainable shrimp fishery in WPP-NRI 718 is 49 500 tonnes per year with the optimum fishing effort 635 units of assuming size shrimp trawlers as 130 GT. Most of the shrimp are caught by shrimp trawlers of size 130 GT and fish trawl of size 180 GT. Maximum sustainable yield is 77.9 tonnes per shrimp trawl with of size 130 GT. In 2011 the excessive

production of shrimp fishing works out to only 66.2 tonnes per vessel. If there were no shrimp trawlers without licenses in 2011, the 267 licensed shrimp trawlers will produce a catch of 123 tonnes per vessel.

Officially, the status of utilization of fish resources in the WPP-NRI, including WPP 718 still refers to the Decree of the Minister of Marine and Fisheries No. KEP.45 / MEN / 2011 on Potential Estimation of Fish Resources in Regional Fisheries Management of the Republic of Indonesia are shown in Table 3.

Table 3 shows that most of the fisheries resources in WPP-NRI 718 are over-exploited, except for shrimp (fully - exploited) and small pelagic fish (moderate - exploited). For demersal fish, which is over-exploited, a reduction in fishing activity is required in order to restore the sustainability of fish resources and the environment. Potential of small pelagic can be increase.

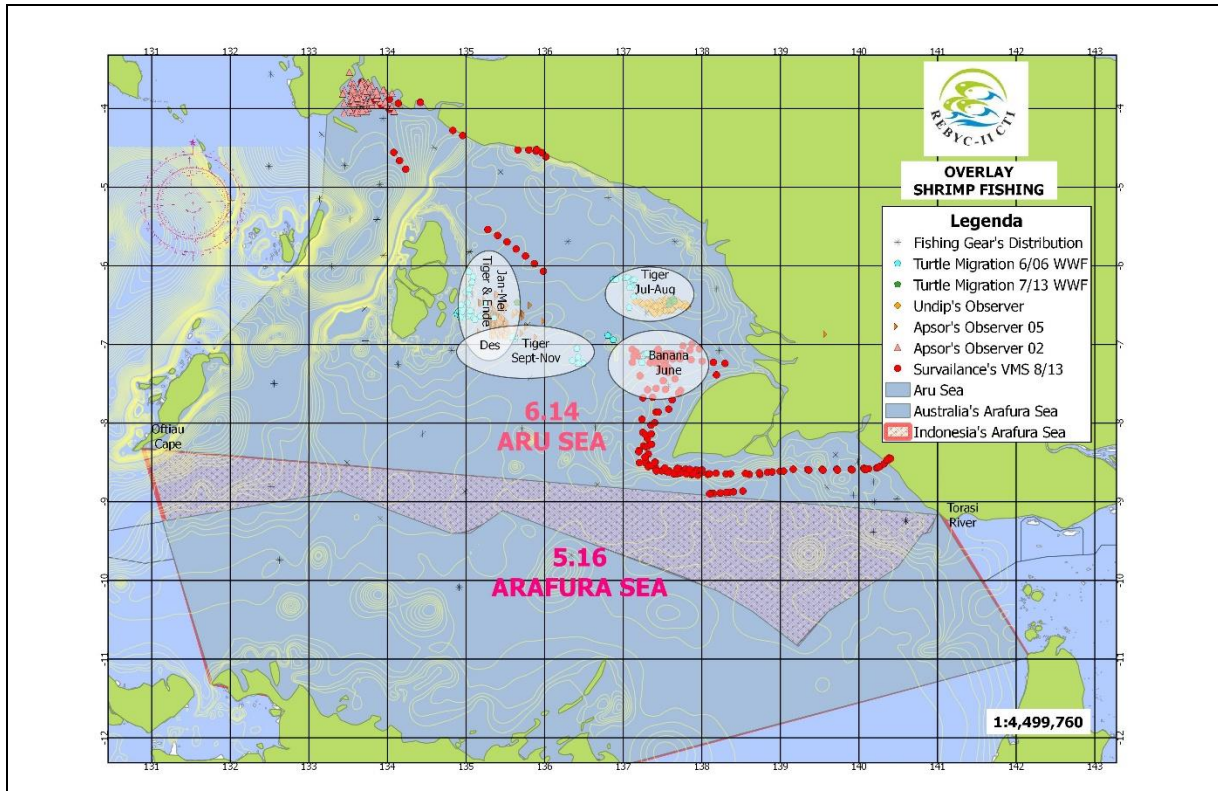
Table 3: Status for exploitation of fisheries resources in WPP-NRI 718.

No.	Fish Resources	Status	Remark
1.	Shrimp	F	Fully – Exploited
2.	Demersal fish	O	Over – Exploited
3.	Arius spp	O	Over – Exploited
4.	Nemipteridae	O	Over – Exploited
5.	Upeneus sulphureus	O	Over – Exploited
6.	Swanggi	O	Over – Exploited
7.	Saurida spp	O	Over – Exploited
8.	Scianidae	O	Over – Exploited
9.	Lutjanidae	O	Over – Exploited
10.	Cynoglossus	F	Fully – Exploited
11.	Small Pelagic Fish	M	Moderate – Exploited

Source: Decree of the Minister of Marine Affair and Fisheries No.KEP.45/MEN/2011

2.5. Fishing ground of trawl vessels

There are four major trawl fishing areas as shown in Figure 9. The results of data collection activities from the vessel monitoring system in the Arafura Sea trawl vessels for 2014-2015 were presented during the National Working Group discussion in late 2015. Trawl fishing areas are concentrated around Aru and in the area of Dolak.



Source: National Working Group – REBYC II – CTI Indonesia, 2015

Figure 11: Map of fishing ground of trawlers in Aru-Arafura Sea

2.6. Fishing method

Decree of the Minister of Marine and Fisheries of the Republic of Indonesia Number KEP.06/MEN/2010 on Fishing Equipment in Fisheries Management Area of the Republic of Indonesia categorized fishing gears into 10 (ten) groups. Tables 4 and 5 show the WPP-NRI 718 recorded the number of vessels that obtained a license to fish in WPP-NRI 718 waters until the end of 2014.

Table 4: Number of licenses (vessels >30 GT) in WPP-NRI 718

No.	Fishing Gears	Name in License	Units	Gross Tonnage
1	Fish Trawl	Pukat Ikan	440	115,932
2	Shrimp Trawl	Pukat Udang	129	19,760
3	Gill Net Oceanic	Jaring Insang Hanyut Oseanik	118	23,360
4	Bottom Long Line	Pancing Rawai Dasar	107	6,354
5	Squid Jigging	Pancing Cumi	99	13,084
6	Drift Gill Net	Jaring Insang Hanyut Pantai	55	3,995
7	Lift Net	Bauke Ami	15	2,029
8	Hand Line	Hand Line	14	1,834
9	Pole and Line	Huhate	8	529
10	Purse Seine (small pelagic)	Purse Seine Pelagis Kecil	2	147
Total			980	184,024

Source : DGCF – Direktorat PUP (2011)

Table 5: Distribution size of fishing vessels in WWPP-NRI 718

No.	Fishing Gears	GT				Total
		30-60	>60-100	>100-200	>200	
1	Fish Trawl	0	2	141	297	440
2	Shrimp Trawl	1	51	75	2	129
3	Gill Net Oceanic	13	14	31	60	118
4	Bottom Long Line	93	11	2	1	107
5	Squid Jigging	1	28	66	4	99
6	Drift Gill Net	20	27	7	1	55
7	Lift Net	10	4	1	0	15
8	Hand Line	0	14	0	0	14
9	Pole and Line	3	5	0	0	8
10	Purse Seine (small pelagic)	1	0	1	0	2
Total		142	156	324	365	980

Source : DGCF – Directorate PUP (2011)

In Figure 12 shows the composition of fishing gears in Aru-Arafura waters (WPP-NRI 718), based on the licenses from the central government in 2014. Trawl nets are dominant gear, with 9% shrimp trawl and 39% fish trawl.

The number of fish trawlers decreased during 2011 to 2014, while the numbers of shrimp trawlers were relatively stable. No new shrimp trawlers are added, whether or not there is a new company in Aru-Arafura Sea.

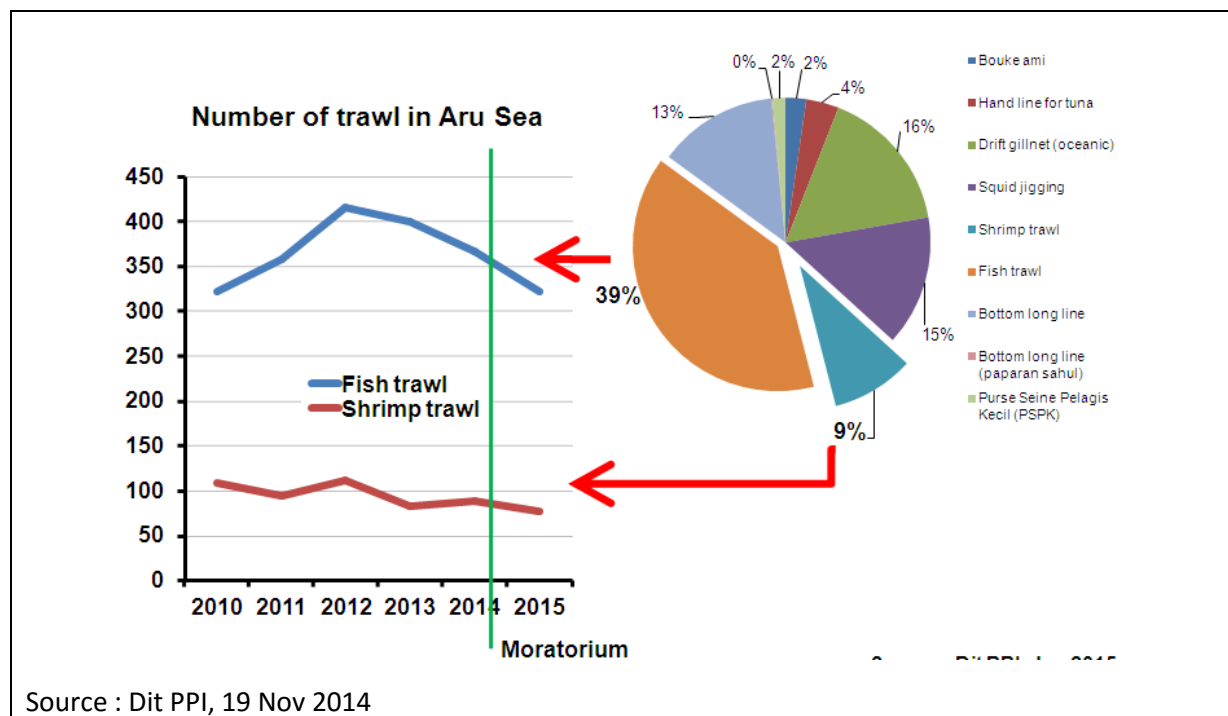
**Figure 12: Composition of fishing gear in Aru-Arafura**

