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MANAGEMENT MEASURES OF SHRIMP TRAWLING FISHERY IN ARAFURA SEA, INDONESIA: A CHALLENGE

Nurul Af-idati*, Sang-Go Lee

Department of Marine Business and Economic, Pukyong National University, Busan, South Korea

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ABSTRACT

Since there were many evidences on trawling impact to the environment and society, government has banned trawl operations in Indonesian waters except for those in the Arafura Sea. It is not solely acquitted trawl operation in the area without restrain, but it has been put together with the measures taken to exploit the shrimp resources in optimal manner. Those are input controls, output controls and technical measures. This paper examines two major challenges in applying these management measures: declining of shrimp stock and lack of legal enforcement. Come what may the fishing regulations impose in the shrimp trawling, without effective enforcement, the purpose of fisheries management unlikely will be achieved.

Keywords: Fisheries, management, trawling, Arafura Sea, Indonesia

***Correspondence**: Phone : +62-81329421982; afidati@gmail.com

INTRODUCTION

Arafura Sea is one of the most productive fishing ground of penaeid shrimp in Indonesia (Monintja *et al.,* 2006). Considered as the most effective fishing gear to fish shrimp, shrimp trawl had first started commercially in 1966 (Evans and Wahju, 1996; Nurhakim, *et al.,* 2008). Since then, shrimp trawl fishery has been developed rapidly in all Indonesian waters. The impact of the fishery are declining of fish populations which has been traced by fisheries scientist, conflict between trawl operators and artisanal fishermen who were competing for the same resource in inshore waters which result on injured party (Purbayanto, 2008). Therefore, under Presidential Decree no 39 of 1980, a ban on trawl operations was enforced to all Indonesian waters through several stages, except for those in the Arafura Sea. Thus, Arafura Sea is the only remaining area of sea in the country where the commercial trawling, with some conditions, is permitted. During 28 years after trawl ban, the shrimp trawling fishery in Arafura Sea has not been without any problem. Nomenclature of trawl, severe disturbance to the seabed and large percentages of unwanted bycatch have been appear to be threats for sustainability of shrimp trawling fishery (Purbayanto, *et al.,* 2004). It seems that the enforcement of trawl ban had been failed to recognize Government's role in addressing such environmental problem and fishery resources depletion.

This paper focuses on what Indonesian Government has attempt in managing shrimp trawl fishery in Arafura

 ISSN : 1410-5217

Sea and its problems on declining shrimp stock and inadequate law enforcement, as this related to the need of improvement of legal framework of shrimp trawling in Arafura Sea.

Shrimp Trawling

There are 19 species of shrimp identified inhabit seabed of Arafura Sea (Nurhakim, 2008) which are dominated by five species; Endeavour shrimp, Spinny lobster, Tiger shrimp, White shrimp and Banana shrimp (Martosubroto, 2005). According to the fisheries stock assessment by Ministry of Marine Affairs and Fisheries (MMAF/*DKP*) and Indonesian Institute of Sciences (*LIPI*) in 2002, the potency of penaeid shrimp in Arafura Sea is 43,100 tonnes/year and the Total Allowable Catch (TAC) is 34,480 tonnes/year. Meanwhile, the production of shrimp trawling has reached 36,670 tonnes/year (Purbayanto, 2008). Since 1984 the utilization of shrimp resources show the high exploitation rate, contributing around 30% of total shrimp export from Indonesia (Nurhakim, e*t al.*, 2008)

The shrimp trawls operated in Arafura Sea are typically double rig otter trawl which works by dragging the net along the bottom of the seabed at a rate of about 2 to 3.5 knots (around 4.5-6.5 km/hr), scraping up shrimp and everything else in the net path. In fishing effort, the duration of fishing trip for trawl vessels is from 40 to 60 days and the average of fishing days at the sea is approximately 280 days in a year (FAO, 2001). As shown in **(Fig.1)** the trawl productivity from 1994-2006 has been fluctuating with declining trend.

