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Purse Seine Utilization in Fishery Development of Muncar Coastal Area, Banyuwangi (Bali Strait), Indonesia

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ABSTRACT
Lemuru (Sardinella lemuru) is a major fishery resources in the Strait of Bali with a base in the Port of of Muncar, Banyuwangi. Since 2000 there has been a large number of fishing activity, especially for catching Lemuru. It is due to an increase in the number of vessels and purse seine. The objective of this study are as follows: to determine the condition of fishery by using Purse Seine, to know the condition of fishery in coastal areas of Muncar in terms of legal and institutional aspects and to determine what the appropriate strategy for developing sustainable fisheries in of Muncar Banyuwangi. A descriptive method is used in this study. While the analysis of the data uses Description Analysis Method and SWOT analysis. The results showed that the rate of Lemuru exploitation in fish port (PPI) of Muncar compared with the Total Allowable Catch (JTB) in the Strait of Bali is exceeding the JTB value or in a state of over fishing. In the case of marine and coastal resource management, Muncar is currently not using the principle of Integrated Coastal Management (ICM). Making the marine and fisheries development policy haveto be established with a multidisciplinary rational scientific approach aims to improve the welfare of fishermen and maintaining optimum utilization of fishery resources to be sustainable. Based on the SWOT analysis, recommendations that can made by policy makers, among others: optimizing the function and role of the port in increasing the production of fisheries, fishing gear optimization, standardization, the selectivity of fishing gear, fishing effort enforcement on 20 miles offshore – 200 mile EEZ and restrictions on the number of vessels and catches.
Key Words: Keywords: Fishing, Purse Seine, Lemuru.

1. INTRODUCTION

Strait of Bali has an area of approximately 960 mil2 with maximum sustainable potential of 46,400 tons per year. The main fishery resources in Muncar is lemuru (Sardinella longiceps). Lemuru fishery is more than 70% of total production in Muncar's catching.
Since 2000 the number of vessels and purse seine for catching Lemuru is increasing, even merchants invite fishermen of Tuban to go to Muncar. Excessive pressure on resources in a short period may decrease the amount of fish. It can be seen from the declining number of catching. If these conditions persist long enough, then the fluctuations in catch levels will have broad impact on the economic life of Muncar population (approximately 45,000 inhabitants including fisherman families). Because Lemuru and Purse Seine is the source of life for the people of Muncar. Excessive exploitation occurs when fishing is greater than the Maximum Sustainable Yield. One of the marine resources that have been overexploited is the fishery resources (Burhanuddin, 2011).
According to Muhammad (2011), many tropical countries with low administrative abilities are encouraged to manage fishery resources on the basis of "species group". For example, trawl fisheries that capture so many kinds of the value of fish resources and geographical conditions of multi-species. In relation with the utilization of resources, the fishing fleet with different locations and tools and will certainly take into account the technology that can bring the biggest reception. Such circumstances can lead to certain fish resources become extinct.
Therefore, this study formulates the problem in order to find solutions of Muncar's fishery in Banyuwangi, as follows:

1) How is the condition of fishery in coastal area of Muncar, Banyuwangi?
2) How is the condition of fishery in Muncar coastal areas in terms of legal and institutional aspect?
3) What is the right strategy to develop sustainable fishery in Muncar, Banyuwangi?

2. METHODOLOGY

Time and Location

The research was conducted from January until November 2011. The location of research was in the area of Muncar (North Bali Strait) which is located in the subdistrict Muncar, Banyuwangi.

Research Methods

Type of method used in this research is descriptive. Descriptive method itself is a form of the method used in researching a condition, system or occurrence in the present through the collection of primary data and secondary data. The purpose of this method is to illustrate components which investigated and link it with existing variables schematically, systematically, timely and reliable about the facts, properties and relationships. In addition, this method also aims to describe the state or status of the phenomenon of the number of purse seine in Muncar towards Lemuru resources (oil sardine Sardinella).

Data Collection Method

The types of data that being collected are:

- Primary data is data that obtained directly from the source. It is observed and recorded for the first time. In this case is the interview with the owners of boats as well as fishermens. The methods used in collecting primary data are survey and observation.
- Secondary data is data that obtained indirectly as from government agencies, libraries, scientific journals and other reports.

