



## **Socio-Economic Determinants of Trammel Net Fishermen Welfare in Cilacap Regency, Central Java, Indonesia**

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### **ABSTRACT**

In the trammel net fishing business, crew members and owners generally have different incomes. This can be influenced by trips and seasons, especially during the famine season fishermen get few catches, many fishermen don't even go to sea, thus impacting fishermen's income and family welfare. The purpose of this study is to analyze the level of welfare of trammel net fishermen in Cilacap Regency with indicators of the Central Statistics Agency and Fishermen's Exchange Rate and analyze influencing factors. This study was conducted from May to June 2022. The sampling method is purposive sampling, with the number of respondents as many as 90 net trammel fishermen. Indicators used as independent variables in determining welfare level factors are work experience, household expenses, number of family members, education level of the head of the family and income which was analyzed using path analysis. The results of the scoring indicators of the Central Statistics Agency 2021 show that 60% of trammel net fishery owners are high prosperous fishermen and 100% of trammel net fishery crews are medium prosperous fishermen. The level of welfare of trammel net fishermen with the Fisherman Exchange Rate shows that 93,4% of trammel net fishery owners and 86,7% of trammel net fishery crews are at a high welfare level. Factors that influence the welfare of net trammel fishermen were work experience, household expenses and income. To improve trammel net fishermen's welfare in Cilacap Regency, the Government should conduct a skills program for fishermen in the fisheries and non-fisheries fields as an alternative job to increase sources of income, especially for the famine season.

Keywords: Fisherman Terms of Trade, trammel net, artisanal fisheries

### **1. Introduction**

Cilacap Regency is one of the regions in Central Java Province that has great potential in capture fisheries. This is because Cilacap Regency's waters are part of the Indian Ocean waters, so it has abundant availability of capture fisheries stocks. Cilacap Regency has been identified as one of the minapolitan areas out of 197 regencies/cities throughout Indonesia in 2011. In 2020, Cilacap Regency has a total capture fisheries production of 25,245.1 tonnes a year. The location of Cilacap Regency, which is also located on the South Coast of Java Island, causes many production and economic activities of the community to depend on the sea. Tuna, skipjack and shrimp are the main commodities from Cilacap Regency that have high economic value (Cilacap Regency Fisheries Service, 2020).

Trammel net or ciker net is one of the dominant fishing gears in Cilacap Waters. The main target catch of the trammel net is king prawns. The catch of trammel net fishermen is influenced by several factors, one of which is nature. Fluctuations in catches are strongly influenced by many factors including the presence of fish, the number of fishing efforts and the success rate of catches (Ramadhani et al., 2023; Hapsari et al., 2022). Besides catches, factors that influence the welfare level of trammel net fishermen in Cilacap Waters are environmental infrastructure facilities, education level and income. Syatori (2014), stated that poverty, which is a label for fishermen in some cases, is caused by several factors such as slum conditions, low income and education levels, their vulnerability to social, political and economic changes, and the powerlessness of fishermen against the intervention of financiers and authorities.

Fishermen's relatively low income makes it difficult for fishermen to fulfil their daily needs, both food and non-food. Suroyya et al. (2017), stated that in general the limited income earned by fishermen causes insufficient primary and secondary needs for both food and non-food consumption. In general, fishermen and owners in the trammel net fishing business have differences in income. During the famine season, fishermen get a small catch and many do not even go to sea, which has an impact on the income and fishermen welfare level.

The problem of the welfare level of the fishing community is measured by two indicators, namely the Fisherman Exchange Rate indicator and the 2021 Central Bureau of Statistics people's welfare indicator. Indicators according to the Fishermen Exchange Rate are used in this research because they relate to income and expenditure which are the measuring points of welfare, while the people's welfare indicators of the Central Bureau of Statistics are chosen in this research because they are more detailed for each indicator studied. Besides determining the welfare level of fishermen, factors influencing the welfare level of trammel net fishermen in Cilacap were also analysed. There are six indicators used to analyse factors affecting the welfare level of fishermen, namely household expenditure, work experience, number of family members, education level of the head of the family, and income. This

study aims to (1) analyse the welfare level of trammel net fishermen in Cilacap Regency using the Central Bureau of Statistics and Fishermen's Exchange Rate indicators; and (2) analyse the factors influencing the welfare level of trammel net fishermen in Cilacap Regency.

