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Typical Analysis for Fisheries Management: The Case for Small-Scaler of Shrimp Fishers

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This study specifically uses the analysis results used to formulate the appropriate policies in the management of shrimp resources. Some forms of fisheries management proposed in this study are as follows: improving and giving space to community's involvement as well as utilizing fishery resources and their conservation in order to balance between utilization and conservation. The active participation of the community will increase their empowerment. The philosophy of sustainable development must start from the bottom, because it is the biggest component of the support and development practitioner. It is the time for the community to be given a freedom to catch fish and maintain the type of the potential commodities that exist in the sea, which could increase their income and welfare.

Keywords: Fisheries Management, Small-Scaler, Shrimp Fishers, Community, Participation, Cilacap.

1. INTRODUCTION

The potential fishery in Indonesia is estimated 6.5 million tons per year with the allowable catch of 5.12 million tons per year or 80% MSY (Maximum Sustainable Yield).[1]

Most of the population living in the coastal area is dominated by fishermen with low level of social and economic life and small businesses, simple technology, strongly influenced by the seasons, and purpose for local consumption only. This condition is affected by the disruption of the balance of the nature, coastal area, and weather conditions that resulted in unfavorable for fishing.[2]

Hilborn and Walters[3] suggested that fishermen economic activity in response to the changes either to the government policy and non-governmental policy is always linked to the dynamics of the environment (ecology) and the dynamics of the fishing fleet in the attempt to exploit fish resources which are taking place simultaneously. Fishery systems have very complex interactions among fish stocks dynamics, fishing fleets, and production factors such as capital and labor in exploiting fish stocks. Pascoe and Mardle[4] explained that in order to understand the economic dynamics and fisheries management, it is needed the assessment of the approach systems that consider the reserves (stock) of fish resources and the fishing fleet dynamics in order to guarantee the availability of jobs and increase the income of the fishermen.

The waters area in Cilacap is known as the part of the WPP Indian Ocean which has potential great fishing production in south of Central Java. This fact is supported by data from Marine and Fisheries Department of Central Java in 2015, stated that Cilacap is one of the largest shrimp producer in Central Java with a yield of 1,563.6 tones (35 percent). Furthermore, the Fishery Port of Cilacap is facing directly to Indian Ocean, which is known to have the potential of small and large pelagic fish resources.

The shrimp resources in the southern coast of Central Java and its surrounding areas have been overfishing. Research carried out by Purwanto[5] showed that the condition of the shrimp resource utilization has indicated the existence of overfishing, reaching up to 100.04% over from its sustainable potency. The indication of the overfishing is also supported by the length of time per unit effort (TPUE), and the downward trend catch per unit effort (CPUE).[6]

Management of marine fishery resources generally still covers around the coastal and beaches areas, while the management of fisheries in the waters off the coast is still quite low. Similarly, there is a tendency of fishing effort in this area in ways that may damage fish habitat (e.g., use of explosives and potassium), thereby disrupting the natural growth of fish. The utilization of fishery resources in that continuous way causes its benefits are also being lost. This is caused by the rate of the increase of the fishing effort which is not comparable with the natural growth of fish resources, so that the fish stocks will be reduced and will lead to lower catches of fishermen. This condition is known as biological overfishing. On the other hand, the decline in production will reduce the revenue and income of fishermen that are likely to experience loss.[7]

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Considering such conditions, in order to implement and improve the conception utilization of fishery shrimp resources and management based on partnership that builds profitable and sustainable of shrimp fisheries resources in Cilacap, it is necessary to have further studies and research on the use and management of fish resources towards sustainable economic development. Therefore, it is needed to investigate and approach to the problem. The approach used is a Schaefer surplus production to assess the sustained fisheries resources (Maximum Sustainable Yield/MSY), and the Gordon-Schaefer bionomics to assess profitable fishery resources/beneficial economically (Maximum Economic Yield/MEY) of shrimp fishery marine resources in Cilacap.

2. MATERIALS AND METHODS

The operational definition is a measurement variable that needs to be explained to avoid different and similar interpretations of the variables and to select the data that will be chosen in the study.