Table 6: Base port of trawlers operated in WPP-NRI 718

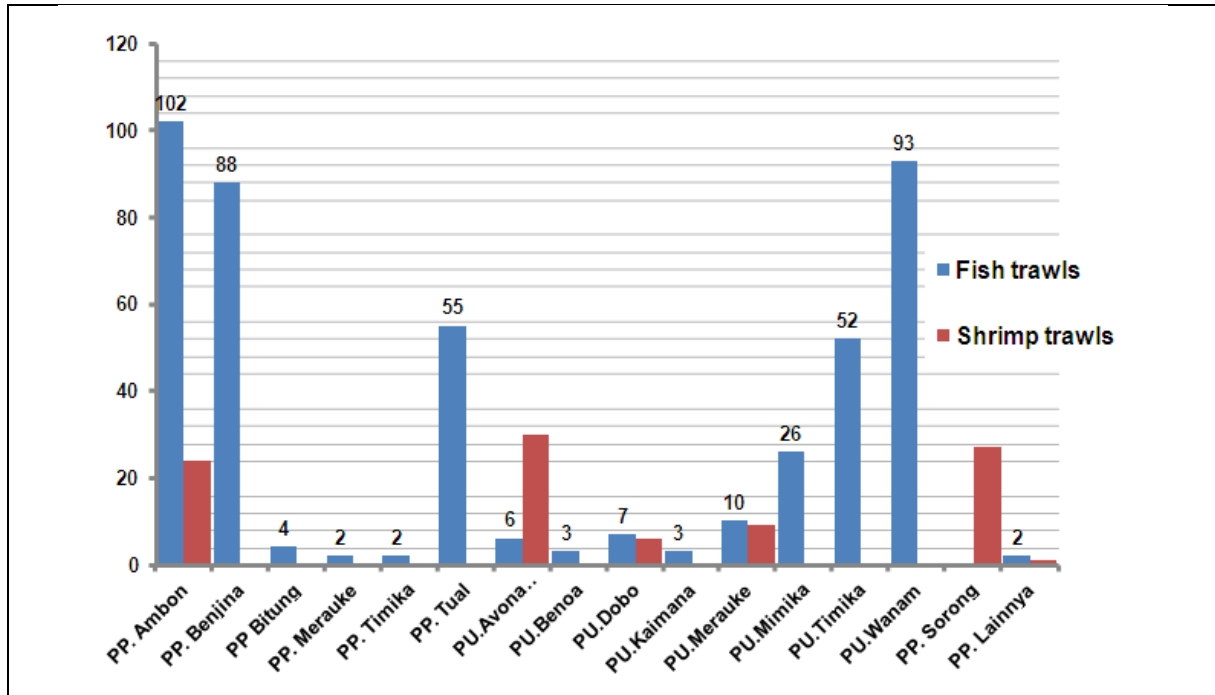
Base Port of Trawler Operated in WPP-NRI 718

No	Fishing Port	Fish trawls	Shrimp trawls	Grand total
1	PP. Ambon	102	24	126
2	PP. Benjina	88	-	88
3	PP Bitung	4	-	4
4	PP. Merauke	2	-	2
5	PP. Timika	2	-	2
6	PP. Tual	55	-	55
7	PU.Avona (Papua)	6	30	36
8	PU.Benoa	3	-	3
9	PU.Dobo	7	6	13
10	PU.Kaimana	3	-	3
11	PU.Merauke	10	9	19
12	PU.Mimika	26	-	26
13	PU.Timika	52	-	52
14	PU.Wanam	93	-	93
15	PP. Sorong	-	27	27
16	PP. Lainnya	2	1	3
Grand Total		453	97	552

Source :Dit PPI, 19 Nov 2014

The number of trawlers (fish trawl and shrimp trawl) operating in WPP-NRI 718, or Aru-Arafura Sea are scattered in various base ports, as shown in Table 6 and Figure 13.

Based on the dominance of shrimp trawl in Sorong and of fish trawl in Ambon, Local Consultative Groups were formed in these two areas.



Source :Directorate PUP - DGCF, 19 Nov 2014

Figure 13: Number of trawlers operated in WPP-NRI 718 (Based on Port)

2.7. Social

Fisheries Management Area (WPP-NRI 718) includes Aru Sea, Arafura Sea and the Sea of Eastern Timor. WP-NRI 718 covers territorial waters of 3 provinces of Maluku, Papua and West Papua Province. In addition, some districts located 4 miles from the baselines of the WPP-NRI 718 are also entitled to fisheries in the area, namely District Southeast Maluku, District West Southeast Maluku, District Southwest Maluku, District Aru Islands, District Merauke, District Mappi, District Asmat, and District Mimika.

Maluku province is an island province with an area of about 581 376 km², consisting of 527 191 km² the territorial waters and 54 185 km² land area. Maluku Province is an archipelago with 559 large and small islands. There are 4 large islands namely Seram Island (18 625 km²), Buru Island (9 000 km²), Yamdena island (5 085 km²) and Wetar Island (3 624 km²). Maluku province includes two cities and nine districts, associated with WPP-NRI 718, which are Southeast Maluku District, West Southeast Maluku District, Southwest Maluku District and Aru Islands.

West Papua province lies between 0-4 degrees south latitude and 124-132 degrees east longitude, which is located below the equator. The level of land ranges in altitude of 0-100 meters above sea level. At least 14 rivers are used as a means of transport or connecting between districts.

Fish resources in the WPP-NRI 718 are used by communities and private companies, including national fishing companies and foreign fishing companies that acquired the license to operate in these waters. Stakeholders involved in the utilization of fish resources in the WPP-NRI 718, has social and economic characteristics of different cultures. They are different among the local communities and immigrant communities recruited by the companies. The detail of the social and economic conditions in the area around Aru-Arafura waters were obtained from several sources, among others Norimarna (2012) and Maanema et al. (2006).

Kinship, customs and culture should be encouraged in order to create synergies that can be relied upon as an attempt of community building in Maluku in the future. Maluku has hundreds of sub-tribe, with about 130 languages known to have existed, and 117 languages are still actively used today.

West Southeast Maluku District is a district in the province of Maluku, with the capital city of Saumlaki. The area of West Southeast Maluku District is 52 996 km², consisting land area of 10 103 km² and sea area of 42 892 km². This area is an archipelago consisting of large and small islands with the total number of islands reaching 85, of which 57 are inhabited and 28 are uninhabited.

Aru Islands district with capital Dobo, is a new district split from Southeast Maluku District. Aru Islands consist of 187 islands, and only 89 islands are inhabited. Aru district has land and coastal ecosystems dominated by mangrove forests, seagrass beds and coral reefs. Various types of marine resources are found in this region; among those are snail pearl, in addition to crocodiles, turtles and marine mammals. The main activity is shrimp trawling. This activity may conflict with the cultivation of pearls and traditional fishing. Benjina is one of the bases of fishing activities.

One of the fishing companies located in Aru is equipped with port and fish processing plant. Cultural communities and especially the indigenous communities of Kei Islands influence the culture of Aru Islands. Residents in the region of Central Aru (Benjina) are mostly migrants coming from Central Java and Java Timur. The community is divided into two groups, with the first group having fishing as their occupation in their places of origin, and have managed to become the owners of gillnets for catching mackerel and shark fin. The second group did not have fishing as their occupation in their places of origin and, have become crew of privately-owned fishing vessels. Javanese culture is more prominent in the region. Ties to the customs and values in the local community in the Aru Islands is still very strong binding Aru public life, showed by the results of the study by PKSPL IPB (2011).

Local Wisdom

The local wisdom in the Aru Islands which is part of the traditional culture still practiced by people is known as "PELA" and "SASI" culture. In general, the villages in the Aru Islands have customary ties between the villages called "Pela". Pela is the bond of brotherhood that exists between one village to another and is equated to relationship between siblings (brothers) from one village to another or even with an oath as brothers by the ancestors of the villagers long back. Pela who have a very strong bond is usually known as "Pela Tumpa Darah". Pela can bind two or more villages.

One example of this practice is the relationship of village of Koba (with Muslims and Christians) that has a pela relationship with the people of the village Ujir (100% Muslim). Pela relationship between these two villages (called Pela Padi), is motivated by traditional rice harvest done in Koba; this required providing parts of the harvest to people of the village Ujir. Pela customary form has been the bond that strengthens inter-religious relations in the Aru Islands, because these are villages interwoven in the pela alliance in spite of having different beliefs.