## 2. Research Method

The research was carried out from May to June 2022 in South Cilacap District, Cilacap Regency, Central Java. This research was conducted descriptively with data collection techniques through interviews with purposive sampling method, with the criteria that respondents are owner or skipper fishermen and trammel net crew with fishing fleet <10 Gross Tonnage and one day fishing trip. The number of trammel net fishermen who became respondents in the research was determined using the Cochran formula (Sugiyono, 2013), with an error rate of 10%. Based on the calculation using the Cochran formula, the number of trammel net fishermen samples interviewed in the research was 90 respondents.

According to Hakim (2013), an interview is a face-to-face situation between the interviewer and the respondent that aims to obtain data about the respondent. The aspects to be obtained from the interview are economic, human resource, social and technical aspects. Economic aspects include: expenses and income of trammel net fishermen. Human resource aspects include education level and length of work experience. Social aspects include home ownership status, number of family dependents and living conditions, while technical aspects include fishing fleet, fishing gear, fishing methods and season. Data analysis methods are scoring based on Central Bureau of Statistics, Fisherman Exchange Rate and path analysis.

The Central Bureau of Statistics (BPS) indicators of people's welfare levels were analysed using scoring. The analysis steps taken are multiplying the score of each question as a whole (Sudjana, 2005):

### a. Determining The Range

$$R = (\text{largest data} - \text{smallest data}) + 1 \dots\dots\dots (1)$$

$$R = (\text{highest score} \times \text{number of questions}) - (\text{lowest score} \times \text{number of questions}) + 1$$

### b. Determining the number of classes

The number of classes in determining the welfare indicators was set at three classes, adjusted to the interests of the research, namely high, medium and low welfare levels.

### c. Determining Class Length

$$\text{Class length} = \text{range}/\text{number of classes}$$

There are 15 indicators from the 2021 Statistics Indonesia that were used in the research to analyse welfare levels. The highest score in each question is 3 and the lowest score in each question is 1. The criteria for assessing the welfare level indicators based on the Statistics Indonesia are low with a total indicator score interval of 15-25, medium with an interval of 26-36 and high with an interval of 37-46.

Fishermen Exchange Rate (FER) is the ratio between the price rate received by fishermen and the price rate paid by fishermen. The fishermen's exchange rate is obtained from calculating the ratio of total income to total expense of fishermen's households during a certain period of time (Koeshendrajana 2012; Hapsari et al 2019). In this case, this fishermen's household income is referred to gross income. According to Dien et al. (2022), the Fisherman Exchange Rate (FER) can be formulated as below:

$$FER = \frac{I_t}{I_b} \times 100 \dots\dots\dots(2)$$

Ib

FER = Fishermen Exchange Rate

I<sub>t</sub> = Total revenue/income (IDR)

I<sub>b</sub> = Total expenditure of fishermen (IDR)

Description:

FER > 100, high welfare because income is higher than expenditure

FER = 100, medium welfare because income is equal to expenditure

FER < 100, high welfare because income is smaller than expenditure

Path analysis is a statistical method used to determine the cause and effect relationship that occurs in regression. Path analysis in research is used to determine the factors that influence the level of welfare. The basis for drawing conclusions uses the significance value (Sig.). Significance (Sig.) < probability 0.05 then there is an influence of the independent variable (X) on the dependent variable (Y) and if Sig. > probability 0.05 there is no influence between variable X and variable Y simultaneously or partially. The path analysis equation to identify factors that affect the level of fishermen's welfare is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 Y_1 + e \dots\dots\dots(3)$$