The population in this study is a fishing community, especially for those who use Purse Seine as fishing gear in Muncar coastal area, as well as agencies which involved in the development of Lemuru fisheries. In this case, the number of Purse seine tools are as many as 203 units and it is assumed there are 203 fishermen who use it, so that the number of sample which taken are as much as 100 Purse seine users.

Data Analysis Methods

Description Analysis

This research uses descriptive analysis that describes the facts. They are as follows:

- Editing is checking or correcting data that has been collected. It is due to the possibility of incoming data (raw data) or the data collected is not logical and doubting.
- Coding is the effort to classify the responses of the respondents.

SWOT Analysis

SWOT analysis is used to identify the strengths and weakness of internal factors, as well as the opportunities and threats of the external factors that affect appropriate strategies for developing Purse Seine fishing gear in Muncar, Banyuwangi.

SWOT analysis is preceded by making strategic internal matrix factor analysis summary (IFAs) and external strategic factor analysis summary (EFAS). Preparation of IFAS and EFAS matrix based on the results of the analysis of the factors that become internal strengths and weaknesses and external opportunities and threats (Hunger & Wheelen, 2003).

Method of Legal Assessment and Institutional Aspects

Evaluation on fisheries regulations and institutional conducted through an indepth study, with a focus on key informant interviews at the study site. Key informants were fisheries officers, port officials, fishermen, traders and fish processing. Depth data analysis conducted by qualitative descriptive.

The questions category is as follows: the introduction of laws and regulations, violations and sanctions, and views on resource management.

3. RESULT AND DISCUSSION

The Development of Purse Seine Gear

Purse seine fishing gear development is not only in terms of sophistication, but it also can be seen in terms of quantitative. From the observation results, the development of Purse Seine in Muncar were not in terms of quality improvement, but there was also the increase amount in almost every year with the same shape and not accompanied by the development of technology.

Table 1. Number of Purse Seine in Muncar In 2004-2011

Year	Number (Unit)
2004	190
2005	190
2006	190
2007	222
2008	203
2009	203
2010	203
2011	203

Source: PPPI Muncar, Banyuwangi.

Table 1 show that in 2004 until 2006 the number of Purse Seine fishing gear is stable, but, in 2007 the number is up to 14% that is equal to 222 units. In 2008 the number of purse seine has decreased by about 9% that is equal with 203 units. That number has not changed yet until 2011.

According to data from the Ministry of Maritime Affairs and Fisheries (2004) the number of purse seine that is allowed to operate in order to maintain the condition of Lemuru catch levels in the Strait of Bali is an average of 187 units. Meaning that in this case, the number of purse seine in Muncar although decreased in 2008, it is still quite over the catch effort, because the number is still above 187 units. If the increasing number of Purse Seine is still continue, then over-exploitated would be something tobe concerned with, it happens if fishing effort is greater than the Maximum Sustainable Yield, meaning there is little fish available in the sea and fought over by many fishermens.

Several approaches could be done in order to keep Lemuru resources in optimal and sustainable number, as proposed by Burhanuddin (2011), including gear restrictions, regulating the use of fishing gear, fishing effort control, closure of fishing areas, fishing season closures, and enforcement quota. In this study, those approaches become objective in developing Lemuru in Muncar, Banyuwangi, especially regarding on optimization of Purse Seine and other gears.

Lemuru and Number of Purse Seine

Besides affecting the number of fishermen, the growing number of purse seine also affect lemuru catches. The data used in this research is the catch-effort data which can be seen in Table 2.

Table 2. Total of Lemuru catches in Muncar Year 2004-2010..

Year	Number (kg)
2004	9,204,618
2005	12,459,178
2006	47,418,774
2007	52,965,549
2008	25,606,358
2009	28.446.134
2010	17.717.764

Source: PPPI Muncar,Banyuwangi.

In Table 2, the production of lemuru fish catches from 2004 to 2007 are constantly increasing, but in 2008 the number of catches lemuru has decreased, and rise again in 2009. But in the year 2010 the decreasing production of lemuru catches happened quite dramatically by 37.71% compared to the catches in 2009.