In addition to their traditional values as cultural ties, their ethics and culture are also associated with human attitude and relationship to nature and the environment. For Aru and Maluku in general, human existence is an inseparable part from other environmental elements of the ecosystem. Humans are viewed as part of a holistic system of nature, which can be seen and felt on the wisdom of local culture. This is unlike the anthropocentric view, which put people at the center. Aru community from both the indigenous tribes in the Aru Islands or immigrant tribes had a cultural wisdom that humans and nature have a law of space and time that are so interdependent. One of this local wisdom is called "SASI".

Sasi is a special prohibition rule controlling exploitation of the natural resources as commonly agreed, and is usually applied to the forests, cultivated fields and seafood. Sasi is applied time or location limit though sometimes the timing is not explicitly defined as regard to validity period, due to the flexible nature of time until sufficient resources are optimally utilized/managed.

Table 7: Population of each district in Papua Island for 2013-2014

District / City	2013		2014			
	Total	Sex Ratio	Male	Female	Total	Sex Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Merauke	209 980	110.84	110 787	102 697	213 484	107.88
2. Jayawijaya	203 085	102.73	103 482	100 630	204 112	102.83
3. Jayapura	118 789	112.12	62 796	56 587	119 383	110.97
4. Nabire	137 283	113.80	73 185	64 591	137 776	113.31
5. Kepulauan Yapen	88 187	106.06	46 104	43 890	89 994	105.04
6. Biak Numfor	135 080	106.24	69 608	66 223	135 831	105.11
7. Paniai	161 324	107.57	84 315	78 174	162 489	107.86
8. Puncak Jaya	112 010	119.94	61 406	51 874	113 280	118.38
9. Mimika	196 401	129.50	111 618	87 693	199 311	127.28
10. Boven Digoel	60 403	118.02	33 225	28 058	61 283	118.42
11. Mappi	88 006	108.42	46 406	43 384	89 790	106.97
12. Asmat	85 000	108.79	44 674	41 940	86 614	106.52
13. Yahukimo	175 086	110.77	92 992	85 201	178 193	109.14
14. Pegunungan Bintang	69 304	115.75	37 607	33 090	70 697	113.65
15. Tolikara	125 326	120.18	69 297	58 229	127 526	119.01
16. Sarmi	35 508	120.59	19 416	16 371	35 787	118.60
17. Keerom	51 772	119.50	28 827	24 175	53 002	119.24
18. Waropen	26 905	111.90	14 597	13 126	27 723	111.21
19. Supiori	16 976	109.55	9 120	8 168	17 288	111.66
20. Mamberamo Raya	19 776	110.63	10 617	9 897	20 514	107.27
21. Nduga	85 894	118.99	52 184	40 346	92 530	129.34
22. Lanny Jaya	161 077	115.19	93 394	77 195	170 589	120.98
23. Mamberano Tengah	42 687	115.78	24 979	20 419	45 398	122.33
24. Yalimo	54 911	112.51	31 096	26 489	57 585	117.39
25. Puncak	99 926	109.04	52 984	48 531	101 515	109.18
26. Dogiyai	89 327	101.12	45 502	45 320	90 822	100.40
27. Intan Jaya	43 405	102.88	22 610	22 202	44 812	101.84
28. Deiyai	66 516	106.52	35 008	33 017	68 025	106.03
29. Kota Jayapura	272 544	111.77	144 440	131 254	275 694	110.05
Papua	3 032 488	112.16	1 632 276	1 458 771	3 091 047	111.89

Source: web site BPS Papua, <http://papua.bps.go.id/linkTabelStatis/view/id/37>.

Aru Islands follow “sasi” in an effort to appreciate the natural resources. In the past, sasi was heavily implemented throughout the Molluca region. For example “Sasi Teripang”, is a practice whereby when the head of the village and the local indigenous stakeholders see that the sea cucumber resources has begun to decrease, then the head of the village take the initiative to run “sasi”. The village head convince the traditional leaders, to agree on “sasi” for sea cucumbers, and then the traditional procession performed, followed by a prayer in a church or a mosque.

The population in Papua based on published data by BPS Papua through the web site can be seen in Table 7. The total population in the year 2014 was 3 091 047 with a male to female ratio almost 112%.

In 1990, there were 385 509 people in the province of West Papua, while in 2000 it was 571 107. In 2007 the population had reached 722 981. Merauke District has an area of 119 749 km², consisting of coastal, land, forest and swamp. Total population was 336 362 in 2003, of which 2.65% were fishermen and fish farmers. Table 8 shows the number of fishermen in WPP-NRI 718.

Fishermen generally are migrants from South Sulawesi. Natives generally will be crew members of the hand line and generally do fishing without use of an engine. The type of fishing gear used varies and is generally kind of drifting gillnets and trawl. Fish produce is marketed locally, inter-island and for export.

Table 8: Number of fishermen in WPP-NRI 718

No	Years	Number of Fishermen
1.	2007	256 000
2.	2008	271 000
3.	2009	243 000
4.	2010	265 000
5.	2011	257 000
6.	2012	273 000

2.8. Economy

Aru-Arafura Sea fisheries is complex and challenging partly due to the large size of trawlers which catch large amount of demersal fish and shrimp, and cause habitat destruction at least locally (Dudley & Ghofar 2006). Nevertheless, fishery resources in the Aru-Arafura Sea have contributed to the income of fishers, and the national fisheries industry as well as the foreign investment companies (ATSEA, 2011).

The large volume of fish catch per fisherman is considered to indicate excessive utilization of fisheries resources (over-exploited) in Arafura Sea, and in particular that of shrimp resources (ATSEA 2011; Purwanto, 2010). This has resulted in the reduction of shrimp stocks and thereby the production is lower than the optimum level (Purwanto, 2010). Such conditions ultimately has led to the situation where the benefits from fishing businesses have become lower than the optimum level. Some businesses have suffered significant losses (Purwanto, 2011). Conditions were similar although not identical where species of shark or rays are over-exploited (Dulvy et al., 2008; Camhi et al. 2009), and the catch of small and medium-size demersal species showed an increase in production (ATSEA 2011).

Based on the 2010 National Census, the total population recorded in 8 districts (West Southeast Maluku, Maluku Tenggara, Maluku Barat Daya, Aru Islands, Merauke, Mappi, Asmat, Mimika) were 2.8 million, with nearly 34 000 households belonging to fishermen (employed full or part time). Fishermen’s livelihood is dependent on marine resources. Marine resources and marine transportation are drivers of economic activity in Aru-Arafura. Activities such as loading and unloading

of goods in the main port in Ambon, Bintuni, Merauke, and the number of available infrastructure and transport in the region are still limited/lacking.

Based on informal information available, the minimum wage of Indonesian fishermen (in 2013) working in shrimp trawlers and fish trawlers in WPP-NRI 718 was within the range of Rp 900 000 to Rp 1 100 000 (equivalent USD 70-85) per month per crew with experience less than one year). When the minimum wage level is compared to the Regional Minimum Wage (RMW) applicable in 3 provinces as mentioned in Table 9, it appears that the minimum wage of Indonesian crew members are still below the RMW.

Table 9: Regional Minimum Wage (RMW) in province of Maluku, Papua, and West Papua

No	Province	RMW 2012 (Rp)	RMW 2013 (Rp)	Based on	Date
1	Maluku	975,000	1,275,000	Governor Agree No. 173 Tahun 2012	17-Dec-12
2	Papua	1,515,000	1,710,000	Governor Agree No. 162 Tahun 2012	10-Oct-12
3	West Papua	1,450,000	1,720,000	Governor Agree No. 561/246/12/2/2012	5-Dec-12

The dominance of foreign crew in fish trawl became one of the issues in the management of fisheries in the Arafura Sea. Based on data of permits issued by the central government for fish trawlers that operate in the area WPP-NRI 718 in 2013, there were as many as 480 units. With the fact that the Indonesian citizen crews were a maximum of 3 persons from a total number of 30 crews, it is predicted that the foreign crews reached almost 13 000 people in 2013.

Information about the investment cost is quite difficult to obtain, especially from companies that operate trawl fishing vessels ex foreign flag with the number 6 and 5 vessels unit. The cost of second-hand fish trawlers with size <200 GT) purchased in 1999 ranged between Rp 200 million to Rp 225 million. The ship is made of steel and equipped with trawl winch.

The operational costs of fish trawler cover the cost of diesel, oil, food, levies, unloading costs, mooring fees and other expenses. The operating costs per trip can be described in two categories: for size <200 GT and >200 GT. The operating costs of fish trawler with a size <200 GT is approximately Rp 1 172 million per year. The operating costs for fish trawlers with size >200 GT are approximately Rp 2 021 million to Rp 5 482 million per year. Trawler with a size < 200 GT go approximately for 10 trips per year, with each trip of about 30 days, and the number of crew of 11 people. Fish trawler of size >200 GT go approximately for 6 trips per year, and each trip takes about 45 days (Manggabarani, 2006).

Based on the sample studied, there are several boats that suffered operating losses. Feasibility of shrimp trawl that is calculated based on a representative sample size study of 100-150 GT, 151-200 GT, 201-300 GT and >300 GT trawlers, shows that the investment cost for trawlers is difficult to be used as a reference, because most ships are old and second hand. In 1988, a trawler of 200-300 GT was approximately Rp 4 600 million.

Second-hand vessels with size of 100-150 GT were purchased at a price of Rp 1 027 million (built in 2002). Number of shrimp trawlers trip averaged about 4-6 trips per year, with operating days of 45-60 days per trip, and the number of crew members at 15-23 people. Operating costs per year ranged between Rp 591 million to Rp 1 928 million (Manggabarani, 2006).