Y	= welfare level
X <sub>1</sub>	= work experience
X <sub>2</sub>	= household expenditure
X <sub>3</sub>	= number of family members
X <sub>4</sub>	= education level of family head
Y <sub>1</sub>	= Income
e	= error

### 3. Result and Discussion

#### 3.1. Characteristics of Trammel Net Fishing Business in Cilacap

Trammel Net Fishing Business in Cilacap uses a fishing fleet of 6 GT wooden motorboats. Fishermen use axle tools in fishing operations, which function to pull the net and there is a hatch in the middle of the ship. In determining the coordinates of the operating area, fishermen usually rely on experience and get information from previous fishermen, but not a few have used the help of the application, namely Sail Free GPS. According to Nugraha et al. (2020), fishermen search for fishing areas by relying on their skills and experience.

**Table 1 - Characteristics of Trammel Net Fishing Business in Cilacap**

Categories	Description
Vessel	less then 10 GT ( 6 GT)
Machine	31 HP engine
Gears	Trammel Net
Fishing Deck Machinery	Roller
Length of Fishing	one day fishing
Members of fishing unit	3 - 4 crew
The Main Catch	<i>Panaeus merguensis</i> , <i>Panaeus mondon</i>

#### 3.2. Characteristics of Trammel Net Fishermen in Cilacap

The socio-economic characteristics of trammel net fishermen in Cilacap in this study include age, education level, number of family dependents, work experience, fishery and non-fishery income and fishery and non-fishery expenditures presented in Table 2. The age of respondents in this study is in the range of 16-64 years as many as 93.3% of skippers and 100% of crew members from each of the 45 respondents. This situation shows that trammel net fishermen in Cilacap are generally at a productive age level at which age humans can work more optimally towards any work in their field. The highest level of education of respondents was elementary school, 84.4%, while the smallest was senior high school, 2.3%. This can occur due to the lack of awareness of the fishing community of the importance of education and economic conditions that are insufficient for education costs. According to Zebua et al. (2017), the low economic level of the family will lead to fishermen's view that education is a need that is not so important so they prefer to work. The number of family dependents in the range of 3-4 people is with a percentage reaching 55.6% compared to the number of family dependents in the category <3 people with a percentage of 13.3%. The more the number of family members and family dependents, the more expenses in the household. According to Rungkat et al. (2020), the number of family dependents greatly determines the number of family needs. The more family members, the more family needs that must be met, and vice versa. Work experience in the range of 25-40 years is the largest category with a percentage of 62.3%. The longer the time of work experience of fishermen to go to sea, the higher the level of knowledge and ability of fishermen.

Revenue is the settlement of obligations from the provision of services, delivery or production of goods or other profit-generating activities (Datulangie and Agus, 2016). The main income in the fishing business varies according to the condition of the catch in the peak, medium and lean seasons. The highest income earned by owner fishers or skipper reached IDR 10,430,166 per month and IDR 2,520,500 for crew fishers. Non-fishery income is income earned from not fishing, which reaches IDR 3,000,000 for owner fishers and IDR 700,000 for crew fishers. Non-fishery income from owner fishers and fishermen is usually obtained from businesses such as grocery stores, selling LPG gas to odd jobs.

Household expenditure consists of fishing and non-catching expenditure. Fishing expenditure consists of fixed costs and the cost of fishing supplies. Fixed costs consist of maintenance of boats, fishing gear and engines, while the cost of supplies consists of fuel expenditure, supplies used. Non-capture expenditures are costs incurred on a daily basis. The highest fishery expenditure reached IDR 26,445,000 per month. The highest non-fishery expenditure is IDR 16,095,000 while the highest non-fishery expenditure reaches IDR 12,060,000. This difference in expenditure can be due to factors presented in the Central Bureau of Statistics indicator, namely the number of family members, the more family members the expenditure incurred by a family will be greater, and vice versa the fewer family members the less expenditure incurred by a family.

