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MAIN DIMENSION CHARACTERISTIC OF CANTRANG FISHING VESSELS IN MAYANGAN COASTAL FISHING PORT

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Cantrang, CUNO, Fisheries, Resistance, Shipbuilding, Stability, Mayangan, Probolinggo

ABSTRACT

The information design of traditional fishing vessels in Indonesia is still lacking. This happens because the construction is still using traditional methods. It was also allegedly able to provide a discrepancy with the characteristics of fishing vessels. Therefore, identification of the main dimensions of fishing vessels is needed as a database of development and preliminary review of fishing vessel performance. The study was conducted on *cantrang* fishing vessels at PPP Mayangan, Probolinggo. The results of the ratio of the main dimensions of the fishing vessel will be compared with the results of previous studies to assess the design characteristics. Besides, the main dimension data can be processed into cubic number values. The results showed the value of L/B of the fishing vessel ranged from 2.20 - 3.68, L/D 7.31 - 13.74, and B/D 2.55 - 4.57. Based on the reference value, the value is following the value of the type of towed gear fishing vessel in Indonesia. These results indicate that *cantrang* fishing vessels at PPP Mayangan have a greater resistance and worse elongation strength. Based on the CUNO that has been valued obtained, 67.15 - 150.67 m3 of raw materials are needed to build a *cantrang* fishing vessels at PPP Mayangan.

INTRODUCTION

Fishing vessels are one of the important factors that need to be considered in fishing activities at sea. During the fishing operation process, all activities fishing are carried out on the vessel. The process has a huge risk because sometimes it is done during bad weather. Therefore, fishing vessels have different characteristics from other types of vessels, such as the speed, maneuverability, seaworthiness, navigational distance, strong construction, propulsion of engine, storage and processing facilities, and fishing machines [1].

The characteristics of a fishing vessel are determined during the design and construction process. In general, the construction of fishing vessels in Indonesia is still carried out in traditional shipyards. Construction of fishing vessels in traditional shipyards does not involve making drawings lines plan and calculations of naval architecture [2]. This causes a lack of information on vessel designs fishing in Indonesia. Shipbuilders only rely on experience and skills acquired from generation to generation [3]. This can adversely affect the characteristics of the fishing vessel itself.

The lack of information about the design of fishing vessels has had a negative impact on fishing vessels provided by the Indonesian government [4]. It is one of the programs of the Indonesian government to improve the economic level of fishermen, but this is considered not yet running optimally. This was proven by the many problems in several regions, such as Bengkulu, Bali, Banten, Jambi, Medan Maluku, Lampung, and several other areas [5]. From 2010 to 2012 based on November 2012 monitoring, the unused government fishing vessels reached 12% in 2010 and 20% in 2011 [6]. Local people consider that fishing vessels provided by the government do not match the characteristics of the fishing vessels they normally use. This phenomenon occurs because the entire fishing vessel was built using only one design [7]. This is, of course, contrary to the characteristics of the Indonesian fishermen. Traditional fishing vessels in Indonesia have diversity in terms of dimensions, shape, and design [8].

The complicated conditions that have been described previously also occur at the Mayangan Coast Fishing Port (PPP), Probolinggo, Indonesia. Fishing vessels provided by the government in the area are not used by fishermen for fishing activities. This, of course, will not occur if the characteristics of the fishing vessel are adjusted in advance to fishing vessels in that area. This method will make the fishing vessels provided by the government more acceptable to fishermen. The subject of this research is the fleet of *cantrang* fishing gear. This is since *cantrang* is one of the fishing gear that has the dominant catch production in the Mayangan PPP [9]. This situation indicates that there is a need to identify the characteristics of *cantrang* fishing vessels in PPP Mayangan.

