

Original Research Article

Analysis of The Exchange Rate of Small-scale Trammel Net Fishermen in Pangandaran District, Pangandaran Regency

ABSTRACT

Fishing activities in Pangandaran District are one of the economic sectors that have been supporting regional development and growth. One of the capture fisheries commodities that contribute to improving the economy, especially the fishing profession in Pangandaran District, is shrimp. Generally, fishermen in Pangandaran District use trammel nets to catch shrimp. This study aims to calculate the Fisherman's Exchange Rate (NTN) on small-scale fishermen who use trammel nets in Pangandaran District. Fisherman's Exchange Rate is an indicator of economic welfare for fishermen published by Ministry of Marine Affairs and Fisheries. The fisherman's exchange rate can describe the income and expenditure of fishermen simultaneously and describe the development of fishermen's income levels periodically as a basis for determining government policies. This research was conducted at the Pangandaran and Cikidang Fish Auction Places, Pangandaran District, Pangandaran Regency, West Java, Indonesia in January-August 2022. This research uses a descriptive type of research method with a quantitative approach. The sampling technique used in this research is census. The data used are primary and secondary data with the number of respondents as many as 45 small scale trammel net fishermen in Pangandaran District with interviews. The data analysis method use one method, Fisherman's Exchange Rate (NTN). The results of this research indicate that the average exchange rate for small-scale fishermen is 92. NTN shows a number < 100. This indicates that small-scale fishermen who use Trammel net fishing gear in Pangandaran District have a deficit. This means that the economic welfare level of fishermen during the calculation period has decreased compared to the welfare level of fishermen in the basic calculation period.

Comment [GS,SM1]: abstract 200-250 words

Keywords: Fisherman's Exchange Rate, Small-scale Fishermen, Trammel net, Pangandaran District

1. INTRODUCTION

West Java Province in 2018 was the province with the third largest level of shrimp production nationally from the capture fisheries sector. West Java Province was ranked third by producing shrimp production of 20,815.65 tons. One of the largest shrimp-producing districts in West Java Province is Pangandaran Regency. The value of shrimp production from the capture fisheries sector in Pangandaran Regency in 2018 reached 537,558.10 kg (DKPKP Pangandaran Regency, 2018).

The high shrimp catch in Pangandaran Regency is inseparable from the productivity of the fishing gear used, namely the *trammel net*. The results of the analysis of catch per unit of effort and catch rate gear trammel net in the Pangandaran District resulted in 27.52 kg/trip

and a catch rate of 9.13 kg/hour (6.28 kg/hour as the main catch, namely shrimp and 2.85 kg/hour as a *bycatch*), with an average towing time of 60 minutes/trip. This catch rate value shows that *trammel net* has a greater ability to catch shrimp than other aquatic biota (Aulia, 2020).

Pangandaran District is one of the sub-districts in the Pangandaran Regency. Pangandaran District is one of the sub-districts that has great capture fisheries potential in Pangandaran Regency. Pangandaran District basically has two locations of Fish Auction Places (TPI) which are active in fish landings and fish buying and selling transactions. The two TPI are TPI Cikidang and TPI Pangandaran (Singkawijaya & Hilman, 2021). According to data compiled from KKP Statistics in 2018, 150,142 kg or the equivalent of 26.17% of shrimp production in Pangandaran Regency was contributed by TPI in the Pangandaran District. This value is also the catch using *trammel net* with the use of fishing vessels of less than 5 GT. The production data of shrimp catches in Pangandaran District is shown in **Table 1**.

