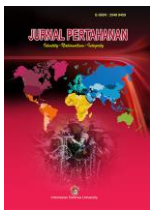
Jurnal Pertahanan

Media Informasi tentang Kajian dan Strategi Pertahanan
yang Mengedepankan *Identity*, *Nationalism* dan *Integrity*
e-ISSN: 2549-9459
http://jurnal.idu.ac.id/index.php/DefenseJournal



FISHERY RESOURCES MANAGEMENT IN THE REPUBLIC OF INDONESIA'S FISHERY MANAGEMENT REGION 711 FOR THE SUSTAINABLE FISHERY RESOURCES CONTROL

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Article Info

Article history:
Received 22 January 2019
Revised 19 February 2019
Accepted 21 March 2019

Keywords:
Fisheries management,
Fisheries policy,
FMR-RI 711

DOI:
http://dx.doi.org/10.33172/jp.v5i1.468

Abstract

The Republic of Indonesia Fisheries Management Region is an area that intended for controlling the fisheries management activities. However, the potential value of fisheries in WPP-RI 711 has been decreasing starting from 2016 to 2017. The problems are about fisheries resource management activities in the region which are then linked to government policy control. This study seeks to determine the development of fisheries resource production in FMR-RI 711, the level of utilization based on management with the MSY and MEY models, and also control of sustainable fisheries policies. This study uses experimental quantitative methods with the Schaefer, Fox and Gordon models. Data obtained came from fisheries resource groups and data samples were taken from shrimp groups. The results of the analysis show that the average development of fisheries resource production in FMR-RI 711 has decreased even experienced overfishing in the commodity of Small Pelagic Fish and Crustaceans. The Schaefer model is considered the most appropriate because it has a determination coefficient value of 42.9%

and has an optimum effort value of 179 trips/year, with the MSY value obtained at 3.8520 tons/year. The policy controls carried out so far are still very lacking and need to take firm action from the government in overcoming fisheries problems that are overfishing. Therefore, it can be concluded that fisheries management in FMR-RI 711 has not run optimally, then fisheries management should also be carried out by considering the economic aspects of fisheries, besides it also needs serious efforts on fisheries supervision and the development of a cost model to maintain resources from overfishing.

INTRODUCTION

Fisheries management activities are a series of programs that have gone through a long journey especially in the determination of Fisheries Management Areas (WPP) which now number 11 (eleven) WPP units. This is in accordance with the mandate of Law Number 45 of 2009 concerning Fisheries (Republic of Indonesia Law, 2009) which includes support for fish resource management policies. Thus a map of the Republic of Indonesia Fisheries Management Region (WPP-RI) was prepared based on the geo-bio-ecological characteristics approach. The current WPP-RI is a development of fisheries management as well as administrative status. WPP-RI 711 covers the Karimata Strait, Natuna Sea and the South China Sea which are in the 71 coded area. This area has a predominantly fishery commodity in the form of humpback shrimp (Penaeid shrimp) and also small pelagic fish resources. The WPP-RI 711 area is an area that is also prone to a conflict between fisheries actors, not only local fishermen but also foreign fishermen who often carry out fishing in the Indonesian water region. The South China Sea (hereinafter abbreviated as SCS) is a water area that is included in one of the Republic of Indonesia Fisheries Management Areas (WPP-RI) 711. This area has an area of 3.5 million km^2. SCS is also a very strategic area and traversed by one-third of the world's maritime traffic. In addition, SCS is also an area that gains a lot of attention, especially by regional countries for its political and economic values. This maritime domain area is known to have enormous natural resource potential, especially from the fisheries sector. Various types of fisheries resources, especially important economic resources derived from several pelagic fish species, demersal fish and reef fish, crustaceans are found in this region. Maritime environment security is one part of the issue of maritime security globally. Where fisheries management activities are part of maintaining security in the maritime environment. Strengthening in the maritime sector through resource management activities is very much needed as one of the national defense efforts in the maritime sector.

Fisheries resources are resources that are renewable and very abundant in nature. However, in practice with fishing activities, these fish resources require a period of "recovery" before they can be reused. This means that management activities must recognize the importance of monitoring fishing efforts so that fish resources can still be utilized for a long and sustainable period. Fisheries management must oversee all destructive fishing, overfishing by both foreign and domestic fishing vessels, as well as illegal fishing.

Faced with the extent of the maritime domain that must be controlled, and also with the many mischievous fish business

people in exploiting fisheries resources, a strict policy and management strategy are needed. The construction of the theory in this field is to use Maximum Sustainable Yield (MSY) as a science, as a policy and as a control policy (legal). The utilization (utility) of MSY as a policy and legal (or control policy) is far more prioritized and stronger than as in science.

MSY is the maximum population number that must be maintained so that future catches will not experience a decrease (overfishing) that is uncontrolled and close to the amount that is harmful to the sustainability of fisheries resources. The MSY model used are two models, namely Schaefer and Fox. These models are used to control the amount allowed to be harvested from one type of fishery resource. Building two models as a control policy tool are not easy, it requires extraordinary effort and enormous cost consequences. In the issue of fisheries, a fundamental assumption in the neoclassical economic market model states that marketing or emphasis in it, such as overexploitation or (even) less will make the fish market system model falter. Therefore we need a model that also discusses and regulates bioeconomic problems from fisheries resources, which will be described through the Maximum Economic Yield (MEY) value.