METHOD

The study was conducted by collecting length, width, and depth data on *cantrang* fishing vessels which were carried out by taking measurements directly in the field. The data obtained were 88 fishing vessels. That is representative of the total number of *cantrang* fishing vessels recorded at Mayangan UPT-PPP in 2016 with 92 units. A good study uses a sample of 10-30% of the population to obtain a sample with an appropriate level of trust [10-11]. The main dimension data that has been obtained will be further processed using a comparison of fishing vessel dimensions. A comparison of the main dimensions is a basic calculation in determining the initial characteristics of a fishing vessel [12-13]. The ratio of main dimensions is obtained by using the following equation [14]:

a) $\frac{L}{B} = \frac{\text{Length}}{\text{Breadth}}$ .....(1)

b) $\frac{L}{D} = \frac{\text{Length}}{\text{Depth}}$ .....(2)

c) $\frac{B}{D} = \frac{\text{Breadth}}{\text{Depth}}$ .....(3)

The ratio of the main dimensions is analyzed using statistics to get the average, maximum, minimum, and range values. These results are then shown in graphical form using AutoCAD for Student and Educator. The results are then compared with the ratio of the main dimensions that have been obtained in other regions in Indonesia. The main dimensions of data that have been obtained will also be processed further for the value cubic number (CUNO). CUNO value can be used as a reference in the cost of material requirements in the construction of a fishing vessel. CUNO calculations are obtained using the main dimension volume formula as shown below [14]:

$$CUNO = L \times B \times D \quad \text{.....(4)}$$

RESULT AND DISCUSSION

A fishing vessel should have particular functions different compared to other types of fishing vessels. One of these functions is to

provide good performance when the vessel is operated [1]. The performance of a fishing vessel can be assessed from several aspects such as the ratio of the main dimensions. The ratio of the main dimensions is closely related to stability, resistance, and elongated strength of the vessel [15]. The ratio of main dimensions on *cantrang* fishing vessels in PPP Mayanganis shown in Table 1.

Table 1. Main Dimension Ratio of Fishing Vessels in Indonesia

	L/B	L/D	B/D
Min	2,20	7,31	2,55
Max	3,68	13,74	4,57

Table 1 shows that the L / B ratio on *cantrang* fishing vessels in PPP Mayangan has values ranging from 2.20 - 3.68. These results indicate that the length is equal to 2 - 3.68 times longer than the breadth. Meanwhile, the L/D ratio is around 7.31 - 13.74. This means that the length is 7 - 13.74 times longer than the depth of the vessel. Finally, the B/D comparison value is 2.55 - 4.57. This indicates that the breadth is 2 - 4.57 times longer than the height of the vessel.

Main Dimension Ratio of Fishing Vessels in Indonesia

Cantrang is a fishing gear that is operated by being pulled onto a vessel. This indicates that *cantrang* are included in the towed/dragged gear category [16]. A comparison between the value of the ratio of the main dimensions with some reference fishing vessels included in the category is towed/dragged gear presented in Figure 1.