The operational concept of the variables used in this study is as follows:

A. Trammel net is a gill net that has three different layers. The operation is carried out by means of passive, semi-active, and active and fish/shrimp are caught by winding around.[8]

B. Arad net is the type of fishing gear base which is a modification of the trawl. Fishing gear is operated by pulling along the seabed so it is effective to catch fish and shrimp.[8]

C. Fixed gill net is a gill net that are installed by using weights or strapped on something so it will not drift away. Nets are generally mounted on the base area waters that catch demersal fish and shrimp.[8]

D. The ship is a boat of a certain size that used in the catching operation, with the machine as a motor and the unit of measurement is GT (Gross Tonnage).[9]

E. Respondents are captains who have the knowledge of cost and value of production achieved.

F. Catching trip is required time to carry out the catching operation and returned to land the catches.

G. Production (catch) is the total catch of shrimp landed with a unit of measurement used is in rupiah currency (IDR) and kilograms (Kg).[10]

H. Fishing effort (effort) is shrimp fishing effort with a unit of measurement used is the number of trammel net units per year (units/year).

I. CPUE (Catch Per Unit Effort) is the total catch (catch) per fishing effort (effort) of trammel net fishing gear (kg/unit).

J. Price (p) is the average value of the overall prices of shrimp catches obtained unit effort (vessel) which has been proportioned based on the total catch per shrimp species. Prices are assumed to be constant.

K. Bionomics is an economic approach in the management of fish resources.

L. Economic Overfishing is if the ratio of the cost/price is too high or amount of input the required is greater than the number of inputs needed to produce at the maximum level of economic rents (maximized economic rent).[11]

M. The average cost (c) is the average value of the total cost incurred per unit ships in one year period, which includes: investment costs, depreciation, maintenance, administrative costs, and operational costs.

N. TR (Total Revenue) is the multiplication of the average price (p) and the catch (catch).

O. TC (Total Cost) is the multiplication of the average cost (c) and the number of vessels (effort).

P. The rent of Economy (π) is the difference of total revenue minus total cost.

Q. MEY (Maximum Economic Yield), production can achieve maximum economic benefit (profit).[12,13]

R. E_{MEY} is the optimal number of vessels on the MEY condition.

S. C_{MEY} is the optimal catches on the MEY condition.

T. MSY (Maximum Sustainable Yield), the production can reach a maximum amount of physical production.[12,13]

U. E_{MSY} is the optimal number of vessels on the MSY condition.

V. C_{MSY} is the optimal catches on MSY condition.

W. OAE (Open Access Equilibrium) is a production that does not earn a profit or loss.[12,13]

X. E_{OAE} is the optimal number of vessels on the OAE condition.

Y. C_{OAE} is the optimal catches on OAE condition.

In carrying out the bionomics analysis, firstly done with standardization mechanism of fishing gear. In the area of trammel net research vessel that operated as a single ship (single operator) and multiple operator for shrimp capture fisheries, so the analysis of fishing gear standardization needs to be done for multiple vessel operators.

The standardization procedures gear into fishing gear unit standard can be done as follows:[9]

A. The standard fishing gear used to have the largest CPUE and has a power factor value of fishing (fishing power index, FPI) equal to 1. The value of FPI can be obtained through the equation:[14]

$$\text{CPUE}_r = \text{Catch}_r/\text{Effort}_r$$

$$r = 1, 2, 3, \ldots, P \text{ (a standardized fishing gear)}$$

$$\text{CPUE}_s = \text{Catch}_s/\text{Effort}_s$$

$$s = 1, 2, 3, \ldots, Q \text{ (standard fishing gear)}$$

$$\text{FPI}_i = \text{CPUE}_r/\text{CPUE}_s$$

$$i = \text{the type of fishing gear; } 1, 2, 3, \ldots, K$$

Where: CPUE_r = the total catch (catch) per fishing effort (effort) of gear r that will be standardized (catch/effort). CPUE_s = total catch (catch) per fishing effort (effort) of gear s is used as the standard (catch/effort). FPI_i = fishing power index of fishing gear i (standardized) and standard fishing gear).

B. FPI_i value is used to calculate the total standard efforts:

$$E = \sum_{i=1}^{i} \text{FPI}_i E_i$$

Where: E = total effort or the amount of fishing effort on fishing gear that is standardized and standard fishing gear. E_i = standardized fishing gear effort and standard fishing gear.

3. RESULTS AND DISCUSSION

The establishment of marine and fisheries exploration department in the national unity cabinet is a step forward since this department managed separated. Abdurrahman Wahid, the fourth President of Indonesia, he is considered as brilliant by his decision to

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form this department. The decision does not only accommodate the desires of related parties, but also utilize the natural resources owned by Indonesia, and one of them is fisheries resources. National development that ignores local resources or not based on natural resources has proven to be very weak. Once national economy is hit by the crisis, the economy sectors based on local resources such as fisheries will rise up and be excellent. The price of fish, shrimp, seaweed, sea cucumbers and other marine commodities will be high. Thus, fishermen and fish farmers rise their activity up in catching or maintaining fishery commodities.