Production of shrimp trawl ranged from 45.318 tonnes to 64.448 tonnes per year. The value of production ranged between Rp 2 406 million to Rp 2 481 million. Calculation of feasibility for shrimp trawlers with size >300 GT shows that it suffered losses of about Rp 254 million per year, with the value of B/C at 0.92. Fish trawler with a size < 300 GT gained about Rp 230 million to Rp 1 114 million, with a value of B/C at 1.17 to 3.52. A shrimp trawler with a size of 100-150 GT has excellent feasibility.

Fishing vessels operating in WPP RI 718 are based in six major ports, namely Ambon national fishing port, Tual national fishing port, Kendari ocean fishing port, Kupang coastal fishing port, Sorong coastal fishing port and Merauke Public Ports and several fishing ports managed by the private sector, such as ports PT. Maritim Timur Jaya in Tual (Maluku Tenggara), port PT. Benjina Resources in Benjina (Maluku Tenggara), port Avona, Kaimana (West Papua), and port Kimaam in Merauke (Papua).

Table 10 illustrates the existing market distribution, i.e. local, regional and export. For local market, the fish catch is marketed to the traditional markets in the island of Ambon; for the regional (inter-island/area) market, fish is marketed to Benoa, Surabaya and Jakarta; and for the export market to Japan and China, Hong Kong SAR for frozen shrimp; and the frozen fish mixture is marketed to Thailand, Singapore, and South Korea.

At WPP-NRI718 IUU fishing practices result in losses for Indonesia to a tune of around Rp 20 trillion, equivalent to USD 2 billion each year (ATSEA, 2011). In order to prevent and combat IUU fishing in Indonesian waters, the Ministry of Maritime Affairs and Fisheries issued a decree No. 50 / KEPMEN / 2012 on the National Action Plan for Prevention and Control of Illegal, Unreported, and Unregulated Fishing years 2012-2016.

Table 10: Market distribution in Ambon Fishing Port (2008 - 2012)

Years	Volume (Kg)			Total (Kg)
	Local	Regional	Export	
2008	3 423 759	24 546	2 756 808	6 207 121
2009	334 175	4 070 202	8 507 532	12 913 918
2010	338 638	3 576 175	54 615 028	58 531 851
2011	518 149	2 349 998	69 626 818	72 496 976
2012	223 148	2 450 300	71 589 717	74 265 177
Total	4 837 869	12 471 221	207 095 903	224 404 993

Source: Ambon National Fishing Port, 2013

Analysis of the fish species composition was done based on the quantity of fish caught by the dominant three (3) types of gear, i.e. shrimp trawl, fish trawl and bottom longline.

2.8.1. Shrimp trawl

The composition of the shrimp trawl catches consisted of white shrimp, tiger shrimp and other shrimp, and the bycatch consisted of Leaf-tail croaker (gulamah), Leognathidae (petek), and Nemipteridae (kurisi). The composition of each type of shrimp and bycatch are specified in Table 11.

Table 11: Catch composition of shrimp trawl.

No	Local Name	Scientific Name	Catch Composition
1.	Udang putih	<i>Penaeus merguensis</i>	40.0
2.	Udang windu	<i>Penaeus monodon</i>	28.0
3.	Udang lainnya	-	32.0
Total			100.0
4.	Gulamah	Scianidae	33.7
5.	Petek	Leognathidae	18.2
6.	Kurisi	Nemipteridae	7.5
7.	Kerong-kerong	<i>Therapon</i> spp	6.9
8.	Gerot-gerot	<i>Pomadasys</i> spp	6.8
9.	Beloso	<i>Saurida</i> spp	6.0
10.	Layur	<i>Trichiurus</i> spp	2.2
11.	Kakap	Lutjanidae	1.7
12.	Bawal putih	<i>Pampus argenteus</i>	0.9
13.	Bawal hitam	<i>Formio niger</i>	0.6
14.	Kuwe	<i>Caranx sexfasciatus</i>	0.3
15.	Lainnya	-	15.2
Total			100.0

Source: 61/KEPMEN-KP/2014 on Productivity of Fishing Vessels

2.8.2. Fish trawl

The composition of fish trawl catches consisted of kurisi, gulamah, layur and other species, with the bycatch including white shrimp and other shrimp species. The composition of each type of fish and bycatch are specified in Table 12.

Table 12: Catch composition of fish trawls.

No	Local Name	Scientific Name	Catch Composition
1.	Udang putih	<i>Penaeus merguensis</i>	80.0
2.	Udang lainnya	-	20.0
Total			100.0
3.	Kurisi	Nemipteridae	12.0
4.	Gulamah	Scianidae	10.0
5.	Layur	<i>Trichiurus</i> spp	5.0
6.	Pari	Rhinobatidae	2.3
7.	Manyung	<i>Arius</i> spp	8.0
8.	Kuwe	<i>Caranx sexfasciatus</i>	7.0
9.	Beloso	<i>Saurida</i> spp	5.4
10.	Kakap	Lutjanidae	5.0
11.	Kembung	<i>Rastrelliger</i> spp	5.0
12.	Sardine	Clupeidae	3.9
13.	Hiu/cucut	Hemigalidae	3.0
14.	Biji nangka	Mullidae	9.9

15.	Pisang-pisang	Casio spp	2.8
16.	Petek	Leognathidae	9.5
17.	Golok-golok	Chirocentrus dorab	1.1
18.	Cumi	Loligo spp	0.6
19.	Gerot-gerot	Pomadasys spp	0.6
20.	Kacangan	Sphyraena spp	0.5
21.	Kerapu	Epinephelus spp	0.5
22.	Bawal hitam	Formio niger	0.3
23.	Lidah/sebelah	Cynoglossus	0.3
24.	Bawal putih	Pampus argenteus	0.1
25.	Senangin	Eletheronemo tetradactylum	0.1
26.	Lainnya	-	6.6
Total			100.0

Source: 61/KEPMEN-KP/2014 on Productivity of Fishing Vessels

3. Trawl ban phase II

The issuance of Ministerial Decree No.2/PERMEN-KP/2015 on Prohibition of the use of Trawls and Seine Nets (trawl ban) dated 9 January 2015 has gradually stopped trawl fishing (Figure 14). According to this decree, the licenses for trawl and seine net gears that had been issued before the decree, were still valid until the license expires. The main goal of this decree is to reduce the use and practices of destructive fishing gears in Indonesian waters. At present, the trawl & seine net fishing ban has completely taken place because the last 1 (one) year period of fishing license had expired on 9 January 2016. It is strongly believed that the (shrimp) resources have started to recover.

Furthermore, based on Ministerial Decree No.56/PERMEN-KP/2014 of 3 November 2014 on Moratorium for Fishing Vessels Built Overseas up until 30 April 2015, which was prolonged up until 31 October 2015 under Ministerial Decree No. 10/2015, less vessels are fishing in Indonesia waters. These two consecutive decrees complete a 1 year cycle of licenses system in Indonesia. Thus, there is no built-overseas vessel operated in Indonesia waters.

The IUU fishing activities that have been carried out by fishing vessels build overseas (called ex-foreign) triggered Permen No. 56/2014. However, not all ex-foreign vessels conduct IUU fishing, such as shrimp trawlers under the HPPI that catch shrimp fishing in the Arafura Sea. Shrimp trawlers were operated by the company originally partnered with Japanese companies in the 1970s; the partnership ended in the 1990s and HPPI has become a national company.

