eISSN: 2721-5717; pISSN: 2747-2124 https://journal.unhas.ac.id/index.php/zonalaut

ZONA LAUT

JOURNAL OF OCEAN SCIENCE AND TECHNOLOGY INNOVATION

Analysis of the Sustainability of the Use of Handlines and Shrimp Nets in Blitok Village Situbondo Regency

Creani Handayani*[1], Pratita Budi Utami[2], Alfiyah Emeliya[1], Moh. Syaifurrijal[1]
[1]Study Program of Ocean Engineering. Abdurachman Saleh Situbondo University, Indonesia
[2]Study Program of Aquatic Resource Management. Tanjungpura University, Indonesia
Email: *creanijuara@gmail.com

Abstract

Blitok Village at Situbondo Regency is a village that borders directly on The North of the Java Sea. Fishermen use handlines and shrimp nets because of a low budget and ease of operation. These fishing gear are considered environmentally friendly. At that time, data and information regarding these fishing are rather specific. Therefore, this research aims to dig into the use of these fishing gear from ecological, economic, and social aspects. Ecological aspects will be using CPUE Analysis. We discuss economics with the use of Financial Analysis. The Perception Analysis is used for the social part. This research was carried out by census because the population observed was 16 fishermen. The observations showed CPUE values were not good enough. It was also confirmed by financial analysis results. As a project, this business activity is not feasible. However, until now, this activity is still carried out by fishermen. Even though, 50% of fishermen admit that their condition is still less than prosperous. 75% of fishermen agree that this activity is Just Enough to support family income.

Keywords: Sustainable, Fishing Gear, Handlines, Shrimp Nets

1. INTRODUCTION

To achieve economic growth with principles such as community involvement and efficient resource management, efforts need to be made to improve sustainable marine management. The blue economy implementation strategy is a government program from the Ministry of Marine Affairs and Fisheries that supports these efforts. The fisheries industry is one of the important sectors in the Indonesia economy [1].

Blitok village, located in Situbondo Regency, is known as one of the coastal areas with fisheries potential. The fishing community in this village utilizes various types of fishing gear, including handlines and shrimp nets to meet their economic and subsistence needs. Fishermen in Blitok Village mostly choose to use handlines and shrimp nets because the capital required is relatively cheap and easy to operate. They land their catch at the Blitok Village Fish Landing Base. Fishermen depend on fishing every day to meet their daily needs. According to [2], small fishermen generally have labor-intensive businesses with limited capital, use simple technology, and have low levels of education and skills.

Handline fishing gear and shrimp nets are claimed to be environmentally friendly fishing gear in their use. Both fishing gear use materials that do not pollute and do not damage the environment. The result [3] revealed that handline fishing gear is known to be very selective in the fishing process so it is considered very environmentally friendly, in addition, the catch has a high economic value. However, in recent years there have been concerns about the environmental impact of the use of these fishing gear and its economic implications for local communities. This opinion is reinforced by [4] that damage to marine ecosystems is caused by one of them, pollution, booth from human activities on land and at sea.

Handlines, although considered more selective, have challenges in terms of efficiency and productivity. On the other hand, shrimp nets, although effective in catching, often cause bycatch problems that can disrupt marine ecosystems. The sustainability of these fishing practices is very important to ensure that marine resources remain sustainable and can continue to be utilized by future generations. According to [5], it is necessary to have a balanced approach between environmental protection and economic sustainability of fishermen in regulating the use of traditional fishing gear. This highlights the importance of policies that not

only take into account environmental aspects, but also the social and economic implications of such regulations.
Until now, data and information on fishing efforts using handline and shrimp nets in Blitok Village, Situbondo Regency are very limited and less specific. Therefore, the purpose of this study is to analyze the sustainability of the use of both fishing gears in Blitok Village, with a focus on ecological, economic and social aspects. This study seeks to answer the question of how fishing practices in Blitok Village can be optimized for community welfare and environmental sustainability.

2. METHODS

This study uses a survey method, where this method is used to collect data and information that is limited in nature. So that it emphasizes determining information about variables rather than information about individuals. The sample survey method is a method with the assumption of representation in a small part of the population observed [6]. The study was conducted for there months, starting from June to August 2024. Observations were made at the Fish Landing Base, Blitok Village, Situbondo Regency, East Java. The selection of PPI Blitok Village was due to the relatively small fishing fleet used (<3GT) using handlines fishing gear and shrimp nets.