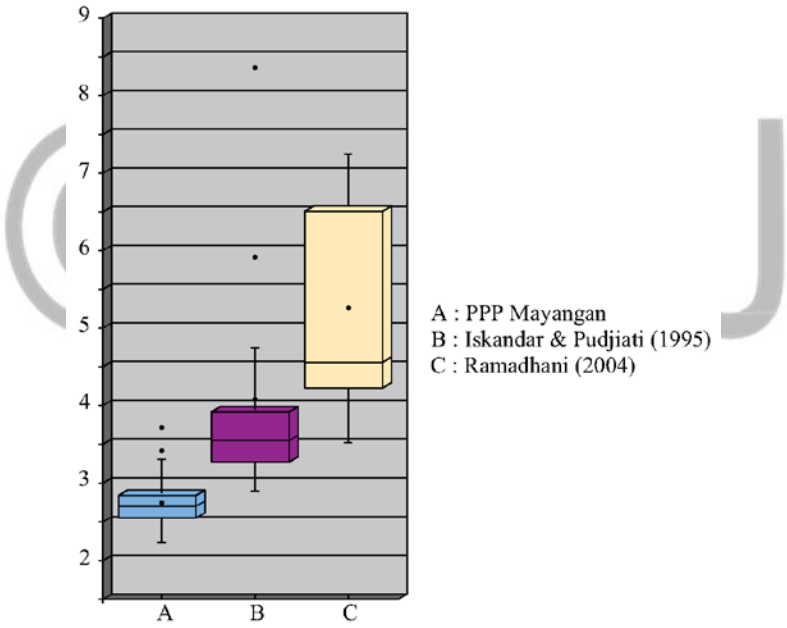

Figure 1. Comparison of The L/B Values of Sample Fishing Vessels With References In Indonesia

Based on Figure 1, the value L/B ratio sample fishing vessels on average have a lower value compared to the two references. The ratio has spread values between 2.55 - 2.84, with an average of 2.71. However, there are 2 outlier values of 3.39 and 3.68. This value indicates that most of the L/B values of *cantrang* fishing vessels in PPP Mayangan have wider vessel dimensions compared to fishing fishing vessels in Indonesia. The smaller L/B value is inversely proportional to the quality of hull resistance. A small L/B value will cause greater resistance so that it can negatively impact the speed of the vessel itself [17].

The L/D value of sample fishing vessels have values ranging between 8.78 - 10.14, with an average of 9.55. This means that *cantrang* fishing vessels based on PPP Mayangan are included in the range of L/D values of fishing vessels towed/dragged gear in Indonesia. The L/D value on the sample vessel indicates that the ability of *cantrang* fishing vessels based at PPP Mayangan has the same capability as vessels towed/dragged gear in Indonesia in terms of elongated strength. The elongated strength of a fishing vessel is needed to deal with high wave conditions [18]. The hull that can deal with waves will certainly help the fishing process take place. The smaller the value of L/D, the fishing vessel will have a good ability to survive in a high wave when circulating nets in the fishing area [19]. The L/D ratio of *cantrang* fishing vessels in PPP Mayangan with reference is shown in Figure 2.

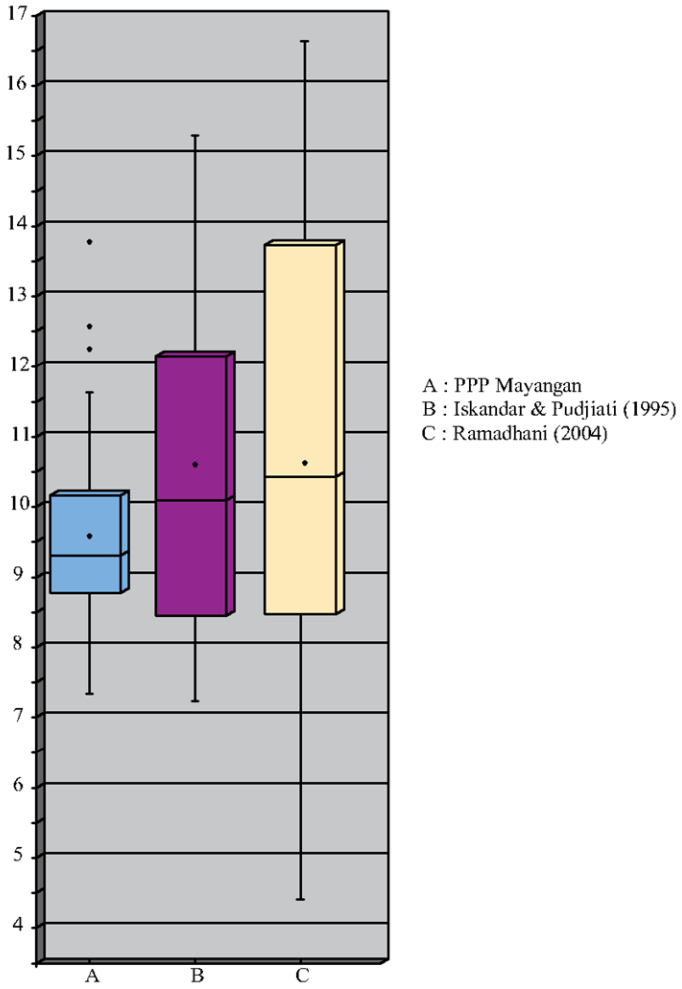

Figure 2. Comparison Of L/D Values of Sample Fishing Vessels With References in Indonesia