MEY is a value or position contained in the MSY curve which produces a different value of total income (market) with the total value of costs to produce fish catches. Or in other words, the MEY value is the cost incurred from the initial management plan to get the largest fish catch. In this case, the economic aspect also seems to have not been touched by the government as a control policy tool as well as a policy to maintain MSY balance (This means that maintaining MSY to be controlled and not causing overfishing that is dangerous, must be balanced with the economic aspects that can be modeled, MEY). Economic aspects that need to be observed so that there is a balance of control for the government is MEY as a mathematical device used to find out how far the opportunity for the government to lose or profit due to the economic impact of MSY. Supporting the previous statement, T.X. Huxley in 1930 made a statement that in the coming century, humans must be aware of the importance of fisheries management or policies on how to maintain fish preservation as well as income for the government or the region.

Potentially uncontrolled fish potential (read: no policy-no strategy-no act) is an easy target for all fishers who are all foreigners (said all are foreign companies because it is reported too little or no number of "mischievous" local fishermen). The Fisheries Management Region basically covers island waters, territorial sea, additional zones and Indonesia's Exclusive Economic Zone (EEZ). WPP-RI 711 with all its potential fisheries resources stores a myriad of complexities due to uncontrolled MSY and MEY such as overfishing due to massive fishing.

It is hoped that through the study of fisheries management based on biology (MSY) it will become a control for the government in supervising fisheries activities especially for all WPP in Indonesia. Utilization of fisheries resources must be rational and economically efficient, taking into account the profit (profit) that will be obtained. This view in the rationale paradigm then underlies the birth of the concept of sustainable production that provides economic value as MEY. Fisheries resources are a common property that is open access so that it can lead to competition between fisheries actors if it is not managed properly. Then in the continuation, it will cause depletion of fisheries resources, as well as the creation of conflicts between fisheries actors. The government has so far used management considerations using the MSY concept regulated through regulations that have been issued. Some of these regulations are in the form of a decision of the Minister of Maritime Affairs and Fisheries (KKP) of the Republic of Indonesia which regulates

the estimation of potential, the amount of catch allowed and the level of utilization of fish resources in WPP-RI.

Analogous to the model, MEY will control the running of MSY as an economic aspect so that it will benefit the local government. The potential of fish resources (SDI) in SCS in 2016 amounted to 1,143,341 tons and on average had experienced overexploitation (Decree of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia, 2016) and in 2017 with a potential of 767,126 tons (Ministerial Decree No. 50/KEPMEN-KP/2017) with the level of utilization (E) of all fisheries resources estimated to have overexploited ($E \geq 1$), meaning that the policy on MSY does not work properly. The government has so far regulated and determined the maximum catch value that can be caught by fishermen. However, the practice is not in line between the policies set by the government and the results in the field. Therefore, the majority of fisheries resources are thought to have experienced excessive exploitation, especially in the penaeid shrimp group (Figure 1).

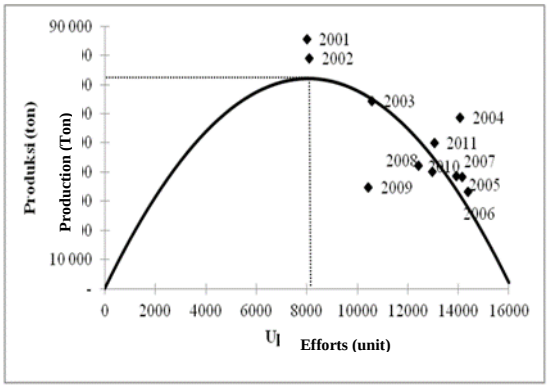

Figure 1. A curve of Relation between Production and Efforts from Shrimp Groups
Source: Research Center for Fisheries Management and KKP Fish Resource Conservation, 2014.

Shrimp are commodities with very high economic value and are also the main export commodity. Based on Figure 1, it can be seen that starting from 2001 to 2011 shrimp fishing activities were very high, even never below the sustainable catch limit (MSY). Therefore, shrimp commodities need special attention in sustainable fisheries management activities, especially in WPP-RI 711.

RESEARCH METHOD

This study uses experimental quantitative methods, then describes the collected data. The population taken comes from fisheries resource data in WPP-RI 711. Population data can be derived from large types of pelagic fish, small pelagic fish, demersal fish, and crustacean groups. In addition, the data used is derived from the trip data of the fishing vessels and fishing gear used in conducting fishing regularly.

The sample in this study is the catch data and the number of trips of the fishing vessels of SDI types in WPP-RI 711 which have high economic value, such as shrimp. These data are data obtained from catches landed at several fish landing sites, especially at the Nusantara Fisheries Port (PPN) which have been determined for WPP-RI 711. The process of collecting data can be in the form of data collection in various settings, sources or the ways conducted. However, regarding the data collection techniques, it can be through interview techniques, questionnaires, observations, and a combination of the three. The technique used in this research is in the form of primary data collection, namely fisheries data in WPP-RI 711 and secondary data in the form of interviews with various parties involved to analyze the extent to which the implementation of the policies that have been set related to management. The interview technique used is in the form of unstructured interviews. An unstructured interview is a free interview where the researcher does not use the interview guidelines that have been arranged systematically and completely for the data collection. Fisheries data analysis techniques use software that can analyze statistical data with IBM SPSS Statistics 25.00 computer program, FishStat J software and data analysis at Ms. Excel 2016.

Effort Standardization

The need for standardizing effort is to standardize each unit of effort from each fishing gear used in fishing. So it will be assumed that each catch has the same catch as the standard fishing gear used. The most used and dominating fishing gear in an area will be used as standard fishing gear. The fishing gear that has the highest per-unit catch value (CPUE) will have the value of the Fishing Power Index (FPI) = 1.00. So then the FPI value on the other capture devices will be converted to the standard FPI value. Calculation of values can be done through the following mathematical formulation.