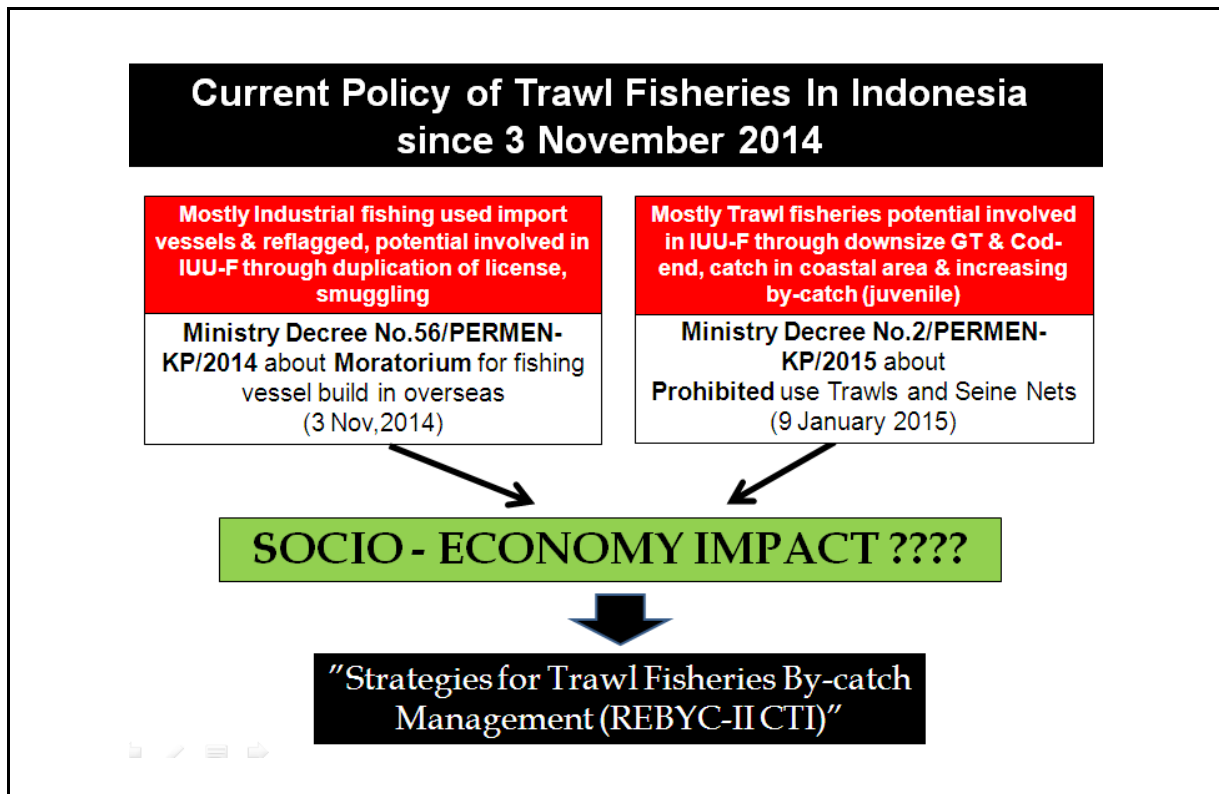


Figure 14: Trawl ban scheme policy of moratorium

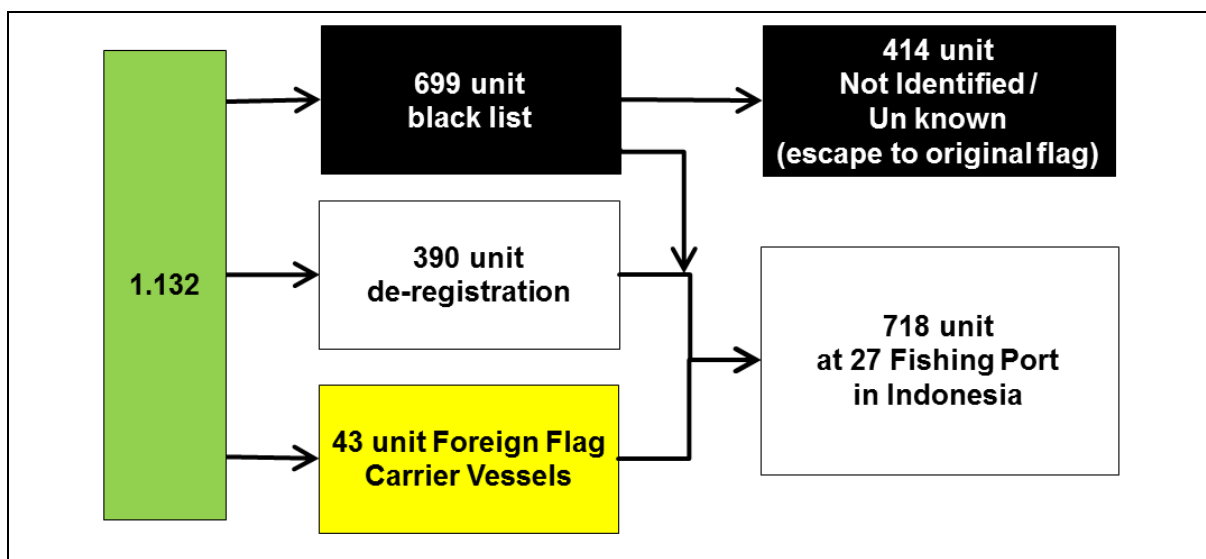
Offenses often committed by ex-foreign fishing boats are violation of the provisions of the regulations in the decree 30/2012 on fishery business that has been updated by decree 26/2013, namely:

1. The catch of the vessels is not landed in Indonesia, but was taken directly to the home country of the vessel;
2. Catch of the vessels are directly moved to the transport vessel at sea without reporting to be taken abroad (do transshipment, secretly or illegally);
3. The use of foreign crew conflicts with Law No.45 / 2009 on the Amendment of Act No. 31 of 2004 on Fisheries, Article 35A.

It is difficult for inspectors from Directorate General of Surveillance and Indonesian Navy to identify illegal and legal foreign fishing vessels using the Indonesian flag in Indonesian waters. This has encouraged foreign fishing vessels to fish without a permit (SIPI). This is compounded by changing the ship's name to an Indonesian name. This is so called double-flag practices in Indonesia waters.

Implementation of the moratorium on 3 November 2014 has successfully identified foreign-made ships numbering 1 132 units consisting of various fishing gear and operating throughout Indonesia. Trawl was the dominant fishing gear (54%), with 8% shrimp trawl and 46% fish trawl (Figure 15).

Trawlers (ex-foreign) authorized to fish in certain waters such as the Strait of Malacca, the South China Sea and Aru-Arafura Sea were up to 616 units. Trawl dominated fishing vessels operating in the Arafura sea-Aru at total 84%, with 9% of shrimp trawler and 75% fish trawler.



Source: Task Force IUU fishing (Press Release)

Figure 15: Status of ex-foreign fishing vessels under evaluation

Results of the evaluation of 1 132 ex-foreign ships carried out by the Task Force on IUU fishing revealed (Figure 15):

- a) 699 ships are black-listed because of serious violation;
- b) 390 Indonesian-flagged vessels can be de-listed (de-registration) if they pay the appropriate amount of tax liability and get cleared by the Directorate General of Taxes, and secure clearance from the Directorate of Sea, otherwise the vessel will be destroyed;
- c) 43 unit carrier vessels with foreign flag cannot operation and should be out from Indonesia.

During the evaluation process it turned out that 414 units were unaccounted for and believed to have escaped and returned to their home country. The remaining 718 units were still in 27 ports in Indonesia.

The statement by honorable Susi Pudjiastuti, Minister of Maritime Affairs and Fisheries given in the "Press release" (Figure 16) on September 17, 2015 referring to the results of monitoring and evaluation team, recommends an assessment to measure the compliance of companies and fishing boats, based on 9 criteria, which are as follows:

1. The legality of ownership of the vessel (including a original ship registered; vessels have other Indonesia flag; deletion certificate cannot be authenticated; and the validity of the provision of the ship cannot be proven);
2. The presence of the skipper and crew (crew) foreigners;
3. Vessel Monitoring System active transmits (there are evidence that the ships do not ever turn on the transmitter during a license period SIPI / SIKPI applicable);
4. Transshipment illegally;
5. Violations of fishing area boundaries;
6. Compliance with the fishing vessels permit in SIPI (such as the size mark down the ship and the use of fishing gear that is not in accordance with SIPI that is based on the findings of field verification);
7. Indications in crime (including the practice of forced labour and human trafficking);
8. Do not fulfil the obligation to build or partner with a processing unit (UPI); and

9. Does not fulfil the obligation of landing at the port designated in accordance with valid licence (SIPI / SIKPI)

Evaluation of the ex-foreign vessels indicate several types of violations, among others:

1. Use of counterfeit documents covering up or altering the vessel deletion Certificate (from flag state), import documents, letters measuring vessel (GT).
2. The vessel use double flags, for easy movement between states,
3. Deactivation of VMS
4. Not paying import tax on the purchase of a ship from foreign company
5. Inaccurate reporting of catch because fish exports are mostly done via transshipment at sea
6. Abuse of foreign crew and activities of human trafficking and labour force. This includes recruiting of child labour, putting crew in remote areas, which result in loss of communication and not paying salaries and social insurance.
7. Some companies just functioning as agents or facilitators for foreign vessels operating in Indonesia, and thereby not doing real business, so it does not create multiplier effect.

