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Construction Suitability of Trammel Net Operated by Kotabaru Fisherman Based on SNI 01-7237-2006

Mihrobi Khalwatu Rihmi*, Hidayatul Aisytu Nurul Akbar, Ledhyane Ika Harlyan, Tri Djoko Lelono

Fisheries Resource Utilization Study Program, Department of Utilization of Fisheries and Marine Resources, Faculty of Fisheries and Marine Science, Brawijaya University
Veteran Road, Malang City, East Java, Indonesia 65145

Correspondence:
mihrobi@ub.ac.id

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ABSTRACT

Trammel net is a type of gill net. Usually, fishermen operate trammel nets to catch shrimp. Many fishermen build trammel nets traditionally without going through a standard design and construction process. They bought webbing on the market to assemble them into three layers of net and equipped with rope components and buoys, sinker, and selvedge. Meanwhile, to realize the effectiveness of fishing and managing fisheries activities, the government regulates the standard form of trammel net through SNI 01-7237-2006. Thus, it is necessary to evaluate the suitability of the standard form of trammel net based on SNI rules. This research was conducted using a quantitative descriptive method. The research locations are in three villages which are fishing bases for trammel net fishermen in Kotabaru Waters, namely: Pantai Village; Salino Village; and Sungai Pasir Village. The results from the three trammel net sample sizes: small; medium and large have scores of 89%; 95%; and 95% which are in the very suitable category.

INTRODUCTION

Trammel net is a type of gill net. According to (Mardiah *et al*., 2017), the primary difference between these two fishing nets lies in the number of layers in the body of the net. A gill net consists of a single layer of netting with same mesh size throughout. In contrast, a trammel net is composed of three layers of netting, where the two outer layers have larger mesh sizes, flank an inner layer with smaller mesh sizes (Cheng *et al*., 2023).

The structural differences between trammel nets and gill nets significantly affect their capture performance (Prasetyo *et al*., 2015) Trammel nets are more effective for catching fish than gill nets. This is due to the different mechanisms of capture in each type of net. In gill nets, most fish are caught by entangling their gills (gilled). In trammel nets, fish are primarily entangled (entangled) in the pockets formed by the net (Hartono, 2018).

The formation of pockets in trammel nets is largely determined by the slackness of the inner net layer (Irhamsyah, 2002). This is caused by the height difference between the inner and outer layers of the net. Fishermen typically use an inner net height of 2 meters and an outer net height of 1.5 meters. The three layers of the net are then assembled, and the overall

net height is adjusted to match the outer net height of 1.5 meters. This characteristic has led fishermen in various regions to refer to trammel nets by different local names, such as: "jaring puntal" or entangled net (Purbayanto *et al*., 2000); "jaring udang" or shrimp net (Rudi & Sumarno, 2015); "jaring kantong" or pocket net (Mardiah & Pramesthy, 2019); and "jaring gondrong" or dreadlocks net (Setyanto *et al*., 2021).

One of the regions where trammel nets are widely used is the waters of Kotabaru, South Kalimantan Province. Fishermen in Kotabaru use trammel nets to exploit shrimp resources (Kembaren & Ernawati, 2015). According to data from the Kotabaru Department of Marine Affairs, the number of trammel nets reaches 74,022 units, or 45% of all fishing gear. Trammel nets are prioritized for shrimp capture over other fishing gear, such as arad, which is considered a destructive fishing practice (Khan, 2018).

This study aims to evaluate the compliance of trammel nets made by Kotabaru fishermen based on existing standards. Research discussing the compliance of trammel nets with applicable regulations has not been conducted previously. Some publications, such as (Yulianto *et al*., 2019) and (Rajab *et al*., 2023), have analyzed the compliance of gill net construction with the Indonesian National Standard (SNI) 01-7214-2006. However, this study will refer to SNI 01-7237-2006, which regulates trammel nets. As a regulation, SNI 01-7237-2006 aims to ensure that trammel nets are effectively designed to form pockets for entangling shrimp. Furthermore, almost all trammel nets are still traditionally assembled without using a proper design and construction process. Therefore, evaluating the compliance of fishing gear with the SNI is expected to help maintain the sustainability of fish resources and aquatic ecosystems.

METHODS

The study was conducted over three months, from January to March 2024. The research location was in three villages that serve as fishing bases for trammel net fishermen in Kotabaru, namely: Salino Village, Pantai Village, and Sungai Pasir Village (Figure 1).