$CPUE_i = \frac{Ci}{fi}$, where $FPI_s = \frac{CPUEs}{CPUEs} = 1$

FPI i = $\frac{CPUEi}{CPUEs}$, and standard efforts = $FPI_i * f_i$

The CPUEs value is the catch per unit capture effort of the standard capture device, and CPUEi is the catch per unit of effort to catch the catch i (other fishing gear used). FPIs and FPIi are the capture power types of standard fishing gear and other fishing gears used.

Schaefer Model

MSY value = $-\frac{(qK)^2}{4(q^2K/r)}$ or can be notated as MSY = $-\ a^2/4b$. Then the value of $F_{msy} = -\frac{qrK}{2q^2K}$ and notated as $F_{MSY} = -\ a/2b$. Lastly, value of $CPUE_t = qK + \frac{q^2K}{r} f_t$.

Fox Model

MSY value = $f_{MSY} * e^{(qK)-1}$ or can be notated as MSY = $-1/b * e^{(a-1)}$. Kemudian nilai $F_{msy} = \frac{-1}{(q^2K/r)}$ and notated as $F_{MSY} = -1/b$. Lastly, value of $LnCPUE_t = qK + \frac{q^2K}{r} f_t$.

Gordon-Schaefer Model

Gordon developed a model derived from the Schaefer growth model and determined three equilibrium conditions in Table 1.

Table 1. Three Equilibrium Conditions of Gordon-Schaefer Model

Variable	MSY	MEY	OA
H	kr/4	$kr/4 * (1 + \frac{c}{(p*q*k)})(1 - \frac{c}{(p*q*k)})$	rc/pq
E	r/2q	$r/2q\ (1 - \frac{c}{(p*q*k)})$	$r/q\ (1 - \frac{c}{(p*q*k)})$
π	$Ph_{MSY} - cE_{MSY}$	$Ph_{MEY} - cE_{MEY}$	$Ph_{OA} - cE_{OA}$

Source: Processed by researchers, 2018.

Where *r* is intrinsic growth (per year), *q* is 1 per effort unit (coefficient of fishing gear), *k* is carrying capacity (ton), *p* is the average price of resources (IDR million / ton), *c* is the average total cost per unit effort (IDR million per day fished), *h* is yield, *E* is the amount of effort per year, and π is the maximum profit.

RESULTS AND DISCUSSION

Development of Fisheries Resource Production in the South China Sea (WPP-RI 711)

Fisheries data WPP-RI 711 originated from five provinces incorporated in this management area as a whole. However, there are several provinces where part of the management area is also included in WPP-RI 711 such as Riau Province, DKI Jakarta, West Java, and Central Java. The data obtained shows the development of the

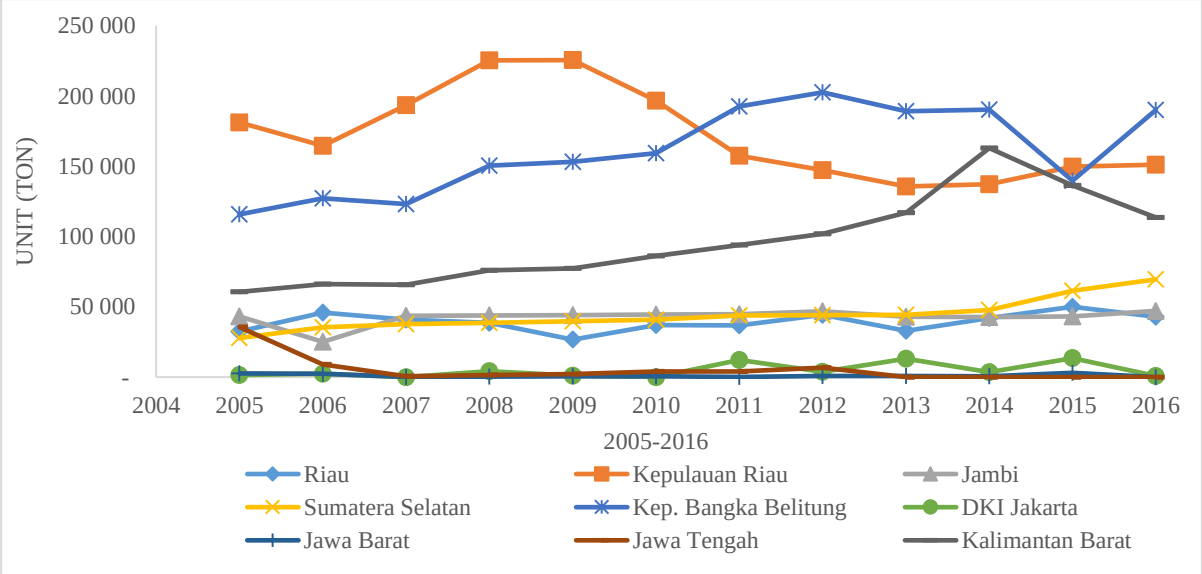

Figure 2. Total Statistics on Capture Fisheries in WPP-RI 711
Source: Processed by Authors, 2018