Balanced maximum sustainable catch levels (C_{msy}) by an average of 31 161 tonnes per year, or catch per unit of purse seine standard of 170 tons per unit per year, whereas the value of JTB (number of allowable catch) for lemuru fishery in the Strait of Bali is equal to 24 928 tons per year (Ministry of Marine Affairs and Fisheries, 2004). Thus, while a decrease in the production of fish lemuru catches occurred in 2010, it can be said that the status of the balanced exploitation exceeds the maximum sustainable conditions (over fishing).

Table 3. Production Lemuru & Total of Purse Seine in Muncar.

Year	Lemuru Production (kg)	Total of Purse Seine (Unit)
2004	9,204,618	190
2005	12,459,178	190
2006	47,418,774	190
2007	52,965,549	222
2008	25,606,358	203
2009	28.446.134	203
2010	17.717.764	203

Source: PPPI Muncar, Banyuwangi.

In Table 3, shows that the number of purse seine fishing gear that affect the amount of production lemuru in the Strait of Bali, especially in Port Muncar exceed optimum effort.
According to the fishermen, this condition is unusual, nearly all fishermen reported that lemuru during the last 5 years is increasingly rare and fishing income also decreased.
In 2007, lemuru catches in Muncar was at its highest point. Then, the sale rate was decreasing in 2008 around Rp 1,500, - / kg. This is associated with the declining number of purse seine that was used. Whereas in 2009 and 2008 the number of purse seine same number of 203 units, production lemuru that catches have increased as well with an average sales value is in the range of Rp 2,000, - / kg. Then in 2010, with the same number of purse seine that were 203 units, production lemuru catches dropped drastically, but the selling value was experiencing a significant increase which was around Rp 7,000, - / kg. This shows the principle of economy where the demand for Lemuru is high but low in production/catches.
Based on the above approach, catching control is done by limiting the number of fishing fleet in the Strait of Bali, where the number of fishermen's benefits are at maximum conditions with regard to the potential sustainable fish resources.
When the fishing effort is greater than the Maximum Sustainable Yield, then it will trigger the over exploitation. One of the marine resources that have been exploited is Lemuru (Sardinellla lemuru). The over exploitation is indicated by the declining number of fishery resources due to over fishing. This condition is not only due to over fishing, but it also caused by pollution and physical degradation of mangrove forests and coral reefs where most of marine life relying their breeding, care and feeding. Many economic activities which are carried out in coastal and marine areas of Muncar are often causing problems in the management of resources as well as its environment.
.Those problems are still problematic. Referring to the decision of the Minister of Agriculture regarding the arrangements for the mesh size is at least 2.5 cm, whereas in the current mesh size according to interviews with several fishermens with 1 or 2 boats is about 2-3 cm. But in fact, Sempenit is being the most catched fish which size is less than 15 cm.
Department of Marine and Fisheries (2005) has set the size of the smallest fish that allowed to be caught which is basically associated with the smallest mesh size, whereas the smallest Lemuru that allowed to be captured is in the length of 15.46 cm. Related to these regulations, fishing Lemuru Sempenit is prohibited

Analysis of Legal and Institutional Aspects
Regulations in the management of fishery resources in Muncar Banyuwangi including Joint Decree between Governor of East Java and the Governor of Bali on regulating the use of purse seine in the Bali Strait No. 1992/674 238 Year 1992 dated 14 November 1992.
Joint decision between the two Governors which regulate the use of purse seine in the Strait of Bali and set some restrictions on the number of purse seine in each region as expressed in Article 2 which states that:

- Purse seine use in the Strait of Bali is set at 273 units which determined as follows:
  a. The Province of East Java as many as 190 units
  b. Province of Bali as many as 83 units

- Permission to use purse seine for fishing was given to a group of fishermen member of Mina Business Unit in accordance with the domicile
- Permit to use purse seine for fishery is not given to private companies / individuals
- Fishing licenses must always be brought by boat user in every fishing activity.