2.1. Data Types and Sources

Quantitative data that is time series during the activity, was not obtained due to limitations of the management institution. So that primary data will be used as calculation data. In the pre-survey activity, coordination and consignment were carried out with the village government and stakeholders in the village. Based on the information obtained, all fishermen who use handline fishing gear and shrimp nets, and unload their catch at the PPI Blitok Village, are only 16 people. So it was decided that the sample survey that was initially carried out, became a census.
Data collection was carried out by collecting primary data and secondary data which are explained as follows:

a. Primary data collection
   In primary data collection, field surveys and in-depth interviews were conducted. Field surveys were conducted to collect data on the use of handline and shrimp net fishing gear, types of fish caught, volume of catch, fishing area, and characteristics of fishermen using each fishing gear. While the purpose of in-depth interviews was to obtain more in-depth information on economic factors that influence the use of fishing gear, including operational costs.
b. Secondary data collection
   Secondary data were obtained from relevant literature studies, including scientific journals and other related publications. Secondary data will be used to support the analysis and deepen understanding of the fisheries context in Situbondo. However, secondary data in the form of fisheries series data was not obtained, so modifications were made in calculating the estimated data needed using the interview result obtained.

2.2. Data Analysis

Data analysis was carried out into three aspects consisting of:

a. Ecological Aspects
   The analysis used in identifying the environmental impacts of the use of both fishing gears, uses literature studies [7] and the perceptions of fishermen who use shrimp nets and handlines. According to [8] where secondary data in the form of literature will be compared and new conclusions drawn to be used in research. Then in addition to using qualitative methods, cross-checking activities in the field, in existing conditions will also be carried out by the research team. The cencus taken, as a description of all resource utilization activities by fishermen. The criteria for respondents taken are fishermen who use the fishing gear, and land their catch at the PPI Blitok Village. Catch Per Unit Effort analysis was also carried out to determine the comparison of the condition of the catch with the efforts made by the fishermen.

b. Economic Aspects

The collected data is analyzed economically to evaluate the economic efficiency of each fishing gear. This will include calculating operational costs including equipment purchases, fuel and other costs related to the use of fishing gear.

Benefit Cost Ratio (B/C R)
The purpose of the cost-receipt ratio analysis is to understand how big the comparison is between income and production costs used. With the following formula [9]:

$$B/C = \frac{\Sigma PV\ Kas\ Bersih}{\Sigma\ PV\ Investasi} \quad (1)$$

Net Present Value (NPV)
Net Present Value (NPV) is used to evaluate the investment value by measuring the present value of net profits [10]. The projection duration used is 10 years, using an interest rate of 12% which refers to the basic credit interest rate [11].

$$NPV = \sum_{k=0}^{n} \frac{Bt - Ct}{1 + i} \quad (2)$$

Where :
B : Profit
C : Cost
I : Discount Rate
T : Period

With Criteria:
- Positive NPV, then the investment is accepted
- Negative NPV, the investment should be rejected

IRR (Internal Rate of Return)
Internal Rate of Return is the discount rate that can cause the Net Present Value of the project to be zero (NPV=0), or make the Benefit Cost Ratio one (B/C=1). Expressed by the formula [12]:

$$IRR = i_1 + \left[\frac{NPV1}{NPV1 + NPV2}\right] x\ (i_2 - i_1) \quad (3)$$

Where :
i1 : Interest rest that produces positive NPV
i2 : Interest rest that produces negative NPV
NPV 1 : NPV at discount rate i1
NPV 2 : NPV at discount rate i2

PP (Payback Period)
The payback period analysis aims to assess the time period required to recover the investment capital used in a business. In other words, it reflects the time required to cover investment expenditure using profit as a comparison. The payback period can be calculated using the formula [12]:

$$PP = \frac{I}{\pi}\ x\ 1\ tahun \quad (4)$$

Where :
PP : Payback Period
I : Investment

π : Profit

With Criteria:
- Payback period value of less than 3 years, return on business capital is categorized as fast
- Payback period value of 3-5 years, medium return category
- Payback period value of more than 5 years, slow category

c. Social Aspects
This analysis is an important approach in understanding a topic or problem by viewing it from different perspectives. This analysis is used to understand cultural, social, historical factors that can influence viewing a phenomenon or event. In this analysis, a questionnaire sheet is used as a data collection tool. The data collection technique is carried out using the snowball method, as a way to obtain potential respondents. Primary data collected using the in-depth interview method is carried out by census by looking at the stratification in the research methodology and field conditions. The data will be analyzed using perception analysis.