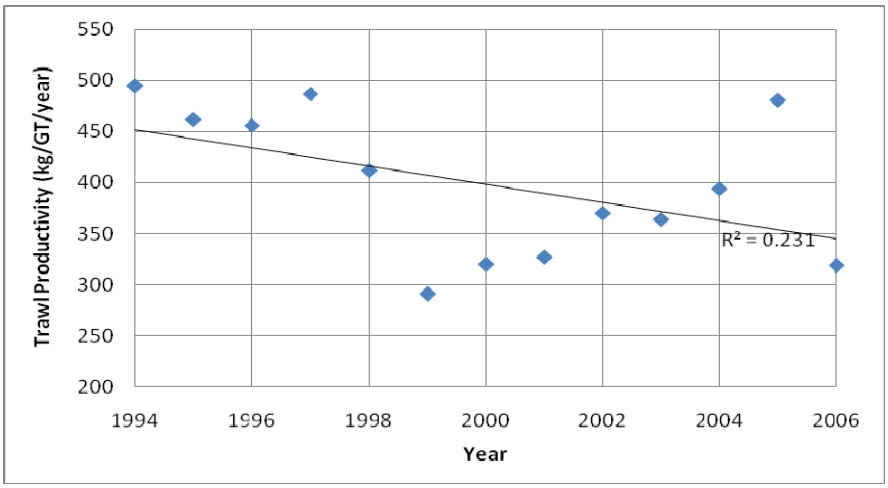

Fig 1. Trend of shrimp trawl productivity in Arafura Sea (Source: Nurhakim, *et al*., 2008)

Since Indonesian government issued a trawl restriction through President Decree in 1980, shrimp trawl net (*pukat udang*), a similar to shrimp trawl but the seine net attached with By-catch Excluder Device (BED), has been the replacing gear (Monintja *et al.*, 2006). Nevertheless, the structure of shrimp trawl net is remain unchanged, both rig structure and operating ways. The only difference is that shrimp trawl net is attached by a filter to exclude non target species (by catch). For simplicity, the term "shrimp trawl" will be keep used throughout instead of shrimp trawl net.

The main legal product issued by Indonesian government, Presidential Decree no 39 of 1980, had eliminated trawl operation in Indonesian waters excluding the Arafura Sea. This had been implemented through following several phases.

The first implementation phase is definition of banned trawl models. The

 ISSN : 1410-5217

decree describes the structure of banned trawl which is a pouch-like shaped net with a beam or an otter board pulled by a vessel or more. Furthermore, it also explained in local name as *pukat harimau, pukat tarik, jaring tarik* etc. Second phase of trawling restriction implementation is reduction of total trawl vessel operating in Indonesian waters become 1000 units. This regulation had been imposed for one year, from July 1st 1980 to July 1st 1981. The third phase is Presidential Decree No. 85 of 1982 which allows shrimp trawls operate in Arafura waters beyond 10 meters isobath line **(Fig. 2)**. The last phase is Presidential Instruction No. 11 of 1982 on implementation of Presidential Decree No. 39 of 1980 which banned trawling totally in all Indonesian waters, except for those in Arafura Sea.

Management Measures

The exclusion of trawling ban in Arafura Sea is not solely acquitted trawl operation in the area without restrain, but it has been put together with the measures taken to exploit the shrimp resources in optimal manner.

Those include controlling fishing efforts into sustainable level of fisheries resource, environmentally friendly fishing activities and assessment of other activities which have impact on fisheries resources and the environment.

The management measures taken by Indonesian government in managing shrimp trawling in Arafura Sea are classified into 3 categories described in follow.

Input control

Input control regulates what fisheries bring into the fishing process or controlling fishing effort taking places (Charles, 2001), such as fishing license and zoning system. (1) In order to obtain fishing license, shrimp trawlers as well as any kind of fishing vessel has been requiring to get recommendation from organization or association of capture fisheries and to apply Vessel Monitoring System (VMS), a monitoring device, in more than 30 GT powered trawls. As obliterating the fishing license for foreign flagged vessel, government has renewed the regulation by giving fishing license only if the company establishes fish processing unit in Indonesia. Furthermore, the establishment of processing unit should collaborate with domestic company to provide job opportunities for local people and to raise foreign exchange. (2) Establishing trawling zone in Arafura Sea to avoid social conflicts happening among fishers, to protect small-scale fishers from industrial fishery in the fishing grounds and to protect resources from damage. It allows trawl vessels operated in the eastern of 130° longitude and beyond 10 meter of isobath line (**Fig.2**). This measure has been a basis of fisheries management oriented in environmental sustainability and equity.