Table 1. Production Data of Shrimp Catches in Pangandaran District

| No | Fish Auction Places (TPI) | Fishing vessel | Volume Produksi (kg) |
|-------|---------------------------|------------------------|----------------------|
| 1 | TPI Cikidang | Fishing motorboat 1 GT | 10.207 |
| 2 | TPI Cikidang | Fishing boat 5 GT | 121.727 |
| 3 | TPI Pangandaran | Fishing boat 5 GT | 17.708 |
| Total | | | 150.142 |

Small-scale fishermen are fishermen who catch fish to meet their daily needs, both those who do not use fishing vessels and those who use fishing vessels with a maximum size of 10 (ten) Gross Tonnage (GT) (Law Number 7 of 2016). Overall, the characteristics of fishermen in Pangandaran Regency are dominated by small-scale fishermen who are not yet prosperous (Sartika, 2011). Small-scale fishermen generally use small vessels and not more than 5 (five) GT to carry out fishing operations (Halim, 2020). The size of fishing vessels is generally measured using units of *Gross Tonnage* (GT). *Gross tonnage* (GT) is a measure that shows the volume of vessels to accommodate the results of fishing operations (Sunardi et al., 2019).

Fisherman's Exchange Rate (NTN) is a comparison between the total income received by fishermen and the total expenditure of fishermen's households during a certain period (Kusdiantoro et al., 2019). NTN is an indicator that can be used to measure the ability of fishermen's families to meet their basic needs (Dessy et al. 2020). Fisherman's Exchange Rate is considered appropriate as a measuring tool to measure the welfare of fishermen because it has advantages by considering all revenues (*revenue*) and all expenditures (*expenditure*) from fishermen's families (Juliani, 2012). Fishermen's Exchange Rate is one of the Main Performance Indicators of the Ministry of Maritime Affairs and Fisheries (KKP) which is claimed to be able to describe the development of fishermen's welfare economically because it is closely related to the income and expenditure of fishermen for each month.

2. METHODS

The research was conducted at the Pangandaran and Cikidang Fish Auction Places, Pangandaran District, Pangandaran Regency, West Java, Indonesia. The research was conducted in January-August 2022. The research method used is a survey method to small-scale trammel net fishermen in Pangandaran District, Pangandaran Regency. The sampling technique used in this research is census. The data used are primary and secondary data with a total number of respondents as many as 45 small-scale trammel net fishermen in

Pangandaran District with interview techniques using questionnaires. Primary data collected directly during the study were the characteristics of small-scale trammel net fishermen in Pangandaran District which included data on age, educational background, marital status, number of family dependents, working time, size of fishing boats, income from the fishery sector, household expenditures, fishermen, and fishermen's income. The secondary data used is data on the number and types of fishing gear and fishing productivity in the Pangandaran Regency. The data analysis method used in this study is Fisherman's Exchange Rate Analysis. The data will be analyzed descriptively with a quantitative approach.

2.1 Data Analysis

Analysis of the data used in this research, including

2.1.1 Fisherman's Exchange Rate

Analysis of the welfare of small-scale trammel net fishermen can be measured using the Fisherman's Exchange Rate formula (Ramadhan et al., 2014), which is formulated as follows:

$$\begin{aligned}
 \text{NTN} &= \frac{\text{IT}}{\text{IB}} \times 100 \\
 \text{IT} &= \sum_{i=1}^n P_t^1 \cdot Q_t^1 \\
 \text{IB} &= \sum_{i=1}^n P_b^1 \cdot Q_b^1
 \end{aligned}$$

Information:

NTN : Fisherman's Exchange Rate;
 IT : Index Received by Fishermen;
 IB : Index Paid by Fishermen;
 Pt : Price of Fishery Production Commodity (Rp);
 Qt : Fishery Production Commodity Quantity (IDR);
 Pb : Cost of Fishing Business Costs, Prices of Food and Non-Food Necessities (IDR);
 Qb : Quantity of Cost of Fishing Business, Food and Non-Food Consumption (IDR);
 t : Time Period.