3. RESULTS AND DISCUSSION

3.1. Ecological Aspects

The limitations of secondary data, related to the amount of fishermen's catch, and the amount of fishing effort of both types of fishing gear. Encourage researchers to conduct a one-year projection, to calculate the CPUE value that will be used as one of the measurements of ecological aspects. The results of primary information covering all fishermen (census), are the justification that can be used in calculating CPUE in 2024. Based on the comparison table of catch results with the efforts made by each fisherman, it is known that the coefficient value produced tends to be below one (1). Which means that too much fishing effort is carried out, to produce production volume at that level. Table 1 is the CPUE value per each fisherman, the resulting value ranges from 1 Kg per 1 Trip to 50 Kg per 1 Trip. Another scenario is to calculate the amount of production volume and the number of trips cumulatively, so as to produce one CPUE value. So the results obtained are 78.43 Tons for production results, 4,656 Trips, and the resulting CPUE value is 0.017 Tons/Trip. Although using two different scenarios, the CPUE results are still not optimal. Therefore, further identification is needed regarding the cause of the low CPUE value produced.

Table 1. Comparison of Catch Results with Fishing Efforts of Blitok Village Fishermen

No	Estimated Production (Tons)	Estimated Number of Capture Attempts (Trips)	CPUE per Fisherman (Ton/Trip)
1	2,16	240	0,009
2	3,36	336	0,010
3	8,40	336	0,025
4	0,19	192	0,001
5	5,71	336	0,017
6	3,70	336	0,011
7	4,37	336	0,013
8	16,80	336	0,050
9	6,38	336	0,019
10	5,04	336	0,015
11	10,58	336	0,031
12	1,15	96	0,012
13	4,54	336	0,014
14	2,69	336	0,001
15	2,40	240	0,010
16	0,96	192	0,005

Source: Processed data (2024)

If using the CPUE calculation result in scenario II, it can be interpreted that in one fishing effort, the average fisherman produces 17 kg of fish. Then based on observations using the Mode Value, as many as 2 out of 16 fishermen, in one fishing effort the fishermen produce 1 kg. However, most of the other fishermen get a

catch of 5 to 17 kg in 1 fishing effort. In terms of numbers, the number of trips made by fishermen has reached its maximum limit. Where 11 out of 16 fishermen, carry out fishing activities every day. So the initial assumption is that fishing activities that are too high suppress fish resources ecologically. And then cause low productivity produced per unit effort.

In addition to the assumption that there is ecological pressure based on fishing effort made by fishermen, it is important to know that the power and capability of the fishing fleet owned by fishermen in Blitok Village are categorized as small fishermen with a size of < 3GT. By using fishing gear that is categorized as traditional. So that it will affect the cruising range to the fishing location. Due to these limitations, this affect the catch obtained. So with the limitations of the cruising range of the fleet and the fishing gear used, the projection of the CPUE value obtained reflect the fishing conditions carried out. So that the assumption that there has been ecological overfishing, deeper observation is needed. Where these observations are outside the framework of the current research.

In addition to the CPUE calculation results, the following are the result of the influence of fishing gear use on environmental conditions based on fishermen's perceptions. 10 out of 16 fishermen gave an assessment that sometimes they see environmental damage (especially to coral reef ecosystems), caused by fishing gear use activities. Figure 1, is the percentage given by fishermen. Based on Figure 1, the conclusion that can be drawn is that the community is quite aware of the level of damage caused by the use of handlines and shrimp nets as the fishing gear they use. So that 93,75% of fishermen feel that the use of shrimp nets and handlines is much more environmentally friendly when compared to the use of other fishing gear. This is reinforced by the result of the Analysis of Fishing Gear Friendliness Levels [13] and [14].

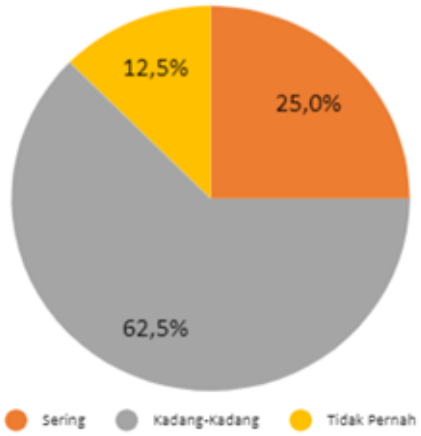

Figure 1. Perception Given to the Influence of Fishing Gear on the Environment

3.2. Economic Aspects

In the economic calculation section, income is obtained from the maximum catch obtained by fishermen and then multiplied by the price received by the fishermen. Then every 3 years, the price of commodities is increased by 5% in response to inflation. Then in Expenditure is divided into two parts, namely Investment Costs and Variable Costs. Investment Costs consist of fishing fleets and engines, then forVariable Costs consist of fuel needs, food and drink supplies, fishing gear and some fishermen also use bait. The following table is the result of the Financial Analysis calculation carried out.