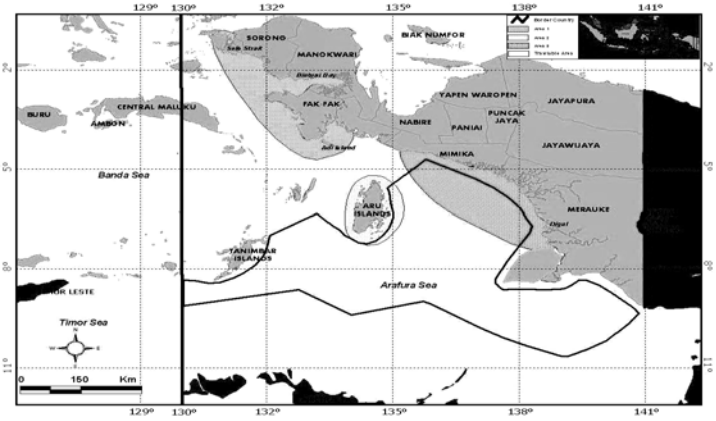

Fig 2. The trawlable area in Arafura Sea (inside the borderline)

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Output Control

Output control regulates the total harvest of fish stock in the fishery system (Charles, 2001). Such control in this situation is called Total Allowable Catch (TAC) which limits shrimp catch to level 17,200 tones according to the Decree of Ministry of Agriculture No. 995/Kpts/IK.120/9 of 1999.

Technical Measures

Technical measures is aimed to limit the "how, when and where" of fishing are restrictions to regulate the output which can be obtained from a specified amount of effort. In terms of the above regulations, these measures generally attempt to influence the efficiency of the fishing gear (FAO, 1997a; Charles, 2001).

(1) The Presidential Decree No 85 of 1982 requires each unit of trawl to apply By-catch Reduction Device (BRD). It is an embedded frame in the net between body and codend part which the function is to release the capture with larger size than the mesh size (Purbayanto, 2004). BRD can improve the selectivity of shrimp trawlers, thus it allows them to catch shrimp in more relative amount than other organisms. (2) In addition, according to Decree of Ministry of Agriculture no.1 of 1975, the minimal mesh size required is 25 millimeters or 1 inch. (3) Facing the problem of by-catch discard, regulation on utilization of by-catch species has been brought up by Decree of Ministry of Agriculture No. 930/Kpts/UM/12 of 1982 and the Decree of Directorate General of Fisheries No. IK 010/S3.8063/82K. Both asserted that trawler operator companies that have licenses for shrimp trawl net should hand over the by-catch species to the local fisheries cooperatives.

Challenges

The major challenges facing Indonesia's MMAF as a manager of shrimp trawling in Arafura Sea, in addition to its implementation and enforcement problems, is the issue of establishing catch limits, protection criteria for populations and species and other conservation/protective measures.

Fisheries scientists have traced the sharp decline of fish populations in the Arafura Sea, although the exact dimensions of the fish stock depletion are unclear. (Heazle and Butcher, 2007).

Decreasing trend of shrimp trawl productivity (**Fig. 1**) over the last decade has been considered as the result of a combination of much greater fishing effort and destruction of fish habitats. Another evidence of overfishing in Arafura Sea is the fact that shrimp production of Arafura Sea has reached a level beyond the TAC, as mentioned in part 2.

The Presidential Decree requiring BRD attachment on trawl vessel does not seem to be able to solve the perceived lack of selectivity of the trawl net, which result on capture of a huge quantity and diversity of non-target species. According to the BPPI report, there have been an increasing proportion of non-target species to shrimp from 9:1 in the year before 1998 to a range of 8:1 to 13:1 in 1998 (FAO, 2001) which means the possibility of discard practice is increasing as well. (Purbayanto *et al.*, 2004) has estimated 332.186 ton/year of fish protein wastes on the sea as result of shrimp trawling in Arafura Sea.