3. RESULTS AND DISCUSSION

3.1 PANGANDARAN DISTRICT PROFILE

Pangandaran District is one of the sub-districts in the Pangandaran Regency along with nine other sub-districts, namely Cimerak, Cijulang, Cigugur, Langkaplancar, Parigi, Sidamulih, Mangunjaya, Kalipucang, and Padaherang sub-districts. Pangandaran District is a coastal area with an average height above sea level of about 611.25 m. Pangandaran District has

an area of 118.87 km². Pangandaran District is the second largest sub-district in Pangandaran Regency after Kalipucang District with a total area of 136.78 km² (Ciamis District Statistical Center Agency, 2021)

Pangandaran District has a population of 58,299 people consisting of 29,311 male and 28,988 female. In 2021, the sex ratio in Pangandaran District will reach 101.10. This means that for every 100 female residents there are 101 male residents or in other words, the male population in Pangandaran District is more than the female population. The productive age group, namely the age of 15-64 years, in Pangandaran District there are 41,190 people (71%) and the non-productive age group, namely the young age (0-14 years) and the old age (> 65 years) as many as 17,109 people (29%). (Ciamis District Statistical Center Agency, 2021)

3.2 CHARACTERISTICS OF SMALL-SCALE TRAMMEL NET FISHERMEN IN PANGANDARAN DISTRICT

Characteristics Of Small-Scale Trammel Net Fishermen In Pangandaran District aims to find out the condition of the respondents and obtain the data needed in compiling the fisherman's exchange rate. Characteristics of respondent data consist of age, educational background, marital status, number of family dependents, work experience, work time, fishing vessel size, fisherman's ousehold expenditure, fisherman's fishing expenses, and fisherman income.

Comment [GS,SM2]: add discussion

3.2.1 Age

Age is the length of an individual's life from birth to birthday. The more old enough, the level of maturity and strength of a person will be better at work (Lasut, 2017). Age is one of the factors that affect a person's productivity at work (Aprillyanti 2017). The age group categorized in the age of 15-64 years while the unproductive age group is the age group under 15 years and above 65 years (Panggabean, 2020). Based on the results of the research in **Table 2**, it shows that the age of small-scale trammel net fishermen in Pangandaran District is dominated by the productive age group, which is 98% and the remaining 2% is the non-productive age group. The average age of small-scale trammel net fishermen in Pangandaran District is 40 years.

Comment [GS,SM3]: add discussion

Table 2. Age of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Age (Years) | Frequency (Fihsermen) | Percentage (%) |
|--------------|-------------|-----------------------|----------------|
| 1 | 22 – 28 | 6 | 14 |
| 2 | 29 – 35 | 13 | 29 |
| 3 | 36 – 42 | 9 | 20 |
| 4 | 43 – 49 | 8 | 18 |
| 5 | 50 – 56 | 6 | 13 |
| 6 | 57 – 63 | 2 | 4 |
| 7 | 64 – 70 | 1 | 2 |
| Total | | 45 | 100 |

3.2.2 Educational Background

Education is one of the important factors in the development of human resources. The level of education is very influential on the ability to work. The higher a person's educational background, the higher the person's ability to increase work productivity (Arifin & Firmansyah, 2017). Based on the results of the research in **Table 3**, it is shown that the small-scale trammel net fishermen in Pangandaran District on average have an elementary school education background (58%). Traditional fishermen in Pangandaran District are dominated by fishermen with low educational levels, Elementary School (SD) (Nastiti et al., 2022).

Comment [GS,SM4]: add discussion

Table 3. Educational Background of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Educational Background | Frequency (Fishermen) | Percentage (%) |
|--------------|--------------------------|-----------------------|----------------|
| 1 | Elementary School (SD) | 26 | 58 |
| 2 | Junior High School (SMP) | 13 | 29 |
| 3 | Senior High School (SMA) | 6 | 13 |
| Total | | 45 | 100 |

3.2.3 Marital Status

Marital status can also affect one's household welfare. A person who is bound to marital status will require more food needs than someone who is not married. Therefore, financial independence is important before starting a household (Sari 2018). Based on the results of the research in **Table 4**, it shows that small-scale trammel net fishermen in Pangandaran District on average are married (91%) and the rest are unmarried (4%).