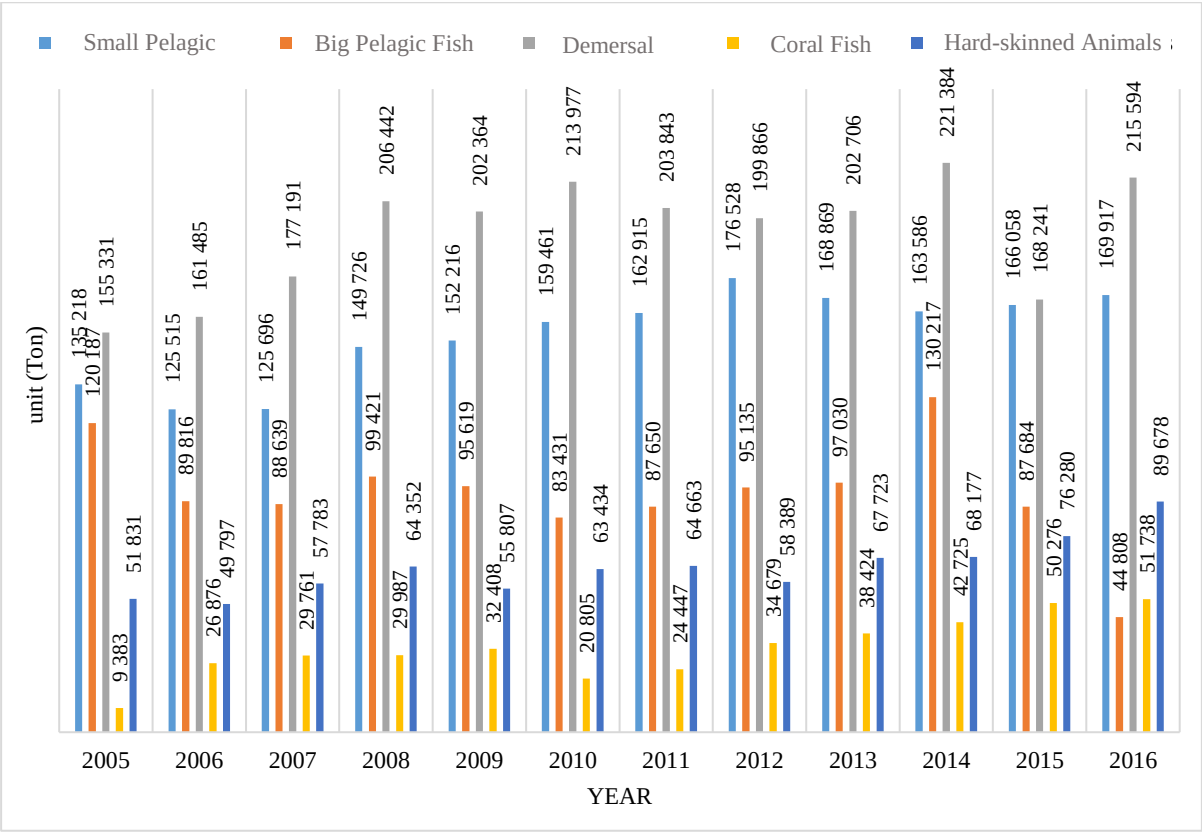

Figure 3. Fisheries Production Statistics in WPP-RI 711 in 2005-2016
Source: Processed by Authors, 2018

production of several fish species from 2005 to 2016. Through the graph trend, we can see an increase or decrease in fisheries production in WPP-RI 711 each year, and indirectly it can be seen whether management activities are running well or not. The ideal management activity can then be determined to refer to the production. Based on the group of species are depicted in the fFigure 2 and Figure 3.

Statistics on total production of fisheries resources in several provinces incorporated in WPP-RI 711 show fluctuating values. Riau Islands and Bangka Belitung Islands hold the highest production value compared to seven other provinces. Then followed by the province of West Kalimantan, South Sumatra, and other provinces. The two islands constitute the provincial region whose entire management area is incorporated in the WPP-RI 711 together with the Provinces of South Sumatra, Jambi, and West Kalimantan. This is because the water region of the five provinces is entirely in WPP-RI 711, in contrast to other provinces whose water territorials are also joined by other WPP-RI. For example, Riau Province whose management area is divided into two, namely, WPP-RI 571 and WPP-RI 711. So the value of fisheries production is also divided into two and must consider the number of catches allowed in the two WPP-RI.

This is in accordance with the mandate of Law Number 45 of 2009 concerning Fisheries (Republic of Indonesia Law, 2009) which includes support for fish resource management policies. When compared with JTB set by KepMen-KP No. 47 of 2016 (Decree of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia, 2016), the total value of small pelagic fish catches as the main commodity WPP-RI 711 has not experienced overexploitation. However, the commodity of penaeid shrimp and reef fish has experienced overexploitation.

Marine and Fisheries Resources

Resources are basically a value contained in a particular material or element in life and are not always physical but can also be non-physical. Some literature defines the concept of resources with quite a variety. Among them are: (1) the ability to fulfill or handle something, (2) the source of supplies, support or assistance and (3) the means produced by one's abilities or thoughts. Furthermore, it is also said that something to be said as a resource must have two criteria, namely; (1) that there must be knowledge, technology or skills to use it, (2) then there must be a demand for these resources. These criteria then become a reference that resources are very closely related to usefulness, for the present and future for human welfare (Fauzi, 2004).

Furthermore, the definition of resources is also related to two aspects, namely aspects of how those resources can be utilized and institutional aspects, which determine who controls the resources and how technology is used. The activity of extracting fish resources, for example, involves technical aspects concerning fishing gear, labor, and ships, as well as the institutional aspects that determine the arrangement. If these institutional aspects do not function, there will be excessive extraction and exhaustion which ultimately does not benefit humans.

Fisheries and Marine Resources is one of the main strengths of the Indonesian nation. Indonesia's vast territorial waters make the wealth of resources especially in the field of fisheries in Indonesia need to be regulated and supervised very well and controlled. FAO states that the importance of fisheries in a country can not only be measured by contributions to GDP (Cadima, 2003) but also must consider that fisheries resources and products are fundamental components of human food sources and jobs or professions. Another aspect that makes fisheries resources important is the main characteristic of renewable resources themselves. If fisheries resources or other biological resources are managed well, their duration will be practically unlimited. The important conclusion is that the fundamental basis for conservation and management of fisheries resources comes from biological characteristics also related to two aspects, namely aspects of how resources can be utilized and institutional aspects, which determine who controls resources and how technology is used. The activity of extracting fish resources, for example, involves technical aspects

concerning fishing gear, labor, and ships, as well as the institutional aspects that determine the arrangement. If these institutional aspects do not function, there will be excessive extraction and exhaustion which ultimately does not benefit humans.