The regulations to control fish resource exploration are as follows:

a. The addition of a new purse seine units are not allowed other than those specified in Article 2.
b. Maximum length of the net is 300 meters, then, the width is 60 meters and net mesh size of 1 inch piece bag.
c. Maximum boat size of 30 Gross Tonnes (GT).

Basically, the rules which concerning on restrictions on the number of purse seine fishing gear is already clear. However, in reality, numbers of purse seine that operate are exceeding the limits. In Muncar, total number of purse seine is as many as 203 units with no licensing restrictions clarity. In this case, the lack of law enforcement in coastal and marine areas has to be a concern of government, not only the central government but also to be handled by local governments who have the authority in maintaining marine and coastal regions in accordance with the law which governing the issue of regional autonomy.
Thus, in essence, sustainable development is a strategy that gives a kind of threshold (limit) on the utilization of natural ecosystems and natural resources that exist in it. This threshold is not absolute, but rather flexible depends on technological and socio-economic conditions concerning utilization of natural resources, as well as the ability of the biosphere to accept the impact of human activities. In other words, sustainable development is a strategic utilization of natural ecosystems in such a way so as not to damage the functional capacity that can still provide benefits for human life. In outline, according Dahuri et al (2008), the concept of sustainable development has four dimensions: 1) ecological, 2) socio-economic culture, 3) socio-political, 4) the legal and institutional.

SWOT Analysis
Further analysis conducted in this study is a SWOT analysis which aims to determine the fishery development strategy in Muncar, Banyuwangi. Data were collected through a questionnaire and interviews, then, formulated in some points which resulting some inputs in making internal matrix strategic factor analysis summary (IFAs) and external strategic factor analysis summary (EFAS).
Analysis of the internal factors meant to understand the strengths and weaknesses in the development of fisheries in Muncar, Banyuwangi. Internal factors which are analyzed among others: fish resources, human resources, facilities.
Score calculation results of internal and external factors are used to determine the coordinates of the strategy. In this case as the "x" axis is an internal factor scores, while the "y" axis is an external factor scores. Thus the coordinates of the grand strategy for the SWOT analysis is (0.18, 1.09) located in the first quadrant that is a very favorable situation. Pelagic fish in Muncar have the opportunity and strength to be developed. So, the strategy which was adopted in this condition is considered to support the aggressive growth policy (Growth Oriented Strategy).

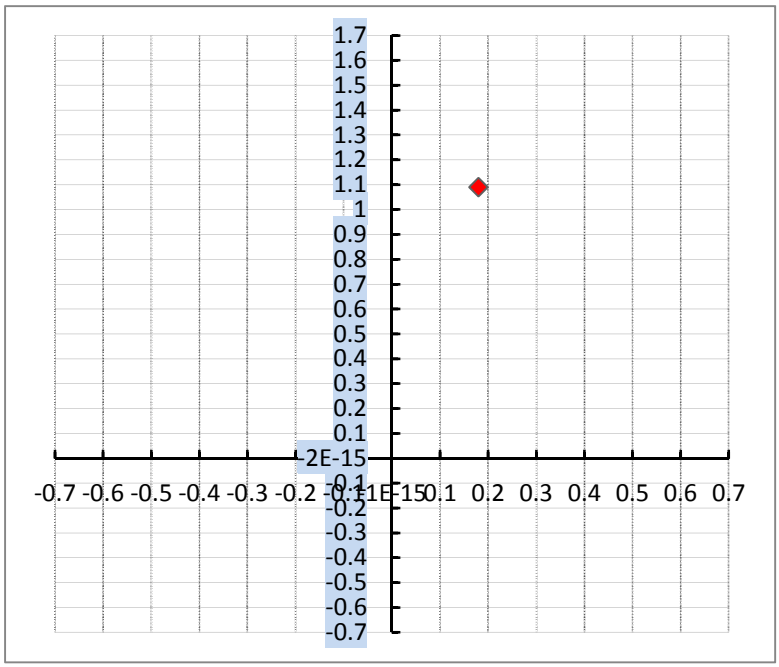

Figure 5. SWOT Analysis Quadrant.