The higher the price of fishery commodities, then the damage to fishery resources also increased. Study conducted by Saputra[15] in Cilacap, proves it. Once, the current price of shrimp has increased in April–June 1998, the fishermen stepped up their activities. In fact most of them do destructive activities by fishing with explosives and chemicals. That means, the effort done by fishermen, although they could increase their income, increase foreign exchange income, and optimize the utilization of fishery resources, but do not consider the conservation or preservation of fisheries resources. Thus, by this way will destruct not only large fish but also eggs and small fish along with the reefs which is the habitat for fish and other marine life. So, does with the chemicals that damage the surrounding ecosystem.

This condition has already happened for a long time ago. The efforts of the government to improve the lives of fishermen and fish farmers during the new order was seen as "half-hearted" and very top down, likewise, the government made the preservation of fisheries resources. The communities around the conservation only be spectators, complement, and patients. So the things happened is that the government stigmatized the local community as poachers, wild catcher, and so forth. In fact what is done by the local community who is considered "wild" is only for steaming the kitchen. Finally, fisheries development strategy carried out by the government is opposite with the fish farmers and fishermen community.

Government try to increase the utilization of fishery resources and preservation oriented to industrialization that has no foundation. Various factories were built in rich areas of fishery resources. Sophisticated fishing vessels were imported, intensive and super intensive ponds were built everywhere but it leaves the community behind. The small fishermen (traditional) were only able to catch fish around the beach which has reached overfishing (catch solid), has even lead to species extinction. Small farmers cultivate fish and shrimp in traditional ponds that has low yield.

Government assistance by motor boat or capital is more harmful than beneficial. Not a few fishermen and fish farmers who have to sell their motor boat or a house to pay debts (government aid). This problems need to be done more seriously. The establishment of marine exploration and fisheries department is expected to become a reliable planning institution and design a program that is more participatory. It needs to take more attention to the objective conditions of the area and the local community.

Participation of the community in the effort to optimize the utilization of fishery resources and its preservation should be given a room. Historically, they have had the ability and traditional wisdom in utilizing and protecting fishery resources. Primack et al.[16] states in book of Conservation Biology that traditional society in general is very well acquainted with the surroundings. They have long coexisted with nature in harmony, and identify the ways in utilizing natural resources in a sustainable manner, for instance, SASI system in Moluccas communication. Customary law is a sign of prohibition to the population that is marked with a palm leaf, mounted on the boundaries of SASI, this means a ban on harvesting, catching or taking without consent to certain resources that are economically beneficial to society.[17,18]

Ability and traditional knowledge possessed by this community, slowly but surely, had been swept away in the new order.[19] Their position is very weak and become increasingly marginalized. Thus, the efforts to consolidate back the participation must start from the bottom (bottom up). The concept of empowerment and participation which has been the language of resistance undercurrent (grass roots) to deal with the state must be converted its orientation into neutral language and unbiased. Participation and empowerment should be seen as the creation of a space and improve the system, to provide opportunities to the community so that it can develop. In the operational phase, planning, implementing, evaluating and monitoring conducted participatory. Once this model will be developed, then the very first to do is to reverse the brain (changing the mindset) of the executor, ranging from the highest to the extension agents in the field. The assumption often seen that is stupid people had to be abandoned first.

4. CONCLUSIONS

Local community should be seen as subjects, not as objects. They have capabilities, both in the use of fishery resources and preserve them. Therefore, studies that have been done so far, related to the business to know the capability and local knowledge, such as SASI in Maluku, commander of the sea in Aceh, awing-awing in Bali, and so on can be used as a reference to design more participatory program. The utilization planning of fishery resources and their preservation, no longer as long as it involves only fisheries and economic experts. Social scientists, such as sociology, customary law, anthropology, history, and social workers in the field (NGO activists) need to be involved. Social incidents happened lately, such as the burning trawler (trawling), looting pond, and the seizure of the fishing area (fishing ground) are the radicalization of the fishermen—fish farmers. These social conflicts need to be studied by social scientists who is competent to handle.

By increasing and giving space to community involvement, in this case fishermen and fish farmers, in exploiting the fishery resources and their preservation, expected to the balance of utilization and conservation. Active participation of the community will enhance their empowerment. The philosophy of sustainable development must start from the bottom, because it is the biggest component of support and development practitioners. It is the time to the community is given the freedom to catch fish and maintain the type of potential commodities that exist in the sea, which could increase the income and welfare. Surely, they get clear information about market prospects and potential resources.

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