It should be noted that the nature of fisheries resources is not unlimited so that their use must be more careful so that there is no overexploitation or extinction (Wiryawan, 2008). Indonesian fisheries development is mainly carried out through efforts to increase fisheries production which is directed at increasing consumption, foreign exchange earnings and increasing the supply of industrial raw materials. As an effort to increase production, it is also encouraged to increase fishermen's income and employment opportunities, to increase fish consumption and to encourage domestic industries. In addition, it also helps support regional development while taking into account the sustainability of resources and the environment in order to realize sustainable fisheries development.

The state of the resource that has been overexploited must be dealt with seriously in its utilization efforts. The government through the CTF has determined the JTB or MSY value of fisheries resources according to fisheries groups, but when compared to the level of utilization it is clear that the majority of fishery commodities have experienced overexploitation with an E value of ≥ 1. However, so far, fishing efforts continue without strict prohibition towards the perpetrators of fisheries in the effort to preserve the overfished fishery commodities. The phrase "in the long run" is used to get high catches in one year which is undertaken suddenly to increase fishing efforts, but then a few years later the catch will be reduced because the resources have been taken very large in the previous year (Sparre P, 1999). Therefore, we need to determine the value of F_{MSY} and MSY to obtain maximum continuous results.

The thieves who were not caught fish in Indonesian water territorials and landed their catches in other countries. This is also one of the causes of the drastic decline in fisheries stocks in WPP-RI 711 and the government cannot calculate the amount of fish stolen and the losses caused by it. So that the government should also consider this matter in determining the value of MSY which is manifested in very strict supervision controls and gives a deterrent effect to anyone who commits a violation. Literally, MSY can be interpreted as the maximum amount of weight or catch that can be obtained from a stock of fish resources without affecting reproduction and recruitment of fish stocks in the future (Michael King, 1995).

The concept of Schaefer Model (1954)

Calculations using the Schaefer model take a sample of the main fishery commodity data in WPP-RI 711 which is from the Crustacean group (shrimp type). Shrimp from the type of tiger shrimp and barong shrimp are types of shrimp that have a decreased production value each year. Therefore, the calculation is done by taking samples from the shrimp. Calculation of the CPUE value is taken by using calculations on the fishing gears of the Layered Gills, Drifting Gills Nets and also Shrimp Trawl. Then the calculation of the value of FPI (Fishing Power Index) is calculated to calculate the standard catch effort. Catches per unit of CPUE catch effort (Catch per Effort Unit) are obtained from the obtained catch value (C) in ton units and fishing effort (F) in trip units. Table 2 presents the catch data in column 2 and capture effort data in column 3.

Table 2. Number of Catch Data (C), Catch Effort (F) and CPUE Value in WPP-RI 711 for Shrimp

No	Year	C (*Catch*)	F (*Trip*)	CPUE (*C/F*)
1	2014	37,4450	487	0,0769
2	2015	53,3840	508	0,1051
3	2016	0,2650	25	0,0106
4	2017	1,2910	16	0,0797

Source: Processed from data from the DJPT KKP fisheries for 2014-2017

Based on the regression results between the variables x (value F) in column 3 and variable y (CPUE value) in column 4 produces the regression equation as follows:

CPUE = 0,0430 - 0,00012 F

that is, any increase in catch effort (trip) will reduce the CPUE value. If there is no fishing activity, then the shrimp stock in nature is 0.0429 ton/trip. If there is an increase in fishing effort of 1 trip, the CPUE value will decrease by 0,00012 tons/trip. To get the optimum effort value (F_{MSY}) in the Schaefer model, with the regression results the value of a = 0.0430, value of b = -0.00012 and the value of R^2 (coefficient of determination) of 42,9%, then we obtain the value of F_{MSY} as follows:

$F_{MSY} = -\frac{a}{2b} = -\frac{0.0430}{2(-0.00012)} = 179{,}1666$ rounded to 179 trips.

This result means that in one year the number of fishing trips should not exceed 179 trips. Then by substituting the coefficient values a and b above, a sustainable potential value (MSY) can be obtained as follows:

$MSY = -\frac{a^2}{4b} = -\frac{(0.0430)^2}{4(-0.00012)} = 3{,}8520$ ton/year

That is, that shrimp resources in the WPP-RI 711 region can only be caught a maximum of 3.8520 tons per year. The value of MSY means that the value is the maximum limit of the number of catches allowed so that shrimp resources remain sustainable in each year. If illustrated, it will produce the trend graph, which can be seen in Figure 4.

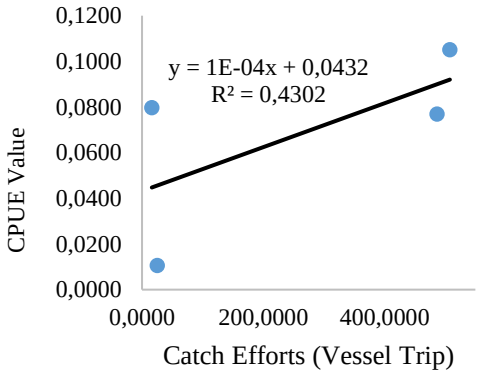

Figure 4. Graph of the Relation Between CPUE Value and Catching Effort
Source: Processed by Authors, 2018

The relationship between these variables is described in the form of a parabolic relationship and will provide information about the value of MSY and the optimum catch rate (F_{MSY}). Schaefer described his model as a logistic growth model (population related to density due to the influence of intraspecific competition). The relationship between *CPUE* and catch efforts *F* follows a linear regression pattern. The symmetrical parabolic curve is assumed by Schaefer as the relationship between the catch *C* catch efforts *F*. The midpoint that divides the curve into balanced parts is a valuable peak point $\frac{K}{2}$ as the amount of biomass of a species (Figure 5).