Table 4. Marital status of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Marital Status | Frequency (Fishermen) | Percentage (%) |
|--------------|----------------|-----------------------|----------------|
| 1 | Married | 41 | 91 |
| 2 | Unmarried | 4 | 9 |
| Total | | 45 | 100 |

3.2.4 Number of Family Dependents

Number of dependents is the number of family members who are still dependents of a family. Family members categorized as family dependents are siblings or non-siblings who live in the same house but do not have a job. The bigger the number of dependent family members owned by a family will generally affect the high level of expenditure from the family (Purwanto & Taftazani, 2018).

Table 5. Number of Family Dependents of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Number of Family Dependents (People) | Frequency (Fishermen) | Percentage (%) |
|----|--------------------------------------|-----------------------|----------------|
| 1 | 1 – 2 | 7 | 16 |
| 2 | 3 – 4 | 26 | 58 |

| | | | |
|--------------|-------|-----------|------------|
| 3 | 5 – 6 | 12 | 26 |
| Total | | 45 | 100 |

Based on the results of the research in **Table 5**, it shows that small-scale trammel net fishermen in Pangandaran District have four family dependents. The minimum number of family dependents owned by fishermen is one person and the maximum is six people.

Comment [GS,SM5]: add discussion

3.2.5 Work Experience

Work experience is one of the factors that can affect a person's productivity at work. The longer the working period of a worker, generally the skills and abilities in doing work are increasing (Aprilyanti 2017). Based on the results of the research in **Table 6**, it shows that small-scale trammel net fishermen in Pangandaran District on average have 20 years of experience at work. The lowest fishing experience is 2 years and the highest fishing experience is 40 years.

Table 6. Work Experience of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Work Experience (Years) | Frequency (Fishermen) | Percentage (%) |
|--------------|-------------------------|-----------------------|----------------|
| 1 | 2 – 7 | 8 | 18 |
| 2 | 8 – 13 | 5 | 11 |
| 3 | 14 – 19 | 11 | 24 |
| 4 | 20 – 25 | 11 | 24 |
| 5 | 26 – 31 | 5 | 11 |
| 6 | 32 – 37 | 3 | 8 |
| 7 | > 38 | 2 | 4 |
| Total | | 45 | 100 |

Comment [GS,SM6]: add discussion

3.2.6 Working Time

Work experience is one of the factors that can affect a person's productivity at work. The longer the working period of a worker, generally the skills and abilities in doing work are increasing (Aprilyanti 2017). Based on the results of the research in **Table 6**, it shows that small-scale trammel net fishermen in Pangandaran District on average have 20 years of experience at work. The lowest fishing experience is 2 years and the highest fishing experience is 40 years.

Comment [GS,SM7]: add discussion

Table 7. Working Time of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Working Time (Trip/Month) | Frequency (Fishermen) | Percentage (%) |
|----|---------------------------|-----------------------|----------------|
| 1 | 12 – 16 | 6 | 13 |
| 2 | 17 – 21 | 25 | 56 |
| 3 | 22 – 26 | 13 | 29 |
| 4 | > 27 | 1 | 2 |

| | | |
|--------------|-----------|------------|
| Total | 45 | 100 |
|--------------|-----------|------------|

3.2.7 Fishing Vessel

The size of fishing vessels is generally measured using units of *Gross Tonnage* (GT). *Gross tonnage* (GT) is a measure that shows the volume of vessels to accommodate the results of fishing operations (Sunardi et al., 2019). In general, fishing vessels used to catch fish consist of fishing boat, fishing motorboats or boats without motors, or other floating equipment used to catch fish. Based on the results of the research in **Table 7**, it shows that small-scale trammel net fishermen in Pangandaran District use two types of boats, namely fishing boat (5 GT) and fishing motorboats (1 GT). Small *trammel net* in Pangandaran District are dominated by fishermen with fishing motorboats (1 GT) as many as 41 people (91%). As for the rest using a motor vessel (5 GT) as many as 4 people (9%).