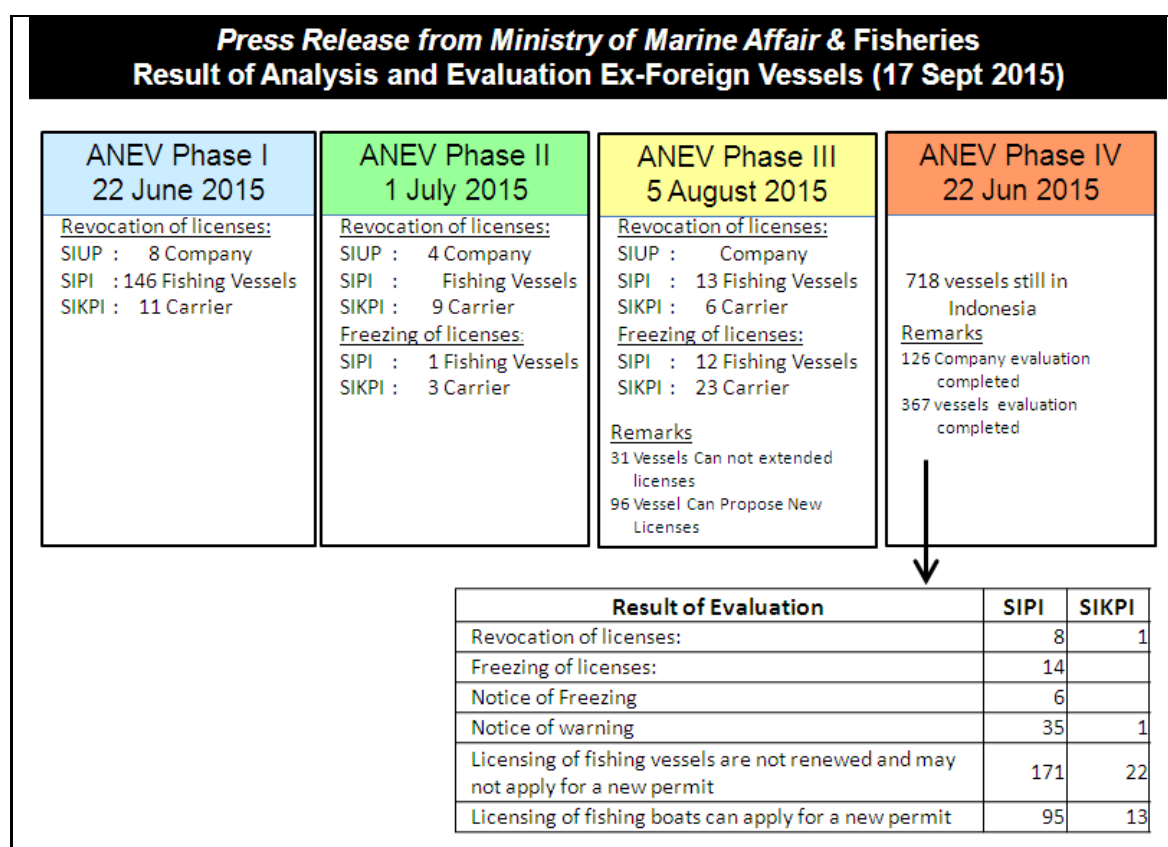


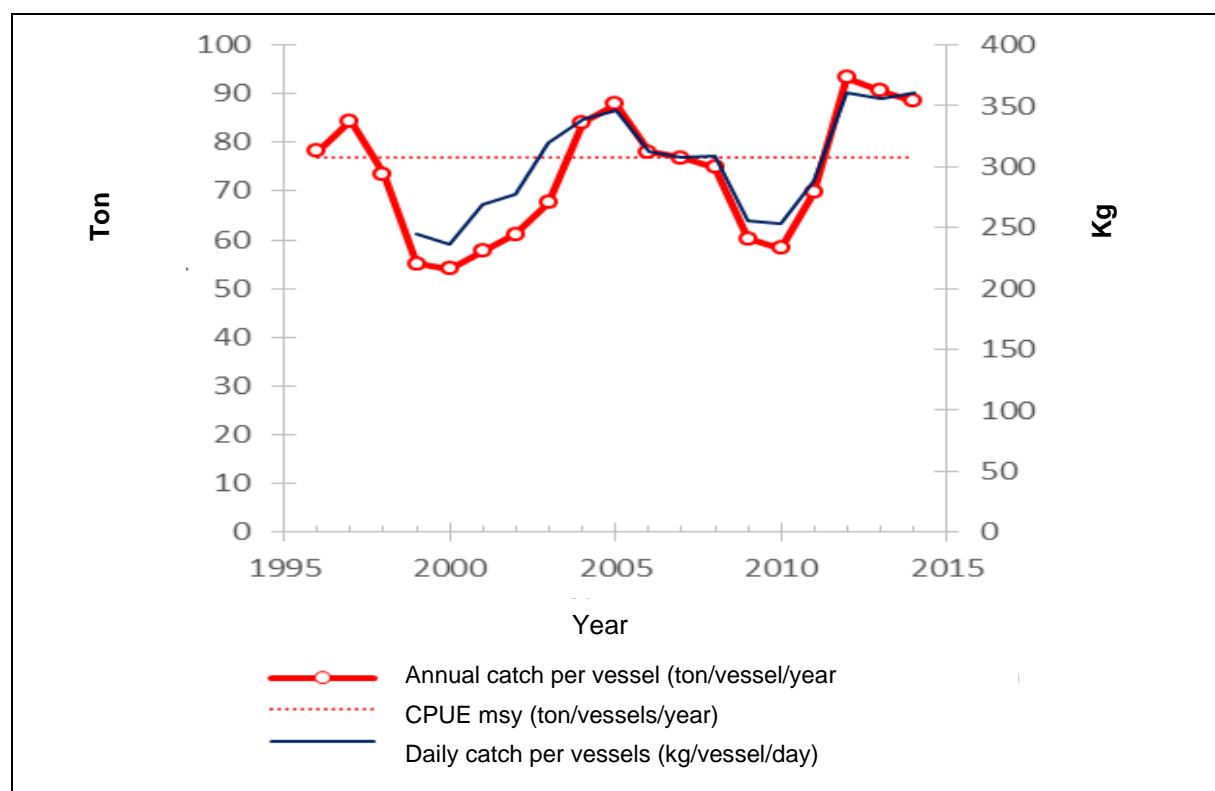
Figure 16: Result of analysis and evaluation ex-foreign.

4. Impact trawl ban phase II

4.1. Shrimp fishery in the Arafura

Data collected by the association HPPI since 1995 shows that there are fluctuations in catch per unit effort (CPUE) in line with the policy of trawlers in Indonesia (Figure 17). The annual catch of trawler in year 2014 for shrimp (Tiger shrimp and Banana prawn) reached more than 90 tonnes / vessel / year. The chart also showed that total shrimp catch on a daily basis was more than 350 kg / vessel / days.

The moratorium of ex-foreign vessels and trawl banning give impact for decreasing fishing pressure in Aru-Arafura, because most of trawlers are not operated. Based on data from 55 unit vessels that are still operating under the HPPI association, in 2014 there were 55 shrimp trawlers from HPPI members producing 4 325 tonnes, which operates a total of 12 385 days. If calculated, the average catch of each vessel would be 78 629 kg/month or equivalent to 349 kg/vessel/day operation.



Source : HPPI, 2016

Figure 17: Trend of Catch Per Unit Effort for shrimp in Aru-Arafura Sea (1995-2015)

In 2015 the production of banana prawns (Jan-Jun 2015) amounted to 633 kg/vessel/day, an increase of 149% compared to 2014. The production of Tiger Shrimp (Aug-Sept 2015) amounted to 435 kg/vessel/day, an increase of 160% compared with 2014.

Banana Prawn (Catch Per Unit Effort)

Shrimp trawlers who operated for banana prawn catch during the years 2014-2015, showed that after the moratorium was applied on 3 November 2014, better capture resulted (Figures 18 & 19).

Figure 19 shows similar seasonality for tiger shrimp and banana prawns, which generally occur in September to February.

During the ban some trawlers with unexpired licences were still in operation. Based on the data from 5 unit trawlers that were still in operation, it was evident that the catch rate of these trawlers increased in the short term showing the positive impact of the ban. In Figure 19, production of a vessel, which targeted banana shrimp in 2015, was 890 kg/vessel/day, and declined in May-June. In year 2014 catch of banana shrimp was 520 kg/vessel/day.

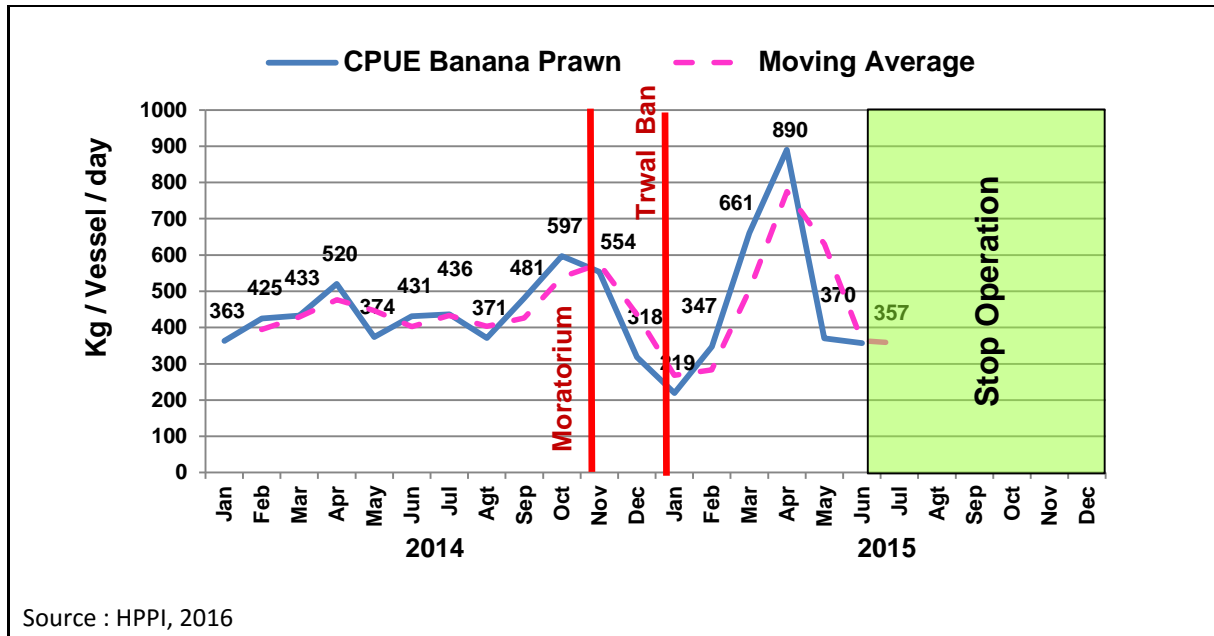


Figure 18: Catch per Unit Effort for banana prawn (base on 5 vessels)

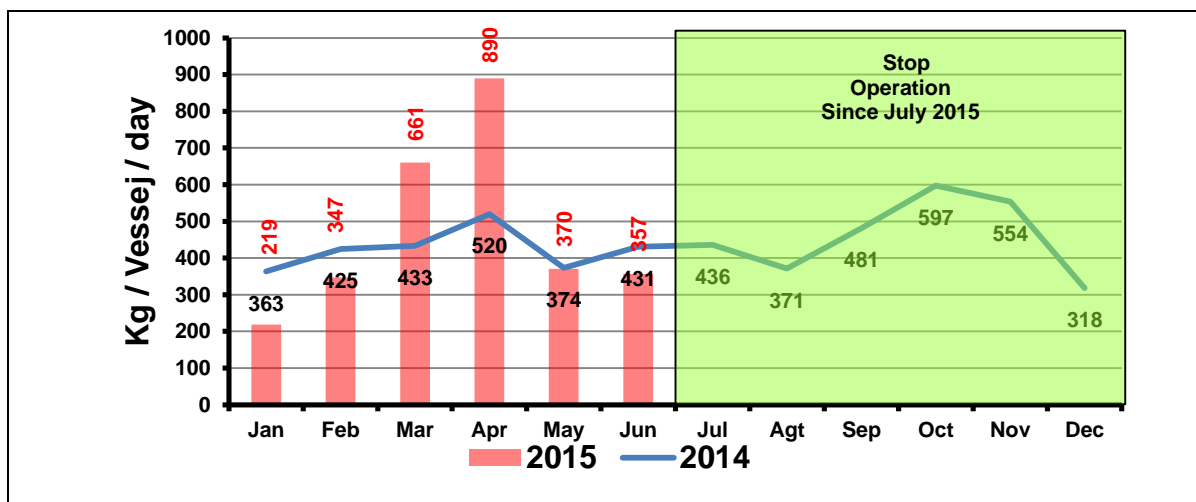


Figure 19: Trend Catch Per Unit Effort for banana shrimp (5 vessels)

Tiger Shrimp (Catch Per Unit Effort)

Shrimp trawlers who operated for tiger shrimp catch during the years 2014-2015, showed that after the moratorium was applied on 3 November 2014, comparison of the catch in the same month (agust-September) showed better capture results (Figures 20 & 21).