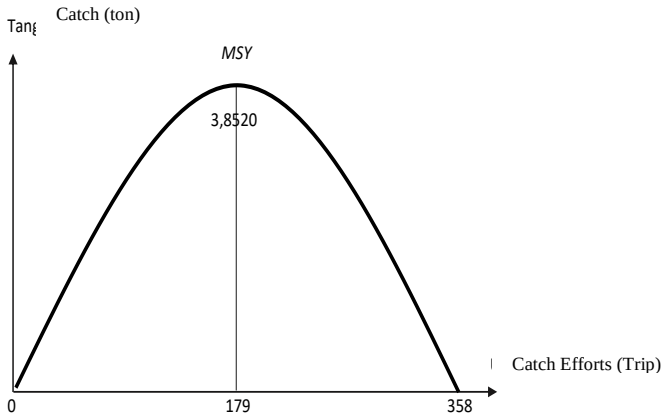

Figure 5. The curve of Relationship Between Catch (C) and Catch Efforts (F) by Schaefer Model
Source: Processed by Authors, 2018

The concept of the Fox Model (1970)

The production model from Fox produces an equation which, if linear, will have a relationship in the form of Ln_{CPUE} = lna – bF. Based on the data obtained in the form of sampling of one of the Crustacean commodities namely shrimp is as follows:

Ln_{CPUE} = 3,5826 – 0,0025F

The linear equation above produces a regression coefficient a = 3,5826 and b = -0,0025 and the value of R^2 (coefficient of determination) of 0,372. So that the value of the optimal catch effort of F_{MSY} in WPP-RI 711 can be obtained as follows:

$F_{MSY} = -\frac{1}{b} = -\frac{1}{-0,0025}$ = 400 trip

Furthermore, the maximum sustainable catch value of MSY can be obtained by the following equation:

$MSY = -\frac{1}{b}e^{(a-1)} = -\frac{1}{-0,0025}e^{(3,5826-1)}$ = 5292,6 ton/year.

Based on the above calculations it means that in one year the activities and efforts to catch shrimp in WPP-RI 711 cannot be more than 400 trips. In addition to guaranteeing the maximum sustainable potential of shrimp, the catch should not be more than 5292.6 tons/year. In addition, the coefficient of determination (R^2) is 37.2% and the correlation coefficient (r) is 0.61. Then the relationship between catches and fishing efforts is described in Figure 6.

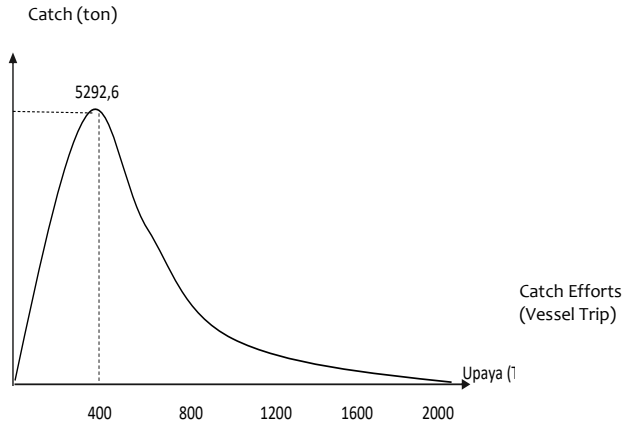

Figure 6. The curve of Relationship Between Catch (C) and Catch Efforts (F) by Fox Model
Source: Processed by Researchers, 2018

Based on the curve, it can be seen that the catch will increase along with the increasing of fishing effort, up to the peak point of the MSY of 5292.6 tons/year. Then the production or catch will decrease asymptotically on the magnitude of the fishing effort.

The concept of Gordon- Schaefer Model

The bioeconomic approach to the use of fisheries resources is needed so that resources provide maximum benefits for the community in the long run (Fauzi, 2017). The ownership of fisheries resources is open access (OA), meaning that the use of resources tends to be open and can be used by anyone, without having to own it. In this case, Gordon assumes that economic overfishing will occur in uncontrolled fisheries. Therefore, more costs will be needed to get less fish catch. In the end, there is no profit to be gained (TR = TC), or even the value of TR (total revenue) < TC (total cost) or it can be said to suffer a loss.

Table 3. Three Equilibrium Conditions of Gordon-Schaefer Model

Variable	MSY	MEY	OA
Catch (H)	468,03	465,24	0,01
Catch Effort (E)	137,61	127,08	254,17

Total Revenue (TR)	46803,00	46524,78	1,70
Total Cost (TC)	7155,96	6608,52	13217,06
Profit (π)	39647,03	39916,25	-13215,36

Source: Processed by Researchers, 2018

If depicted into the curve, we can see the comparison between the three conditions as can be seen in Figure 7.