**Table 2 - Characteristics of Trammel Net Fishermen in Cilacap**

Categories		Description	
		Skipper	Crew
Age	< 15 year	0%	0%
	16-64 year	93,3%	100%
	>65 year	6,7%	0%
Level of Education	Elementary school	68,9%	84,4%
	Junior high school	24,4%	13,3%
	Senior high school	6,7%	2,3%
Family Dependents	< 3 person	31,2%	13,3%
	3-4 person	44,4%	55,6%
	> 4 person	24,4%	31,1%
Work Experience	< 25 year	42,2%	33,3%
	25-40 year	42,2%	62,3%
	> 40 year	15,6%	4,4%
Fishery Income	< IDR 3.000.000	0%	100%
	IDR 3.000.000– IDR 4.000.000	0%	0%
	> IDR 4.000.000	100%	0%
Nonfishery Income	< IDR 3.000.000	100%	100%
	IDR 3.000.000 – IDR 4.000.000	0%	0%
	> IDR 4.000.000	0%	0%
Fishery Expenditure	< IDR 3.000.000	13,3%	0%
	IDR 3.000.000– IDR 4.000.000	86,7%	0%
	> IDR 4.000.000	0%	0%
Nonfishery Expenditure	< IDR 3.000.000	100%	0%
	IDR 3.000.000– IDR 4.000.000	0%	0%
	> IDR 4.000.000	0%	0%

### 3.3. Trammel Net Fisherman Welfare Level in Cilacap

#### a. Trammel Net Fisherman Welfare Level Based on Central Bureau of Statistics 2021

Central Bureau of Statistics Indicators are used to determine the physical level of fishermen's welfare. The measurement results use the Central Bureau of Statistics because each indicator studied in the fishermen's community life is listed in more detail, not only in terms of finance but also in terms of housing or occupancy. The 2021 Central Bureau of Statistics indicators used in the study are 15 indicators, which include the status of ownership of housing, floor area of residential buildings, the widest type of floor, the widest type of roof, the widest type of wall, the main source of lighting, the source of water for daily use, the use of defecation facilities, fuel for cooking, the frequency of consumption of animal side dishes, ownership of savings, the number of family dependents, where to seek medical treatment when sick, the education level of the head of the household, and the number of family members who use device technology with internet access >3 months.

**Table 3 - The level of welfare of Cilacap Net Trammel Fishermen based on the Central Statistics Agency 2021**

Categories	Skipper		Crew	
	Total (Person)	Percentage (%)	Total (Person)	Percentage (%)
Low	0	0	0	0
Medium	27	60	45	100
High	18	40	0	0
Total	45	100	45	100

The majority of trammel net fishermen in Cilacap are categorised in the medium welfare category with a percentage of 60% for skipper fishermen and 100% for crew fishermen, while 40% of skipper fishermen are in the high welfare criteria. skipper who fall into the medium welfare category because there are still low scores on the savings ownership indicator, the place of medical treatment indicator, the education indicator of the head of the household and the indicator of the number of family members who work.

Some trammel net fishermen have large expenses for household consumption, while the income from one day fishing is only enough to fulfil daily needs so that the fishing community is unable to collect their income to save. In the indicator of place of treatment, trammel net fishermen in Cilacap mostly choose treatment at the health centre because they have BPJS (Social Health Insurance Administration Body), so most of the respondent fishermen are included in the medium score 2. The results of the last education indicator of the average fisherman's family have an elementary school level of education. This is because fishermen have been fishing since they were young because of the direction of their parents, so they are only able to complete education at the elementary school level, the score value of elementary school completion is 1. The score value of the number of family members who work is mostly 1 person, namely the fisherman as the head of the family, so it is included in the score value of 1.

### b. Trammel Net Fisherman Welfare Level Based on Fisherman Exchange Rate

The Fishermen's Exchange Rate (FER) is an indicator to measure the relative welfare of fishing communities. It is also a measure of a family's ability to fulfil its subsistence needs. After knowing the total income and total expenditure of trammel net fishermen, the level of welfare of fishing households can be known. According to Koeshendrajana (2012), measuring the welfare of fishermen requires indicators that are quick and precise to see the picture of welfare that has been achieved. One of the indicators that can be used to see household welfare is the Fisherman Exchange Rate (FER) indicator.