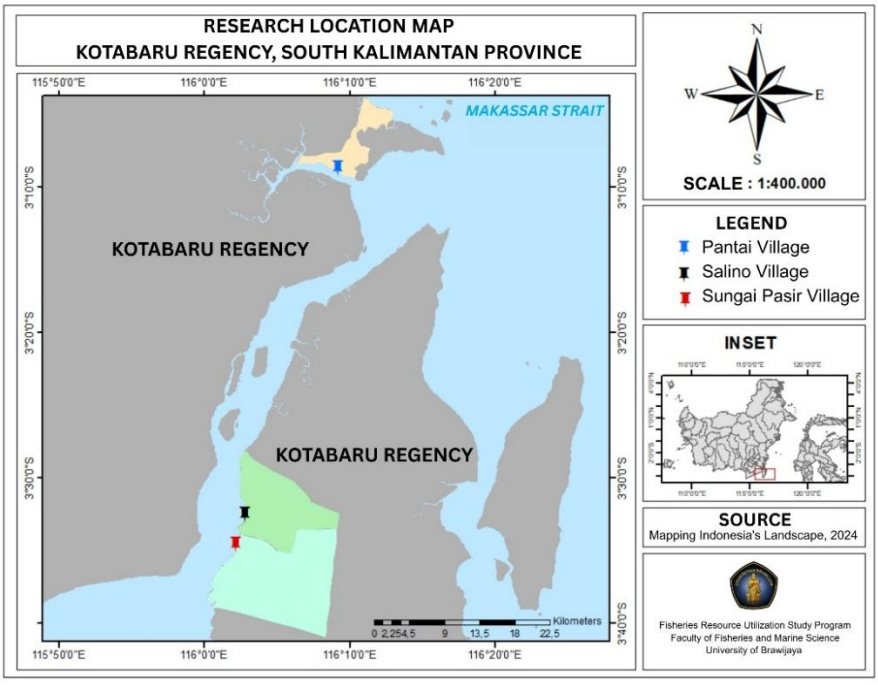

Figure 1. Research Location

The research process began by determining the population and sample of trammel nets. Subsequently, three trammel net samples were selected, representing nets with the longest top rope length, average top rope length, and shortest top rope length. The tools and materials used in this study are listed in Table 1.

Table 1. Tools and Materials

No	Name	Function
Tools		
1.	Roll meter (50 meter)	Measuring the length of rope net
2.	Vernier calliper	Measuring the length and diameter of components (floats, weights, threads)
3.	Hand tally counter	Calculating the number of meshes (vertical dan horizontal)
4.	Analog scales (50 kg)	Measuring the weight of nets and ropes
5.	Digital scale (10 kg)	Measuring the weight of components (buoy and sinker)
6.	Beaker glass (50 ml, 100 ml and 1000 ml)	Measuring volume
7.	Dropper pipette	Measuring displacement volume
Materials		
1.	Water	Measuring volume
2.	Observation form	Recording research data

The study was carried out using a quantitative descriptive method by measuring and calculating the parameters specified in SNI 01-7237-2006, as shown in Table 2.

Tabel 2. SNI Trammel Net Criteria

No.	Criteria	Value
1	Hanging ratio (E1) of inner net	0.440 – 0.680
2	Hanging ratio (E1) of outer net	0.610 – 0.880
3	Mesh size of inner net	31.75 – 38.10 mm
4	Mesh size of outer net	114.30 – 152.40 mm
5	Diameter of inner net	0.120 – 0.240 mm
6	Diameter of outer net	0.30 – 0.75 mm
7	Weight of inner net	20.000 – 62.500 m/kg
8	Weight of outer net	6.400 – 11.100 m/kg
9	Length of ground rope : length of upper rope	1.00 – 1.20
10	Height of installed net	0.920-1.545 m
11	Height of outer net : height of inner net	1.120-2.120
12	Distance between buoys : installed height	0.340 – 0.670
13	Distance between sinkers : installed height	0.140 – 0.220
14	Buoyancy force (B)	620 – 1155 grf
15	Average of buoyancy force (b)	22.60 – 57.70 grf/m
17	Sinking force (S)	1332 – 4224 grf
18	Average sinking force (s)	49.80 – 211.20 grf/m
19	Buoyancy force (S) : Sinking force (B)	3.50 – 4.10

The methods for data collection for each parameter are presented in Table 3.