Based on results from 11 vessels that are still operating, it was evident that total catch amounted to 481 kg/vessel/day with tiger shrimp as target. Data from one company that was still operating during May-August 2015 showed that there were very high catch rates, amounting to 414 kg/vessels/day in August and increased to 703 kg/vessel/day in October 2015. Unfortunately, the license expired in October 2015 and could not be extended (Figure 21).

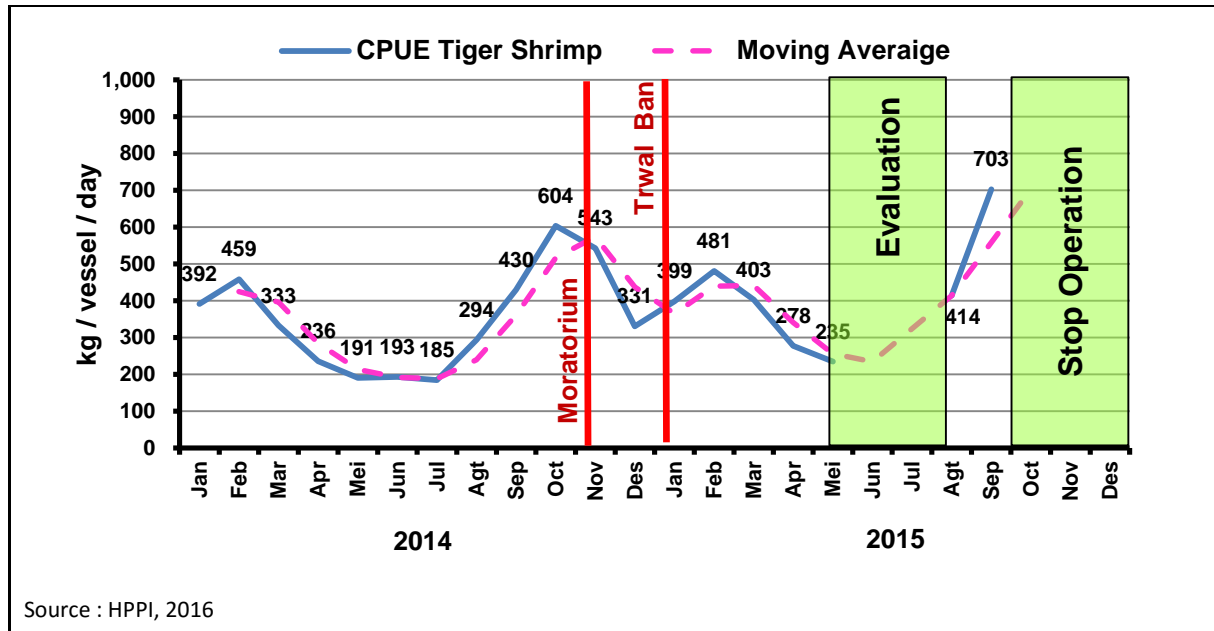


Figure 20: Trend Catch Per Unit Effort for tiger shrimp (11 vessels)

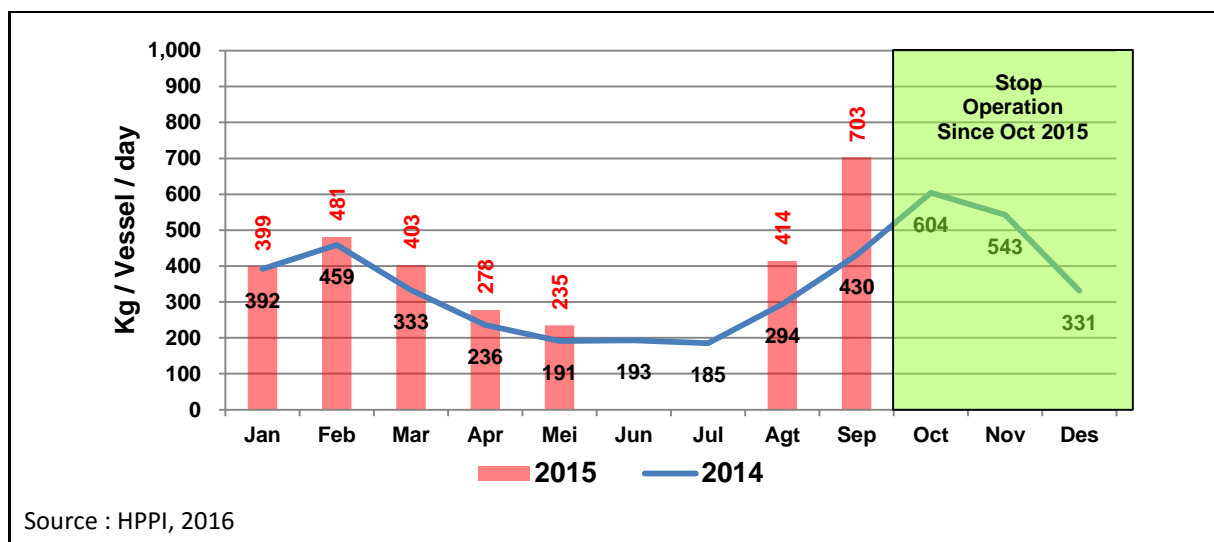


Figure 21: Trend Catch Per Unit Effort for tiger shrimp (base on 11 vessels)

The potential positive impact for small-scale fisheries resulted from trawl ban phase II is the fact that there are some claims from fishers that they are now able to fish in nearer distance than in the past. The fishers also feel they nowadays can catch more in the same fishing ground with short time fishing operation.

4.2. The value chain of trawl fishing activities in Aru-Arafura

The value chain of the trawl fishery activities in Aru-Arafura is illustrated in Figure 22.

There are two types of commercial trawlers operating in the Aru Sea i.e. fish trawl and shrimp trawl:

- Shrimp trawlers are incorporated in HPPI. Fish (bycatch) are brought to the port when there is remaining space in the cold storage. Otherwise the bycatch is discarded at sea. Catch of shrimp is landed in the company's private port, and packaging is done prior to export by carrier ship. Most of the landed fish is marketed for local consumption around the harbour bases or to the island of Java.
- Fish Trawlers are incorporated with another association. All catches are retained and there are no discards at sea. Transshipment is done on the fishing grounds and at the port, to carrier vessels, so much of the data go unreported. Only a small portion of fish is marketed in the local market.

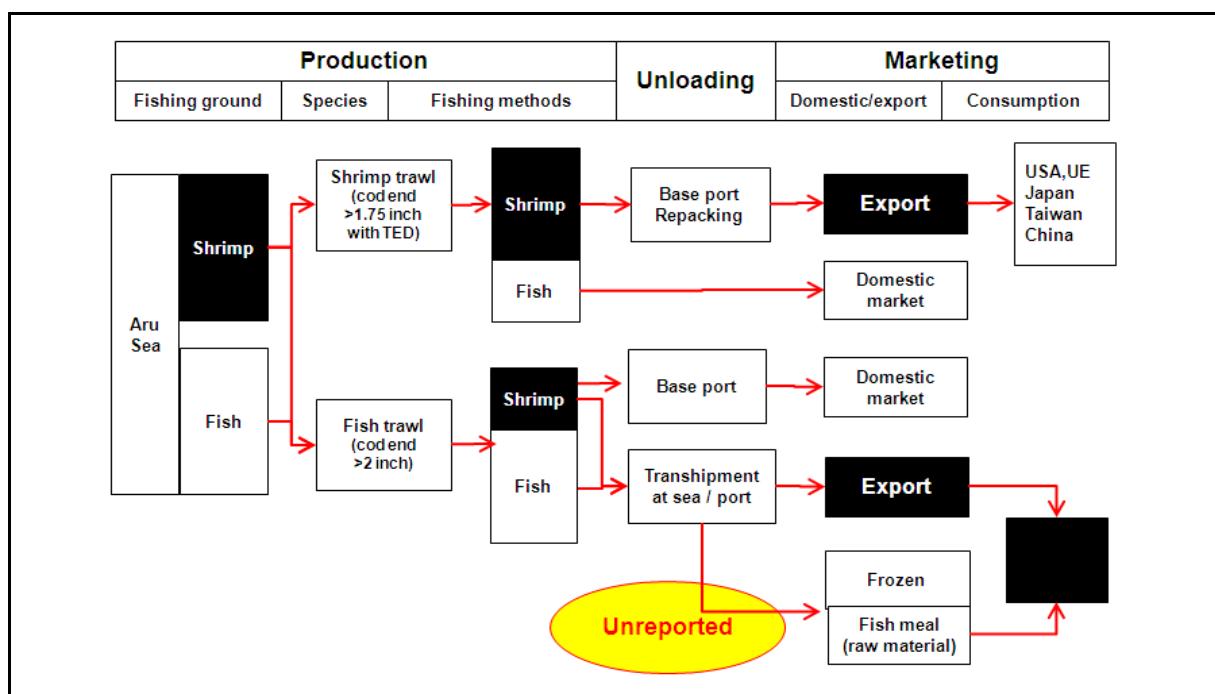


Figure 22: Diagram of value chain trawl fisheries in Aru-Arafura Sea

Companies, who are part of the association HPPI, operate 55 shrimp trawlers in Aru-Arafura Sea, with total operating days between 226-244 days per vessel per year. Shrimp production is sold and marketed locally in Indonesia and exported to Japan, China, Australia and several other countries. The Japanese market is a market with huge potential. Details are shown in Table 13 and Table 14.