Fishermen Exchange Rate (FER) is said to be good if the value received by fishermen is greater than the value that must be spent, both for expenditure on consumer goods and for expenditure on production factors. The higher the Fishermen Exchange Rate (FER), the relatively stronger the level of ability/purchasing power of fishermen. In addition, a low Fishermen Exchange Rate (FER) indicates that the fishermen's income cannot be sufficient to fulfil the fishermen's consumption. Low Fishermen Exchange Rate (FER) can be caused by the low management ability of fishermen in an effort to increase production, market prices that are not in favour of fishermen or consumption patterns of fishermen.

**Table 4 - Trammel Net Fishermen's Welfare Level based on Fishermen's Exchange Rate Criteria**

FER	Categories	Skipper		Crew	
		Total (Person)	Percentage (%)	Total (Person)	Percentage (%)
<100	Low	0	0	0	0
=100	Medium	27	60	45	100
>100	High	18	40	0	0
Total		45	100	45	100

Based on Table 4, it is known that 93.4% of respondents of skipper and 86.7% of crew fishermen fall into the high FER category (>100), while the rest fall into the low category (<100). High Fishermen Exchange Rate (FER) is influenced by side businesses that can support household income. In addition, good financial processing between income and expenses can also affect the high and low Exchange Rate of Fishermen. According to Firdaus and Rikrik (2015), increasing the income of fishermen households can be done through empowerment efforts for household members who are already in the active workforce, through skills training in fisheries and non-fisheries, and business assistance that is implemented at the right time and target, so as to overcome poverty in fishermen households.

Financial management skills in the household can also affect household expenditure. Families that have the same family dependents but one of them can measure finances well, the Fishermen's Exchange Rate (FER) will be higher. Unexpected expenditure funds often influence and become the reason for setting aside money during the peak season (Humaedi, 2017; Husni, 2020). The money is used to increase the needs during the lean season so that the purchasing power of fishermen is not too reduced, when the lean season the purchasing power of fishermen will decrease, thus affecting the Fishermen Exchange Rate (FER) because income is also reduced.

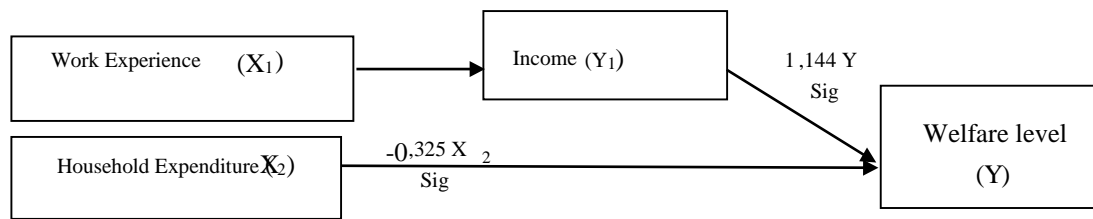
### 3.4. Factors affecting the Welfare Level of Trammel Net Fishermen in Cilacap

The variables to be used as factors are work experience ( $X_1$ ), household expenditure ( $X_2$ ), number of family members ( $X_3$ ), education level of the family head ( $X_4$ ), and income ( $Y_1$ ), which are analysed by path analysis. The data used as the dependent variable or welfare level is the Fisherman Exchange Rate (FER) data.