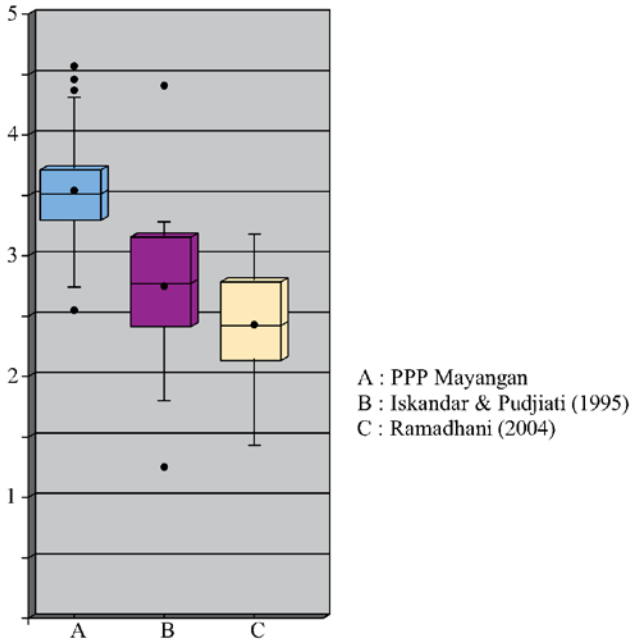

Figure 3. Comparison of B/D value of sample fishing vessels with reference in Indonesia

Figure 3 shows the value of B/D sample fishing vessels has values ranging from 2.74 - 3. 73, with an average of 3.54. There is a value outlier minimum of 2.55 and a maximum of 4.57. This shows that almost all of the average B/D value of *cantrang* fishing vessels in PPP Mayangan have a greater value compared to vessels towed/dragged gear in Indonesia. Even so, several values intersect with each other. B/D value will present the ability of stability on a fishing vessel. The greater the value of the B/D ratio will tend to change the stability arm to be smaller [20]. This, of course, will affect the stability when the fishing vessel is carrying out capture operations.

Ratio of Main Dimensions of Fishing Vessels in Regions

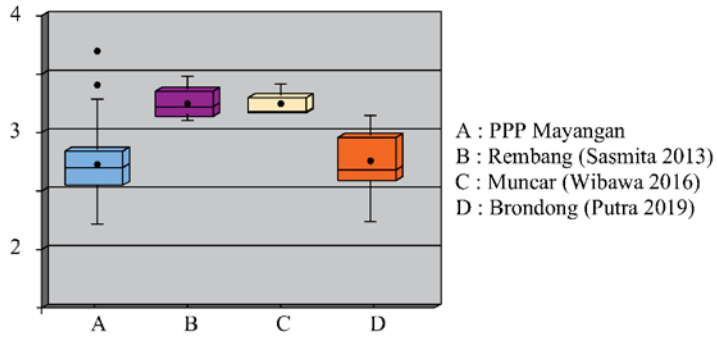

Figure 4. Comparison of L/B Values of Fishing Vessels Towed/Dragged Gear in Other Areas

Based on Figure 4, the L/B value of sample fishing vessels has smaller average range values compared to *cantrang* fishing vessels in Rembang and Muncar. This shows that, if in the same length, the *cantrang* fishing vessels in PPP Mayangan have greater breadth than the *cantrang* fishing vessels in Rembang and payang fishing vessels in Muncar. The greater breadth of the hull will have a bad effect on-resistance [21]. However, the L/B value of sample fishing vessels has a value that is not the farthest difference when compared to *cantrang* fishing vessels based in Brondong. Shipbuilder in Brondong said that the "fat hull" is one of the characteristics of fishing vessels in Brondong [4]. Therefore, *cantrang* fishing vessels in both regions have the same breadth size (if they have the same length). A comparison of the L/D value of sample fishing vessels with several other regions based on the reference is presented in Figure 5.