Table 13: Market distribution of shrimp (tonnes)

Years	No of Vessel	day operation /vessel/ year	Market (Tonnes)					
			JAPAN	RRC	AUSTRALIA	Others Country	LOCAL	TOTAL
2012	57	244	2 281	338	-	1 378	98	4 095
2013	55	227	2 057	952	-	1 407	107	4 523
2014	55	226	2 157	806	7	1 319	21	4 310

Source: HPPI (Association Company for Shrimp Trawl in Indonesia)

Table 14: Market distribution of shrimp (USD)

Years	No of Vessel	DayOperation /vessel/ year	Market (Value – USD)					
			JAPAN	RRC	AUSTRALIA	Others Country	LOCAL	TOTAL
2012	57	222	25 195 321	5 351 769	-	18 790 848	1 518 024	50 855 962
2013	55	226	20 623 373	11 898 107	-	15 465 626	1 191 514	49 178 620
2014	55	225	22 600 911	11 294 410	73 936	14 661 694	134 739	48 765 690

Source: HPPI (Association Company for Shrimp Trawl in Indonesia)

The shrimp trawl catches is dominated by Tiger Shrimp (*Penaeus monodon*) 44.4%, followed by Banana shrimp (*Penaeus merguensis*) 21.9%, and Ende (*Endeavour sp.*) 16.4%, based on the data of HPPI (year 2014) (Table 15).

Table 15: Composition of shrimp production

Years	No of Vessel	day operation /vessel/ year	no of hauling /vessel/ year	Total Catch (kgs)	Composition (%)			
					<i>P. monodon</i>	<i>P. merguensis</i>	<i>Endeavour sp</i>	others
2012	57	222	1 967	4 497 662	41.7	27.0	15.8	15.5
2013	55	226	1 978	4 389 010	43.1	23.0	16.8	17.1
2014	55	225	1 969	4 324 613	44.4	21.9	16.4	17.3

Source: HPPI (Association Company for Shrimp Trawl in Indonesia)

Trawl vessels are generally operated by a crew of 20-25, bringing the estimated total number of crews as 13 800 persons. Each company is supported by a processing unit with a capacity of 1 000 tonnes of cold storage, which employs a staff of 250 persons. In Aru-Arafura Sea, there are 7 companies belonging to the Indonesian Shrimp Catching Entrepreneurs Association (HPPI) and there are 35 companies belonging to other associations. The estimated total number of processing staff employed by the 42 companies is 10 500 persons. This gives an indication of the socio-economic impact to be addressed.

4.3. Impact

Martosubroto et al. (2015) explained the impact that could occur from implementing a fish-licensing moratorium in WPP-NRI, and can be broadly grouped into environmental and economic aspects.

The environmental impacts that may occur from these policies generally have a positive impact on the main fish resources and the environment, which is as follows:

1. If within six months half the number of ex-foreign fishing vessels in question is not in operation (estimated between 200-400 boats), then the fishing pressure on fish resources will be reduced, so that the impact in terms of biology such as the number of fish which will spawn will be more than usual. This condition is expected in the number of juveniles (recruitment success) which will increase, especially for fish whose age is short, such as: shrimp (4-6 months), kurisi, etc.
2. If the period of the moratorium is extended for 2-3 years, the biological impact will be more significant, with the increasing trend of CPUE (catch per unit of fishing effort) of fishing vessels operation.
3. Reduced damage in ecosystems and fish resources. With a reduced number of ex-foreign vessels fishing, which generally use destructive fishing gear, such as shrimp trawl and fish trawl, the estimated damage to ecosystems and fish resources will be reduced. The resources will have the chance to recover, because the marine aquatic ecosystem and fishery resources are renewable.

Meanwhile, the economic impact that may occur as a result of this policy can be positive and negative. The positive economic impacts are as follows:

1. Reduced fishing pressure by ex-foreign fishing vessels, will certainly benefit fishing vessels nationwide, as expected catch will rise, which in turn will contribute to the welfare of the Indonesian fishermen, either directly or indirectly.
2. Reduce the state losses due to IUU fishing practices conducted by ex-foreign vessels which is estimated at more than Rp 7.5 trillion (information based on Tempo News, June 29, 2014). Moratorium within a period of 6 months is expected to reduce IUU fishing of as much as 200-400 units ex-foreign fishing vessels. Generally IUU fishing operates in the Natuna Sea and Arafura Sea.
3. Improving the system of fisheries management and licensing of national fishery business, which then is expected to optimize the economic benefits for the country of Indonesia, through tax revenues and non-tax revenues (PNBP). The period of moratorium is an opportunity to conduct the review and evaluate the fishery management plans and fishing licensing system. This is also an opportunity to review the regulations related to fisheries management (capture) based on the precautionary approach and the ecosystem approach to fisheries (EAF). Also, it should review or strengthen licensing system and make documentation fool proof specially for the ex-foreign fishing vessels, so the opportunity to manipulate the documents can be removed.
4. This is an opportunity to conduct the review of policy on the use of fish resources by the ex-foreign fishing vessels. The study of state losses due to illegal fishing has been done, both in the official report and the investigation report in the mass media, and show the value of the loss was very high. The period of the moratorium can certainly be used to carry out a policy review of the utilization of the fish that has opened up licensing for fishing by ex-foreign vessels.

The negative economic impacts can be explained as follows:

1. Decreased PHP (Fishery Products Fee). The moratorium will cause a reduction in PHP. However, the declining value of PHP is not comparable with the losses caused by IUU fishing by ex-foreign fishing vessels resulting in damage to fish resources and ecosystems.
2. Reduced employment opportunities for Indonesian crew on ex-foreign fishing vessels. Losses due to reduced employment opportunities for Indonesian crew as a result of the moratorium would be considerable though the actually affected Indonesians are to be assessed, because many ex-foreign fishing vessels need not necessarily employ Indonesian crew.
3. It is estimated that there would be a decline in the supply of fish for fish processing units (UPI). It remains to be clarified and studied in greater depth, because the condition before the moratorium also showed that a large number of fish transferred via transshipment are taken directly out of the country.

5. Conclusions and recommendations

The conclusion of the implementation of the moratorium and the ban on trawling for the environmental aspects of fishing activities, are as follows:

1. Provides rest period for exploitation and improves the condition of the aquatic environment
2. Reduced IUU-fishing
3. Reduced human trafficking
4. Small-scale fishermen's role in the economy restored.

Recommendation that can be submitted to improve the management of shrimp in Aru-Arafura are as follows:

1. Shrimp fishing areas have been identified and can be managed well by making clear boundaries for the fishing areas, and in particular, set the fishing season, and the minimum size of shrimp allowed to be caught. At the time if the composition of shrimp caught are more below the allowable size, then the management can be applied by closing fishing season;
2. Restrictions on the number of trawl vessels that should be allowed to operate in order to maintain optimum productivity of each trawl vessel so as to provide profits for the fishing companies.
3. Re-examine appropriate fishing gear to catch shrimp and maintaining the quality of the shrimp.
4. Small-scale fishermen are using gillnets, trammel net and traps to catch shrimp. But shrimp production from these gears often result in some physical damage on shrimp. There is a need of upgrading skill to improve shrimp quality and appearance of shrimp caught according to the demands of export markets.
5. Increased adherence to the application of regulations consistently and continuously. This will support transparency and licenced utilization of fish resources such as vessel size, the company obtaining necessary license, publicizing violation by any, the use of vessel monitoring system, maintaining export documents and complying with tax and evaluation.
6. Application of Fishing Work Agreement (FWA) and social security for the crew can improve protection in preventing human trafficking and forced labour.
7. To keep the economy through export shrimp fishery, there is need for strengthening the cooperation pattern of fishing communities in the model of "INTI-PLASMA", including the following:

- a. "INTI-PLASMA" is a model of partnership between large-scale enterprises with a group of small-scale fisheries. This pattern has developed and grown in some areas for certain commodities such as seaweed and live fish.
- b. Existing shrimp fishing industry can act as an "INTI" (core). Company has port facilities, cold storage, network marketing, etc. and utilize the ex-trawler vessels for collecting and transporting shrimp from all fishing village;
- c. Developing the fishing vessels that are given to small-scale fishermen who act as "PLASMA" to supply shrimp to the processing unit owned by INTI. Plasma can involve small-scale fishing communities locally or from outside the Arafura region.
- d. To provide proper storage for shrimp as simple as a cool box that can store the shrimp a few days to maintain the quality of the shrimp, while awaiting shipment through the carrier ship.

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