**Table 5 - Path Analysis**

Variabel	Sig.	Unstandarized Beta	Standarrized Coefficients Beta
Work Experience ( $X_1$ )	0,322	-0,079	-0,032
Household Expenditure ( $X_2$ )	0,000	-0,246	-0,325
Number of Family Members ( $X_3$ )	0,370	0,769	0,029
Latest Education ( $X_4$ )	0,437	1,406	0,027
Income ( $Y_1$ )	0,000	0,213	1,144
Work Experience ( $X_1$ ) to income ( $Y_1$ )	0,000	-0,079	-0,032

Based on the significant value, the variables that affect the level of fishermen's welfare directly are: household expenditure ( $X_2$ ) and income ( $Y_1$ ), as well as work experience ( $X_1$ ) to the intervening variable ( $Y_1$ ). Analysis of the effect of  $X_1$  through  $Y_1$  on  $Y$ : the direct effect of  $X_1$  on  $Y$  is -0.032, while the indirect effect of  $X_1$  through  $Y_1$  with the beta value of  $Y_1$  on  $Y$  is:  $0,252 \times 1,144 = 0,288$ . So the total effect given by  $X_1$  on  $Y$  is the direct effect plus the indirect effect, namely  $-0.032 + 0.288 = 0.256$ . Based on the results of the above calculations, it is known that the direct effect value is -0.032 and the indirect effect is 0.256, which means that the indirect effect value is greater than the direct effect value, this result indicates that indirectly  $X_1$  through  $Y_1$  has a significant effect on  $Y$ .



$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 Y_1 + e$$

$$Y = 93,825 + 0,134(Y_1 X_1) - 0,246(X_2) + 0,213(Y_1) + e$$

The results of the analysis show that variable  $X_1$  work experience ( $\beta=0.134$ ) through variable  $Y$  has a significant positive effect on welfare levels. This means that every 1 unit increase in work experience will increase the level of welfare by 0.134 units. Work experience positively and significantly affects the welfare level of trammel net fishermen, the longer the work experience of fishermen, the greater the income from the catch obtained because they are able to predict the fishing area and conduct fishing operations efficiently through the experience of fishermen so that it can affect the level of welfare. According to Lamia (2013); Azizi et al. (2017), the longer the experience of fishermen, the greater the catch, due to the efforts of fishermen to know fishing locations and the effectiveness of fishing activities by relying on work experience at sea.

The variable  $X_2$  household expenditure ( $\beta=-0.246$ ) has a significant negative effect on welfare levels. This shows that every 1 unit increase in household expenditure will reduce the level of welfare by 0.246 units. The income variable ( $\beta=0.213$ ) has a significant positive effect on welfare levels. This shows that every 1 unit increase in income will increase the welfare level by 0.213 units.

Household expenditure and income have a significant effect on welfare levels. Lower household expenditure will improve welfare, while high income will improve welfare (Rengganis, 2017; Wijayaningrum, 2017). According to Sembiring (2017), fishermen's income and expenditure have a significant effect on the level of welfare, because if income is higher than expenditure, the fishing community can be said to be prosperous.

Based on the equation model, it is known that the factor that has a significant negative effect on the welfare level of fishermen directly is the variable household expenditure ( $X_2$ ) and a significant positive effect on the welfare level is income ( $Y_1$ ) and indirectly work experience ( $X_1$ ) through income ( $Y_1$ ) has a significant positive effect on the welfare level ( $Y$ ). Based on these results, it can be concluded that the factors that influence the level of welfare are work experience ( $X_1$ ), household expenditure ( $X_2$ ) and income ( $Y_1$ ).

#### 4. Conclusion

Based on the welfare indicators of the Central Bureau of Statistics, it is known that 60% of skipper fishermen and 100% of crew fishermen are included in the medium value criteria. Based on the Fishermen Exchange Rate (FER) calculation, 93.4% of skipper fishermen are included in the high welfare criteria and 86.7% of crew fishermen are included in the high welfare criteria. Factors affecting the welfare of trammel net fishermen in Cilacap are work experience, household expenses and income.

The author suggests that the government needs sustainable empowerment programme assistance for fishermen, both business assistance in fisheries and non-fisheries, to improve skills that can be used as alternative jobs as an effort to increase their main source of income during the lean season so as to improve the welfare of trammel net fishermen in Cilacap.

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