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Table 1. An Estimation of By-catch Amount in Shrimp Trawl Fishery in Arafura Sea (Purbayanto, *et al.*, 2004)

Fishing Ground	Volume By-catch		
	Ton/haul	Ton/day	Ton/trip
Dolak waters	1.03	7,21	216,30
	0.93	6.50	195.09
Aru waters	0,37	2,57	77,07
Kaimana waters	0,04	0,31	9,24
	0.23	1.61	48.30
Average	0,52	3,64	109,20
Amount of shrimp trawl			336
Estimation of by catch potency (ton/year)			332,186

The huge amount of non target species consists of pelagic fish, demersal fish, chepalopod (squids), shark and rays, and crustaceans (Badrudin *et al.,* 2004). Fishermen usually discard the low commercial value of those catch since it is not economical to retain it onboard. The discarded catch may consist of undersized species, juveniles, inedible and damaged fish and seabed debris. However, the optimal by-catch utilization along the line with Code of Conduct Responsible Fisheries principles (FAO, 1997a) that require the by-catch species on board preserved is practically not easy because of space limitation in the fish storage. The trawl operators are objected to spend the time and effort for handling a portion of the catch considered as trash. Yet, by catch utilisation sometimes fail to address more fundamental ecological questions. Indeed, even if all the by-catch could be processed, part of the problem (creating a shrimp-dominated ecosystem) would remain (EJF, 2003).

In addition, Sadhotomo *et al.,* (2003) has released that these trawl nets can severely disturb species composition and size composition of shrimp and demersal fish. Moreover, the index of abundance certainly decreased shown by the declining of fishing rate, increasing dominancy of another crustacean and species replacement of shrimp. However, the absence of reliable data on catches and the status of Indonesia's fisheries make it impossible for scientists to provide management advice that would not be undermined by uncertainty arguments from industry (FAO, 1997b).

Another major challenge in managing shrimp trawling in Arafura Sea is the lack of legal enforcement. Although Indonesian government has a series of laws that address coastal management in Indonesia authority, there appears to be high degree of disobedient behaviour. This has caused widespread illegal fishing fishing practices in almost all Indonesian coastal areas, including the Arafura Sea (Pet-Soede and Djohani, 1998). In addition, there has been an unknown number of vessels, both Indonesian and foreign, that did not appear in any statistics (Heazle & Butcher, 2007)

After the trawl banning, in 1989 there was common arrangements for foreign companies called charter their vessels to Indonesian companies. The foreign companies, in these arrangements, were supposedly bound by many regulations. Among other things, the arrangements specified that thirty percent of the crew had to be Indonesian, their nets had to have a certain minimum mesh size, and they had to unload their catches in an Indonesian port. In practice, they comply with few of these regulations. The chartered fishing vessels whose all the crews were from original countries (mainly Thailand), uncontrollably operated within teritorial waters of Arafura

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Sea event close to the coastal zone and estuarine. (Badrudin *et al.,* 2008; Nurhakim *et al.,* 2008). Most notably, they used fine-meshed nets, and there is some evidence that the catch obtained by these vessels is commonly unrecorded/unreported because these catches were directly transhipped and transported to the original countries, and no records from the Indonesian side (Fegan, 2003). At the same time they enjoyed the advantages of operating under the Indonesian flag, the most important of which was subsidised fuel (Heazle & Butcher, 2007). These practices would undoubtedly cause big losses to Indonesia, due to the fact that beside the index of abundance will certainly decrease, in the context of stock assessment carried out by Indonesian side, unreported catch will lead to inappropriate results and the outputs of the assessment will be misleading (Badrudin et al., 2008). To this time, other violations on trawling regulation still happen mostly by foreign trawls (Wiguna, 2007, Fegan, 2003) argues that having Indonesian Navy interest on the fishing industry has also resulted difficulties for the government in implementing the trawling regulation in the Arafura Sea. The involvement of the Navy's Cooperative Enterprise in the fishing industry as a business partner of the leading foreign fishing companies, whose trawlers fish in Arafura Sea, has resulted in ineffective law enforcement in the field. (Heazle and Butcher, 2007).