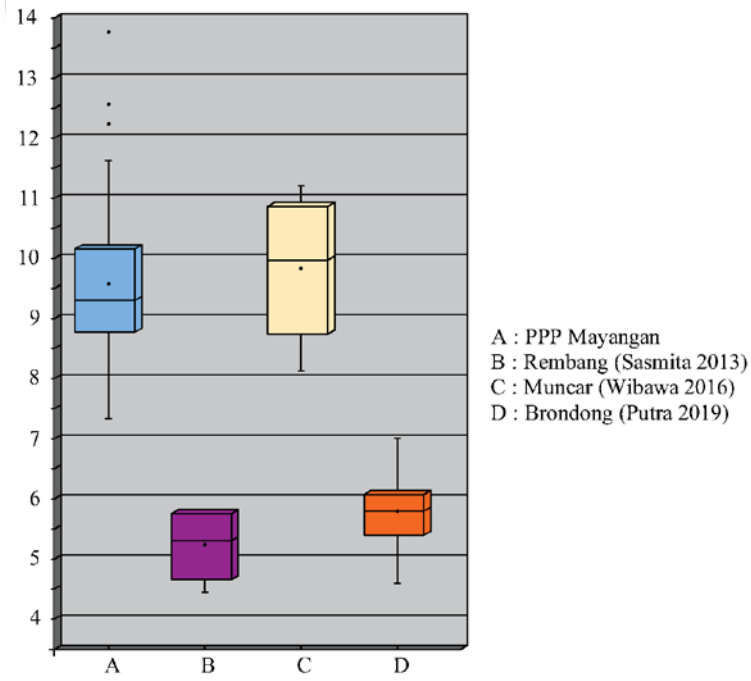

Figure 5. Comparison of L/D Values of Fishing Vessels Towed/Dragged Gear in Other Areas

Figure 5 shows that the L / D value on sample fishing vessels has a depth that almost the same as the Payang vessel in Muncar. However, the height of the hull in the PPP Mayangan is shorter compared to *cantrang* vessels in Rembang and Muncar. The greater L / D value will certainly influence the elongated strength of a hull. A large L / D value will have a low depth hull so that it will provide poor

longitudinal strength [22]. Based on these results, the elongated strength of *cantrang* fishing vessels in PPP Mayangan is worse compared to *cantrang* fishing vessels in the Rembang and Brondong areas. A comparison of the B/D value of sample fishing vessels with several other regions based on the reference is presented in Figure 6.