IFAS and EFAS matrix are summarized in the SWOT Matrix to provide an alternative formulation of appropriate policy strategies for the development of fisheries in Muncar Banyuwangi.
The formulation of the strategy is a mix of SWOT factors that have been developed in IFAS and EFAS matrixs. The combination of the SWOT matrix can be seen in the following table:

Table 4. Grand Strategy Matrix of Pelagic Fishing Development in Muncar.

IFAS EFAS	*Streghts* (S)	*Weaknesses* (W)
Opportunity (O)	Recommendation SO: 1. Optimizing the function and role of the port in increasing the production of capture fisheries. So they can supply the high demand for fresh and processed fish. 2. Developing aquaculture in coastal area as it ever undertaken in Muncar 3. Integration and coordination of Minapolitan Programs with Muncar Port Development Plan that can accommodate large fishing vessels. 4. Coastal conservation for preserving resources and to ensure the availability of fish stocks 5. The addition of fish processing units and improvements in fish processing technology to support the high demand for processed fish.	Recommendation WO: 1. Optimization of fishing gears and application of standardization and the selectivity fishing gears in order to maintain the sustainability of fish resources. 2. Fishing along the 20 miles offshore - EEZ 200 miles 3. Installation of rumpon in the Strait of Bali in accordance with the laws and regulations on fisheries 4. Revitalization of KUD to reduce the monopoly of middlemen who control the price of fish. 5. Improvement of access roads to facilitate the production and fishery activities. 6. Improvement of fishing technology and marine acoustics
Threats (T)	Recommendation ST: 1. Socialization of government programs related to the development of coastal communities in fisheries 2. The use of environmentally friendly fishing gear. 3. The use of energy-efficient fishing gear. 4. Conservation of fish resources need to be done to reduce the over fishing and reduce fishing behaviors that are not selective 5. Improving the quality of fishing resources 6. The development of fishing effort 20 miles offshore - EEZ 200 miles	Recommendation WT: 1. Restrictions on the number of vessels and catches 2. Increasing the offshore aquaculture activity associated with the installation of rumpon in Muncar bay. 3. Improvement of access roads to support fisheries production especially on distribution. 4. Follow up on socialization from the government with the realization of the program plan. 5. Provision of fishing fleet to operate in 20 miles offshore - EEZ 200 miles 6. Training / mentoring on handling the fish processing

CONCLUSIONS AND SUGGESTIONS

Conclusions

1. Current exploitation rate (2010) for lemuru in Muncar port is 17,717,764 kg, when it is compared with the Total Catch That allowed (JTB) in Bali Strait for lemuru of 24 928 tons or 24.928 million per year, then the

rate of exploitation has been exceeded JTB value. Thus the status of the fishery in the Strait of Bali Lemuru is in a state of over fishing.

2. In the case of marine and coastal resource management, Muncar area is currently not using the principle of Integrated Coastal Management (ICM). Thus, the marine and fisheries development policy should be established in Muncar, with a multidisciplinary rational scientific approach aims to improve the welfare of fishermen and maintaining optimum utilization of fishery resources to be sustainable.
3. Based on the SWOT analysis, grand strategy is in quadrant I, which is situated in a very favorable situation. Optimizing the function and role of the port in increasing the production of fishery so that it can supply the high demand for fresh and processed fish. Optimization of gear, standardization and the selectivity of fishing gear in order to preserve fish resources. Development of fishing 20 miles offshore - 200 mile EEZ. Socialization of government programs related to the development of coastal communities in Muncar, restrictions on the number of ships and catches.

Suggestions

Overall, the number of purse seine for sustainable balanced category is 187 units, but the condition of the fish resources, especially for Lemuru which are degraded, so the researchers gave the following advice:

- Optimization gear for pelagic / surface needs to be held so that the fish resources can be back to normal in a balanced position.
- The need for the development of alternative employment (AMP) for fishermen. In this way fishermen could generate greater revenue and it will automatically reduce the fishing fleet, because the fishermen would leave the fishing business. When the number of the fishing fleet is reduced, so there is a chance for fish to recover, then the productivity of fisheries at a later stage will also increase, so that the income of fishermen who has survived will also increase.

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