Table 8. Fishing Vessel of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Fishing Vessel Size (GT) | Frequency (Fishermen) | Percentage (%) |
|--------------|---------------------------|-----------------------|----------------|
| 1 | Fishing Motorboats (1 GT) | 41 | 91 |
| 2 | Fishing Boat (5 GT) | 4 | 9 |
| Total | | 45 | 100 |

3.2.8 Fishermen's Revenue

Fishermen's revenue (Total Revenue) is the multiplication of the number of fishery commodities obtained or yield (Y) with the selling price of the fishery commodity (Py) (Rafki, 2022). Basically, the income received by fishermen does not include the reduction of fixed costs and variable costs incurred by fishermen. Based on the results of the research in Table 9, it shows that small-scale trammel net fishermen in Pangandaran District are dominated by fishermen with revenues ranging from IDR1,000,000 – IDR3,500,000 in one month as many as 23 people (51%). The lowest income owned by small trammel net fishermen in Pangandaran District is IDR1,000,000 and the largest is IDR19,000,000 by one fisherman.

Comment [GS,SM8]: add discussion

Table 9. Fishermen's Revenue of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Fishermen's Revenue (IDR/Month) | Frequency (Fishermen) | Percentage (%) |
|--------------|---------------------------------|-----------------------|----------------|
| 1 | 1.000.000 – 3.500.000 | 23 | 51% |
| 2 | 4.500.000 – 7.000.000 | 17 | 39% |
| 3 | 8.000.000 – 10.500.000 | 1 | 2% |
| 4 | 11.500.000 – 14.000.000 | 1 | 2% |
| 5 | 15.000.000 – 17.500.000 | 2 | 4% |
| 6 | 18.500.000 – 21.000.000 | 1 | 2% |
| Total | | 45 | 100 |

3.2.9 Fisherman's household expenditure

Fisherman's household expenditure is one of the factors that can affect the welfare of fishermen (Sukmawardhana et al., 2013). In general, fishermen's household expenditures can be categorized into two groups, namely expenditure needs for food and non-food (Firdaus et al., 2015). Based on the results of the research in **Table 10**, it shows that small-scale trammel net fishermen in Pangandaran are dominated by expenditure groups of IDR 1,450,000 – IDR1,800,000 as many as 12 people (27%) in one month. The lowest fisherman household expenditure in one month is IDR800,000 for one fisherman. The largest household expenditure in one month is IDR4,750,000 for one fisherman..The average expenditure for the household is IDR2,312,222.

Comment [GS,SM9]: add discussion

Table 10. Fishermen's Household Expenditure of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Fishermen's Household Expenditure (IDR/Month) | Frequency (Fishermen) | Percentage (%) |
|----|---|-----------------------|----------------|
| 1 | 800.000 – 1.150.000 | 5 | 11 |
| 2 | 1.450.000 – 1.800.000 | 12 | 27 |
| 3 | 2.100.000 – 2.450.000 | 11 | 24 |
| 4 | 2.750.000 – 3.100.000 | 8 | 18 |
| 5 | 3.400.000 – 3.750.000 | 3 | 7 |
| 6 | 4.050.000 – 4.400.000 | 5 | 11 |
| 7 | > 4.400.000 | 1 | 2 |
| | Total | 45 | 100 |

3.2.10 Fisherman's fishing expenses

Fishermen's fishing expenses (Total Cost) are expenses incurred by fishermen in carrying out capture fisheries activities. In general, fishermen's fishing expenses consist of fixed costs and variable costs. Fixed costs, for example, are maintenance and repair costs for ships and their engines or fishing gear. Meanwhile, variable costs fishermen in fishing activities generally consist of fuel oil, equipment (ice, water, bait, food supplies, cigarettes, medicines) and labor. Based on the results of the research in **Table 11**, it shows that small scale trammel net fishermen in Pangandaran District are dominated by expenditure groups of IDR 750,000 – IDR1,750,000 as many as 26 people (58%) in one month. The lowest expenditure is IDR750,000 and the largest expenditure is IDR10,000,000. On average, fishing expenses for small-scale trammel net fishermen in Pangandaran District for one month are IDR 2,232,222.