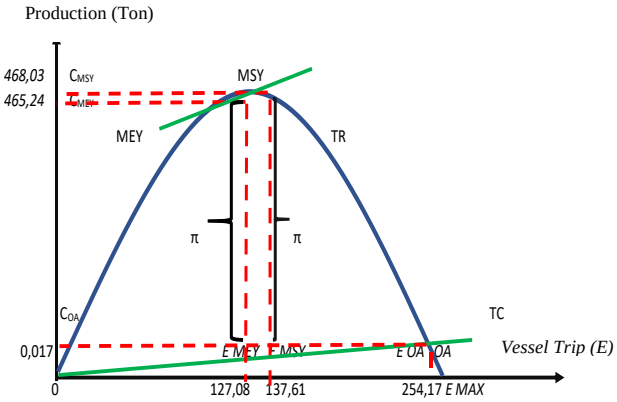

Figure 7. The curve of Sustainable Production of Shrimp Resources in WPP-RI 711
Source Processed by Researchers, 2018

Figure 7 above shows that the value that provides benefits is in the condition of MEY. The condition of MEY indicates that the value of TR (total revenue) is greater than the value of TC (total cost). The value of production is indeed not as big as the catch with the value of MSY but can maximize profits which are equal to IDR 399,162,508,000. Whereas if catching using the MSY value that is equal to 468,0300 tons, then the profit obtained is IDR 396,470,356,000. Whereas if fishermen make an effort to catch without any control or open access (OA) with a total trip of 254.17 ship trips, then the catch will decrease, even very little. The catch value is 0.017 tons per year, and the profits obtained are negative. That is, TC (total cost) is greater than TR (total revenue) which causes fishermen to lose and this is called economic overfishing. So, for developing countries like Indonesia, it would be better if they use a management approach based on socio-economic fishermen (Boer, 2007).

The concept of Maritime Security as a Policy Control of Fisheries Resource Utilization

The difficulty of conducting supervision and control in the sea area is one of the main obstacles. The weakness of law enforcement in WPP-RI 711 is also the reason for a large number of fishermen who carry out large-scale fishing. As an example, it can be seen in Table 4 the comparison between the number of fishing vessels with fishing licenses issued by the Department of Marine and Fisheries (DKP) in Riau Islands Province.

Table 4. Number of Fishing Vessels and Catching Permits in Riau Islands Province

Year	Number of Fishing Vessels	Catching Permits
2007	28 801	950
2008	30 293	808
2009	32 387	375
2010	63 973	1 045
2011	40 073	1 058
2012	51 997	629
2013	51 703	760
2014	56 715	409
2015	38 133	412
2016	38 189	304
2017	38 189	304
Total	470 453	4 951

Source: Processed by Researchers from Statistics Indonesia (BPS) data for 2007-2017, 2018

The complexity of the problems that occur in the territorial waters requires special attention from the government. One of the fisheries commodities in the region that is the focus of attention is shrimp species. Sustainable management of shrimp

requires considerable effort because there are not many studies conducted that can provide sufficient information. In addition, due to the lack of supervision, the shrimp stock in the region is getting depleted.

Indonesia is a very large archipelagic country and has the potential of strategic values from various fields of maritime affairs that will support national development. The size of the territory owned by Indonesia is directly proportional to the level of threats and challenges that must be faced. Safe and controlled sea conditions are sea conditions that are free from all kinds of threats. The threats come from both military and non-military. In this case, it is in accordance with the concept of maritime security by Christian Bueger who divides maritime security into four important pillars (Figure 8). Maritime security is a whole entity which consists of a focus on the marine environment, economic development, national security, and human resilience.

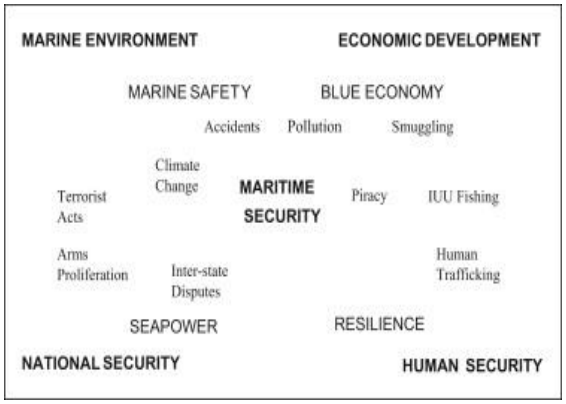

Figure 8. Maritime Security Matrix by Christian Bueger (Bueger, 2015).
Source: Christian Bueger, "What Is Maritime Security?", Marine Policy, 2015, in http://bueger.info, p. 5.

Indonesian waters have enormous production potential for fisheries resources each year and their availability in nature must be maintained, in this case, the marine environment. So that the government must be able to protect it from all forms of problems at sea so that it will ensure the safety of fisheries resources in the sea from all forms of threats and this is included in the marine safety category. In addition, good fisheries management will be able to provide foreign exchange to the country and also various production surpluses in the fisheries sector. This then possibly make Indonesia have a concept of fisheries economy (blue economy). The Blue economy can support the country's development in the economic field sourced from the marine sector.

Sustainable fisheries management has many dimensions in maritime security itself. The final goal to be achieved in this case is the existence of food security (food resilience), where fisheries resources should be the main source of protein for humans. The fulfillment of food security, especially those from the fisheries sector, will be able to provide security for humans (human security). As for efforts to secure all forms of theft of fisheries resources (illegal fishing), maintaining the security of the marine environment from all forms of disputes will be able to create national security.

Basically, Indonesia's marine power is a combination of the strength of the Navy with non-Navy forces such as trade vessels, fishing vessels, maritime service industries, and maritime communities. In marine power in Indonesia, the Navy is a major component and is supported by non-military components. Therefore, in securing the sea, it must be a synergistic whole. He further said that in addition to a top-down political approach, efforts to create Indonesia as a sea power must also take a cultural approach.

Buzan divides the analysis into individual, national and international levels both in broader regional and systemic security. While the security dimension consists of military, political, societal, economic and environmental security. Some other scientists use different categories of security issues such as energy security, food security, transnational crime, and migration. However, this issue can still be included in the sub-discussion on security (Setiawan, 2017).