This sea is coming under intense pressure from illegal, unreported and unregulated fishing activities. If this trend persists, the fish protein dependent communities that surround the sea will face a considerable challenge in sustaining their livelihoods (Nurhakim *et al.,* 2008)

CONCLUDING REMARKS

To this time, shrimp exploitation using trawl gear has been continued in Arafura Sea encouraging over-fishing and sea ecosystem distraction. At the same time, Indonesian government has been facing multitude problems in law enforcement activities, from monitoring and surveillance to trial and deterrent penalties. There were shortages in government management agencies in terms of motivation, coordination, knowledge, infrastructure and funding support.

An idea of fishing moratorium (suspension of fishing activities) in Arafura Sea by MMAF should be appreciated, in which the idea is to close the Arafura Sea from trawling activities in a certain period while other gears are still allowed to exploit demersal fish. The Fisheries Law no 31 of 2004 is a basis of the moratorium by establishing fishing area and fishing season (Purbayanto, *at al.,* 2008). It is implied that those are closure system in which the certain area and certain season are closed temporarily to give opportunity for juvenile to reach commercial size, replenish local stocks and the habitat recovery.

In trawlable area of the Arafura Sea, fisheries scientists have recognized that the most of area within 12 miles from coastline waters is the spawning ground and nursery ground for juvenile fish and other animals (Nurhakim *et al.,* 2008). Therefore when the spawning seasons of shrimp have come, the areas should be temporarily prohibited for fishing activities and allowed to be fished after the spawning season is elapsed.

Some states in Australia have been imposing this closure area and closure season for shrimp trawling activities in order to let the shrimp juveniles grow to the marketable size (Grafton *et al.,* 2006). The same system could be imposed in Arafura Sea as well. Once the closure is in place and the trawling is prohibited then no by-catch will be (legally) caught. Closures also afford to fully protect by-catch species while they remain within closed areas. It is unlikely that BRDs will ever achieve an equal level of protection. However, come what may the fishing regulations imposed into the shrimp trawling, without effective enforcement of

 ISSN : 1410-5217

fishing regulation, the purpose of fisheries management unlikely will be achieved.

Then, how these destruction practices of marine ecosystem have been allowed to happen? The answer is involving the political and social complexity in Indonesia. The country is a highly fragmented made naturally structure of competing components that in many cases have to raise their own profits in order to function (Heazle and Butcher, 2007). The Indonesian navy, which responsible for enforcing fisheries regulations but short of funding, has a direct interest in the fishing industry, while provincial authorities have the power to issue licenses for quite larger vessels. During fisheries regulations are enforced so far, they are often enforced unofficially, even sometimes violent way enforced by local fishing communities rather than by state authorities (Heazle and Butcher, 2007). Although there were signals of change that parliament passed a law declaring that military would give up all its business by 2009, another rule undermined it. Right after it passed, the new minister of defence indicated that the new law would not apply to businesses having assets worth less than 5 billion rupiahs ($550,000), as these would be needed to fulfil the soldiers' needs. Such an interpretation would create a great range of opportunities to elude the new law. When the navy is able to engage in the fisheries business, it will inevitably have conflicts of interest that will weaken its ability to enforce regulations designed to limit the exploitation of marine resources.

The empowerment of local communities may mean little effect in the face of large fishing companies operating powerful fishing boats over large sections of the Arafura Sea. Only government are capable of regulating such industrial forms of fishing. In 2002, MMAF has established the Arafura and Timor Seas Expert Forum (ATSEF) seeks to promote sustainable management of the seas by preventing, deterring and eliminating IIU fishing in Arafura and Timor Seas. Here, it is worth recalling the initial impact of the ban on trawling in western Indonesia in 1980. Strict enforcement of the ban, which took the form of a presidential decree, brought about a rapid recovery of demersal fish populations in the Straits of Malacca and the Java Sea (Bailey, 1997)

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