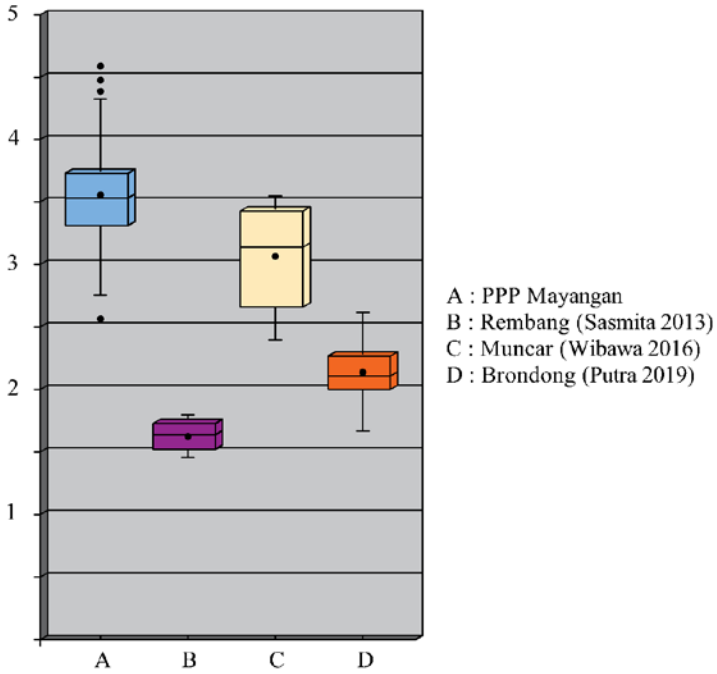

Figure 6. Comparison of B / D Values of Fishing Vessels Towed/Dragged Gear in Other Areas

Based on Figure 6, the value of the B/D ratio of sample fishing vessels has a greater average compared to *cantrang* in Rembang and Brondong. However, the B / D value of sample fishing vessels still overlaps with the value of B/D payang fishing vessels in Muncar. This means that *cantrang* fishing vessels at PPP Mayangan have a lower depth hull compared to *cantrang* fishing vessel in Rembang and Brondong. A high B/ D value will adversely affect the stability and the maneuverability of the vessel [23]. This will greatly affect the characteristics that should be owned by fishing vessels. A large B/D ratio will also affect the propulsive engine. The smaller the L/B value, the resulting ship will have good stability and movement, but it will have a negative impact on the propulsive engine [24]. Based on the type of fishing gear used, *cantrang* fishing vessels need high stability (Mulyanto et al. 2012). That is because almost all activities hauling fishing gear are carried out on one side of the vessel. It will depend on the stability capability possessed by the vessel. When the process is hauling carried out on one side of the hull, the weight of the vessel will stack on that side [19].

Cubic Number of *Cantrang* Vessels in PP Mayangan

The CUNO value of fishing vessels is one aspect that needs to be considered before shipbuilding is carried out. Knowing the value of CUNO is the best way to calculate shipbuilding cost plans [25]. The result of the CUNO calculation is the unit of m3 so that it is suitable for calculating consumables to make hulls such as wood and fiber. The graph of CUNO values on *cantrang* vessels in PPP Mayangan is presented in Figure 7.

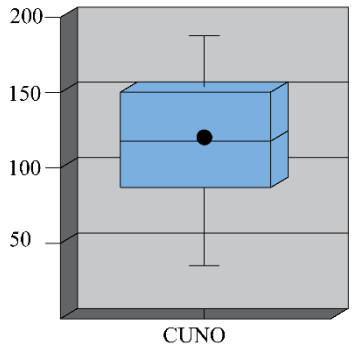

Figure 7. CUNO value of *cantrang* vessels in PPP Mayangan

Figure 7 shows that the value of CUNO ranges from 87.15 - 150.47 m3 with an average of 117 m3. This means that to build *cantrang* fishing vessels in the Mayangan PPP, wood or fiber of this size is needed. The costs required to build a wooden ship and a fiber ship are very different. The cost of building a fiber ship is very expensive during the mold making phase. However, at the time of the second and third shipbuilding, the amount of material used was far less compared to wooden ships [27].

CONCLUSION

Cantrang fishing vessels in PPP Mayangan have L/B and B/D values ranging from 2.55 - 2.84 and 2.74 - 3.73. In general, this value is smaller than fishing vessels than included in the towed/dragged gear category in Indonesia. This means that the *cantrang* vessels in PPP Mayangan have a large breadth but lower depth. Therefore, *cantrang* vessels in the PPP area of Mayangan have more resistance and worse elongation strength compared to the reference value. *Cantrang* ships in PPP Mayangan have CUNO values ranging from 87.15 - 150.47 m3.

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