Comment [GS,SM10]: add discussion

Table 11. Fishermen's fishing expenses of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Fishermen's fishing expenses (IDR/Month) | Frequency (Fishermen) | Percentage (%) |
|----|--|-----------------------|----------------|
| 1 | 750.000 – 1.750.000 | 26 | 58 |
| 2 | 2.250.000 – 3.250.000 | 14 | 32 |

| | | | |
|--------------|-----------------------|-----------|------------|
| 3 | 3.750.000 – 4.750.000 | 1 | 2 |
| 4 | 5.250.000 – 6.250.000 | 1 | 2 |
| 5 | 6.750.000 – 7.750.000 | 1 | 2 |
| 6 | 8.250.000 – 9.250.000 | 1 | 2 |
| 7 | > 9.250.000 | 1 | 2 |
| Total | | 45 | 100 |

3.2.11 Fishermen's income

Fishermen's income is the subtraction between *total revenue* (TR) and all costs or *total cost* (TC) incurred by fishermen to carry out their work. Based on the results of the research in **Table 12**, it shows that Small scale trammel net fishermen in Pangandaran District are dominated by the income group of IDR850,000-IDR1,850,000 as many as 20 people (44%). The lowest income was IDR850,000 and the largest income reached IDR9,000,000. On average, small-scale trammel net fishermen in Pangandaran District have an income of IDR 2,572,222 for one month.

Comment [GS,SM11]: add discussion

| No | Fishermen's Income (IDR/Month) | Frequency (Fishermen) | Percentage (%) |
|--------------|--------------------------------|-----------------------|----------------|
| 1 | 850.000 – 1.850.000 | 20 | 44 |
| 2 | 2.350.000 – 3.750.000 | 19 | 42 |
| 3 | 3.850.000 – 5.250.000 | 1 | 2 |
| 4 | 5.350.000 – 6.750.000 | 1 | 2 |
| 5 | 6.850.000 – 8.250.000 | 3 | 8 |
| 6 | > 8.250.000 | 1 | 2 |
| Total | | 45 | 100 |

3.3 FISHERMAN'S EXCHANGE RATE

Fisherman's Exchange Rate (NTN) is a comparison between the price index received (It) by fishermen and the price index paid (Ib) by fishermen. NTN has a function to measure the ability and purchasing power of fishermen in financing their household life. Conceptually, the fisherman's exchange rate describes all revenues from the capture fishery business then traded for the non-capture fisheries sector.

Comment [GS,SM12]: add discussion

Table 13. Fishermen's fishing expenses of Small-Scale Trammel net Fishermen in Pangandaran District

| No | Fisherman's Exchange Rate (NTN) | Frequency (Fishermen) | Percentage (%) |
|--------------|---------------------------------|-----------------------|----------------|
| 1 | NTN < 100 | 32 | 71 |
| 2 | NTN = 100 | 2 | 4 |
| 3 | NTN > 100 | 11 | 25 |
| Total | | 45 | 100 |

Based on the results of the research in **Table 13**, it shows that small scale trammel net fishermen in Pangandaran District are dominated by fishermen with NTN < 100 as many as

32 people (71%). The overall NTN result for small-scale trammel net fishermen in Pangandaran District is 92. This figure shows that fishermen experience a deficit and the level of economic welfare of fishermen during the calculation period has decreased compared to the welfare level of fishermen during the previous calculation period. Research conducted in 2021 in Pangandaran District on traditional fishermen showed that the NTN yield was 99 (Nastiti et al., 2022).

Comment [GS,SM13]: add discussion

4. CONCLUSION

The average exchange rate (NTN) for small-scale trammel net fishermen in Pangandaran District is 92 or less than 100 (<100). This shows that the economic welfare of small-scale trammel net fishermen in Pangandaran District is deficit. This means that the level of economic welfare of fishermen during the calculation period has decreased compared to the level of welfare of fishermen during the basic calculation period. The low fisherman exchange rate can indicate the amount of fisherman's expenditure is bigger than the amount of fisherman's income.

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Comment [GS,SM14]: minimum library 40-50 libraries. 80% latest library last 5 years

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