Table 3. Data Collection Methods (Measurements or Calculations)

Criteria	Methods
Hanging ratio	Calculations based on (Fauzi *et al*., 1991): $E = L \div Lo$ (1) Where: E: hanging ratio L: net length after installation Lo: initial net length
Mesh size	Direct measurements
Diameter	Direct measurements
Weight	Direct measurements
Length	Direct measurements
Depth	Direct measurements
Distance	Direct measurements
Buoyancy and sinking force	Calculation based on (Puspito, 2009): $Q = W - B$(2) $W = \rho \, . v$(3) $B = \rho w . v(4)$ Where: Q: weight of object in water (kg) W: sinking force (kgf) B: buoyancy force (kgf) r: specific gravity (kgf/ m^3) rw: specific gravity of fluid (kgf/ m^3) v: volume (m^3)

The percentage of suitability was calculated using the formula (Ernawati, 2017), as follows:

$$\text{Suitability} = \frac{\textbf{Number of criteria with values} \geq \textbf{standard}}{\textbf{Total criteria}} \text{ X } 100\%$$

The obtained percentage values were then classified based on (Puspito *et al*., 2021) to determine the suitability status of the Kotabaru trammel nets based on SNI, as shown in Table 4.

Tabel 4. Suitability Categories

Percentage	Suitability Status
0-46.6%	Not compliant
46.7-73.2%	Compliant
73.3-100%	Highly compliant

RESULTS

Trammel nets are the most operated fishing gear in the Kotabaru waters. According to data from the Kotabaru Department of Fisheries and Marine Affairs, they account for 46% of

the total fishing gear operated by fishermen in Kotabaru. Figure 2 shows the proportion of fishing gear in Kotabaru Regency.

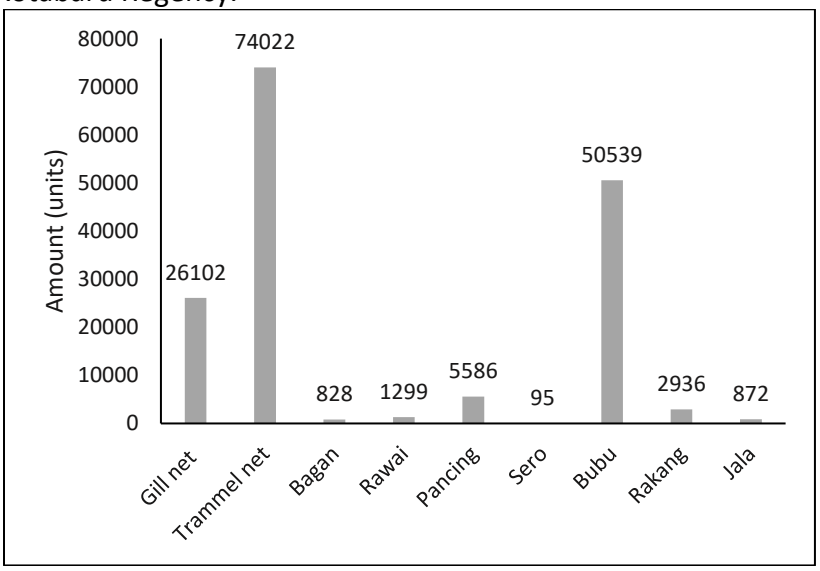

Figure 2. Proportion of Kotabaru Fishing Gear

Based on the research results, it was found that all Kotabaru fishermen construct their trammel nets traditionally. Fishermen purchase polyamide net sheets to create both the inner and outer layers of the net. They then suspend the net body on a top rope and add other components such as: float ropes, floats, sinker ropes, bottom ropes, and weights. Figure 3 shows the construction of the trammel nets operated in the waters of Kotabaru.