Table 2. Results of Financial Analysis of Blitok Village Fishermen

No	Information	Score
1	PV Revenue	Rp 26.633.821.252
2	PV Expenditure	Rp 29.563.069.368
3	NPV	Rp -2.929.248.115
4	BCR	0,9
5	IRR	-
6	PP	11 years

Source: Processed data (2024)

Based on the projection in the next 10 years from the initial investment year, it is known that the NPV value generated has not yet generated a profit (generated minus Rp 2.929.248.115). So that the investment made still cannot be returned in full. This can also be seen from the PP value generated for 11 years, although the projection made is only up to 10 years. This means that the investment made in years 0, during the projection

duration, still cannot be returned by the fishermen. The same thing is also shown by the BC Ratio value, where the calculation result are less than 1. So that business activities are indeed not feasible to run.

3.3. Social Aspects

Based on the results of the questionnaire, the perception that can be drawn from all respondents is that they do not feel prosperous from the results of their livelihoods in capture fisheries. 50% of respondents feel that it is not good enough, although the other 50% of respondents admit that they feel that their income is very good. If observed more deeply, the results of the CPUE calculation do not show good results, because the resulting value is < 1. Either because of the factor of Fishing Effort which is too dense, or the factor of unknown target fish biomass. Then the perception that the respondents feel that their livelihood is still not feasible, is also shown by financial calculations. In theory, this business activity is not feasible. However, the respondents (fishermen) still continue to do this activity. The cause is thought to be that the respondents dis not calculate the value of the fleet, engines, engines repairs and fishing gear, into their investment calculations. So that investments that are seen daily, such as fuel and food and drink needs for supplies are seen as capital. Which will then be compared directly with the result of the sale of the catch. The following is a diagram of the perception of the respondents' assessment of the level of welfare of fishermen in Blitok Village when compared to fishermen in other villages.

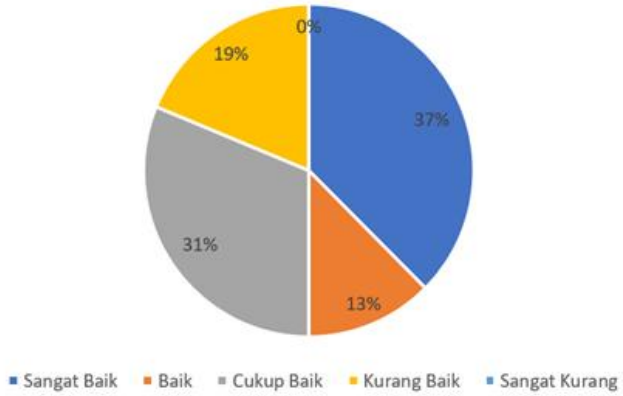

Figure 2. Fishermen's Perception Assessment of Welfare

In addition to the perception of the level of welfare felt, respondents were also asked to assess the daily catch on the influence of family income. The results obtained that 75% of respondents felt that fishing activities carried out with fishing gear and shrimp nets were sufficient as family income. Only 4 respondents felt that the influence of fishing income on their family income was very large. This is because the catch is in the form of shrimp, so the sales result are classified as having a high price.

4. CONCLUSION

Utilization of fish and shrimp resources in Blitok Village, in terms of biomass abundance, has not been possible due to limited secondary data. However, based on the results of CPUE calculations of all fishermen using fishing rods and shrimp nets in the village, it can be seen that the results tend to be unworthy. In terms of financial calculations, the activities carried out are also not feasible. And in the perception of the respondents, the catch is considered not satisfactory enough for them to influence family income, so they still feel less prosperous. Apart from that, the presence of middlemen also influences welfare factors in Blitok Village. Most fishermen sell their catch to middlemen because they borrow capital to catch fish from these middlemen.

ACKNOWLEDGMENTS

The research team would like to express their appreciation and gratitude to the Directorate of Research, Technology, and Community Service (DRTPM) of the Ministry of Education, Culture, Research and Technology for the financial support provided for this PDP research grant. We would also like to thank all parties who have provided moral and material support during research process.

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