Related to maritime security, Feldt, et al. defines maritime security as "The combination of preventive and responsive measures to protect the maritime domain against threats and intentional unlawful acts" (Lutz F, 2013). This clearly states that maritime security is the steps used in carrying out prevention and response efforts in protecting the maritime domain from all forms of intentional threats. The key words of the definition are preventive measures (prevention), responsive steps (responsive), which in this case were carried out by law enforcers both civil (Fisheries Supervisor) and the military (Navy).

Indonesian defense is structured in the form of a universal defense system to achieve national goals. This universal defense is defined as a national defense that involves all citizens in accordance with their roles and functions (Ministry of Defence, 2015). As for the issue of SCS, Indonesia is not a claimant state. Indonesia carries out policies externally and internally in order to create a peaceful regional situation and each can hold back.

In this regard, in this case, the conflict over the territorial waters can certainly disrupt order and a safe and controlled environment from threats. Estimates of the threats, challenges, and risks of administering national defense can be determined through an analysis of the development of the strategic environment. State defense is also explained in Law No. 3 of 2002 concerning National Defense (Law of the Republic of Indonesia, 2002). Article 1 paragraph 1 outlines that national defense is all efforts to defend the sovereignty of the country, the territorial integrity of the Unitary State of the Republic of Indonesia, and the safety of all nations from threats and disturbances to the integrity of the nation and state.

The sea area is a very sensitive area because it cannot be fenced or occupied at all times, so the sea area can only be controlled. The tension in SCS is one source of conflict between border regions between countries that must be addressed wisely. Related to national defense and Law No. 32 of 2004 concerning Regional Governments (Republic of Indonesia Law, 2004) where regional governments can mean that the provincial, regency or city governments have autonomous duties and responsibilities within the scope of demographic, geographic and social conditions of a society. Therefore, the regional government plays an important role in safeguarding its territory from all forms of threats that exist. Furthermore, this also aims to empower the existing aspects to support the implementation of a state government system as part of the functions of the government in the region to create conducive conditions in order to prepare and foster national defense. The Defense White Paper also states that disputes in the SCS have the potential to be an armed (open) conflict caused by three reasons, namely as follows:

1. The parties involved in the South China Sea dispute often use military instruments to strengthen their claims.
2. There is involvement of countries outside the Region in the conflict.
3. There are no credible international institutions or organizations in resolving disputes.

Therefore, one of the things that can be done in safeguarding Indonesia's fisheries management area is by maintaining full and strict supervision of the region. Violations of the sovereignty of the state in the sea area will cause tension, even leading to conflict. Military modernization is one that can be done as an influence from the advancement of defense technology. Furthermore, in the white paper, it is stated that increasing maritime security is carried out by deploying marine power capable of reaching out to the foremost small islands, and is effectively able to maintain the sovereignty of the territorial sea of national jurisdiction and is directed at being able to monitor the security of the Indian and Pacific Ocean regions.

CONCLUSIONS

The discussion above produces some conclusions as follows:

a. The condition of development of production in the majority of fisheries resources in WPP-RI 711 on average has decreased the value of catches each year. But there are also some resources that show an increase in the value of the catch and are used optimally. Basically, the JTB value set by the government through KepMen-KP No. 47 of 2016 is not fully working well. Some important economic resources have experienced overfishing with catch conditions above the specified JTB value. The level of utilization of resource groups that have been exploited has the effect of decreasing the value of sustainable potential set by the government in 2017 through KepMen-KP No. 50 (Decree of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia, 2017).
b. The condition of the MSY value that should be in shrimp fishery commodities is following the Schaefer model because it has a greater value of the coefficient of determination (R^2), which is 42.9%. Every year the government has determined MSY's policy to prevent overfishing, but its value decreases every year. The absence of strict and strict control from the government has caused many resources to experience overfishing conditions. Sustainability of resources must be maintained so that there is no scarcity of resources or even extinction.
c. The supervisory activities carried out so far have indeed been working optimally by cooperating with other parties as well as increasing supervision efforts and infrastructure. But basically because of the vast area of Indonesian water region, so that surveillance measures must also be in line with this. The weak supervision and uncertainty of the government in imposing sanctions on individuals who violate the law has made it difficult to enforce regulations for management. Through the role of supervision under The Directorate General of Marine and Fisheries Resources Surveillance (PSDP) and also the use of technology and surveillance vessels currently available it seems that it can still be improved. The condition of some resources in WPP-RI 711 that have been overfished must be overcome by the government. The construction of surveillance stations should be added especially in WPP-RI 711 which is prone to fishing theft. The use of the latest technology is also believed to be very necessary considering that this will facilitate the oversight role in areas with a very wide area.

SUGGESTIONS

The government through the Ministry of Maritime Affairs and Fisheries (KKP) is expected to be assertive in determining inputs (fishing licenses, fishing gear, fishing vessels, webs) and fisheries catch. Determination of the value of MSY through the KepMen-KP should also be done not entirely but per species, in fisheries groups, because the biological condition of a resource is different from other resources. Research on bioeconomic analysis (MEY) must also be conducted specifically by researchers (academics) and by the government (KKP) to control the optimal use of resources so as to prevent economic overfishing. In addition, further studies are needed through research on the formulation of functions or cost models to prevent resources from reaching the point of MSY or MEY. Efforts to rationalize catches need to be carried out which means that rearrangement of fishing activities is needed so as not to exceed the carrying capacity of the potential for the sake of sustainable fisheries resources. The availability of actual and integrated statistical data also needs to be immediately realized as support for the analysis process in the management of fisheries resources.

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