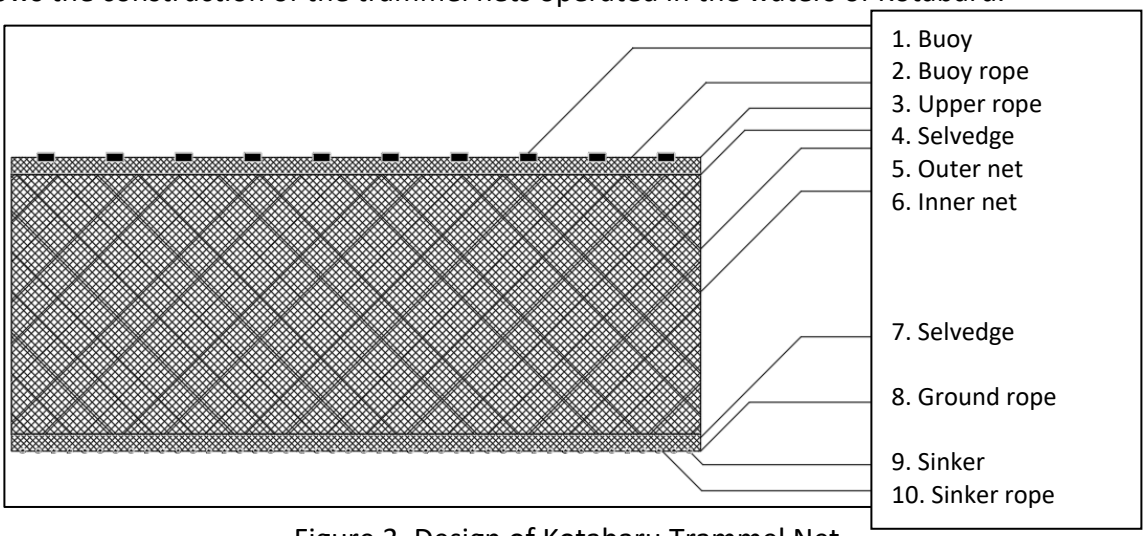

Figure 3. Design of Kotabaru Trammel Net

Figure 4 shows the measurement activities for the fishing gear according to the Director General of Capture Fisheries Decree No. 1546/DPT.2/PI.320.02/IV/08, namely: a) mesh size measurement; b) thread diameter measurement; and c) net body dimension measurement.

Figure 4. a) Mesh Size Measurement; b) Thread Diameter Measurement; c) Rope Length Measurement

The measurement results and calculations for the Kotabaru trammel nets are tabulated in Table 5.

Tabel 5. Research Results

Criteria	Values	Trammel net Sample		
		Small	Medium	Big
1	0.440 – 0.680	0.48 - 0.62	0.52 - 0.66	0.51 - 0.65
2	0.610 – 0.880	0.68 - 0.84	0.65 - 0.77	0.65 - 0.81
3	31.75 – 38.10 mm	38.1	38.1	38.1
4	114.30 – 152.40 mm	137.16	139.7	139.7
5	0.120 – 0.240 mm	0.12	0.12	0.12
6	0.30 – 0.75 mm	0.3	0.6	0.6
7	20.000 – 62.500 m/kg	20.11	20.11	21.12
8	6.400 – 11.100 m/kg	7.71	6.78	8.72
9	1.00 – 1.20	1.4	1.2	1.1
10	0.920-1.545 m	1.5	1.5	1.5
11	1.120-2.120	1.34	1.34	1.34
12	0.340 – 0.670	0.3	0.28	0.31
13	0.140 – 0.220	0.16	0.16	0.173333
14	620 – 1155 grf	701.8	745	735.4
15	22.60 – 57.70 grf/m	34.88	37.03	34.81
17	1332 – 4224 grf	2913	2972	2843.45
18	49.80 – 211.20 grf/m	144.80	147.73	134.61
19	3.50 – 4.10	4.15	3.98	3.86

DISCUSSION

The suitability analysis was calculated using equations (3). The results show that all three trammel net constructions fall into the "highly compliant" category according to SNI standards. The medium and large construction trammel nets received the same suitability score of 95%. Meanwhile, the small construction trammel net scored 89%. These findings align with studies conducted by (Retnowati, 2011), (Hamdani & Wulandari, 2016) and *(Ramlah et al*., 2022), who stated that the majority of Indonesian fishermen are traditional fishermen who construct their fishing gear manually based on inherited skills with minimal technological input. Furthermore, (Saraswati *et al*., 2022) and (Fauzi *et al*., 1991), argue that traditional fishermen are capable of modifying their fishing gear based on the phenomena and challenges they encounter daily (trial and error). Thus, the fishing gear they create is effective and able to meet SNI standards, even when constructed without following established design and construction regulations for fishing gear.

CONCLUSION

Based on the research results, it can be concluded that the trammel nets used by Kotabaru fishermen demonstrate a high level of compliance with SNI 01-7237-2006, with suitability scores ranging from 89% to 95%. This indicates that the majority of the technical components—such as mesh size, float and sinker spacing, net depth, and hanging ratio—are constructed in accordance with national guidelines. The high conformity level suggests that fishermen in Kotabaru possess a strong understanding of standardized gear specifications, which can contribute positively to resource sustainability.

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