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Overview of the Characteristics of the River Ship at Pier 16 ILIR Palembang City

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Abstract:- River transportation in Palembang is one of the most reliable modes of transportation for people who live in the waters of the Musi River. This study aims to explain the characteristics of river vessels, namely Getek Boat, jukung, and speed boats operating in the waters of the Musi River, and compare the ratios of the main dimensions of the ship to determine the ability of stability, loading capacity, resistance, and maneuverability. Measuring the dimensions of the ship using the measurement procedure in accordance with Ministerial Regulation 08 of 2013 concerning ship measurements and analyzing the ratio of the main dimensions of the ship. Based on the calculation of the ratio of (L/B, T/B, T/H, L/H) the ships are speed boats (100%,95%,52%,43%), long boat (72%, 16%, 52%, 68%), Jukung (94,7%, 19,3%, 100%, 21%), Getek Boat (83,9%, 89,3%, 83,9%, 19,6%).

Keywords:- *River Transportation, Dimensions, Ratio, Prototype.*

I. INTRODUCTION

1.1. Background

River transportation in Palembang is one of the most reliable modes of transportation for people who live in the waters of the Musi River. The type of ship used also varies based on its functions such as Getek Boat and speedboat to transport passengers and jukung used to transport goods and passengers with different characteristics. The characteristics of the ship are related to the dimensions of the ship and the function of the use of the ship. The main dimensions of the ship consist of length (L), width (B), water-laden or draft (T), and depth (H). The dimensions of the ship have a considerable percentage to improve the safety of river transportation. The ideal determination of ship dimensions as a safe and comfortable prototype ship is needed for use in the waters of the Musi River (Apriani, 2020). In addition to knowing the main dimensions of the ship, it is also necessary to know the ratio of the main size comparison which is a picture of the characteristics of a ship. Performance of important aspects such as stability, readability, resistance, movement, and other technical aspects can be seen in the value ratio of the main size (Lungari, 2018). The comparison between the length and width of the ship (L/B) is suitable for ships with high speed and has a good room comparison, but reduces the capability by the ship's movement and reduces the stability of the ship. The comparison between the length and width of the ship (L/B) provides good stability capability but can also add to the ship's resistance so that greater power is needed. Based on research on The Evaluation of Speedboat Safety in Palembang of 35 speedboat units only 15 units have a measuring letter resulting from the absence of images issued by the shipyard because the ship is made in conventional shipyards and the lack of several measuring experts who can measure ships in inland areas (Apriani, 2020), so it needs to be done in conventional shipyards and the lack of measuring experts who can measure ships in inland areas (Apriani, 2020), so it needs to be done in conventional shipyards.

According to Hardjono, 2010, the ratio of the main dimensions of a fishing vessel can describe the characteristics of the vessel based on the type of fishing gear. In addition, the ratio of the main dimensions, such as the ratio of length to width (L/B), length to depth (L/H), and width to depth (B/H) of fishing vessels, can determine and reflect the performance characteristics of important aspects such as stability, resistance, loading capacity, maneuverability, and others. While the usefulness of the calculation of the ratio of the main dimensions of the katir boat is to facilitate the grouping of boat models into groups of fishing boat fishing gear operating methods (Lungari, 2018). The shape of the hull is designed in such a way that it can meet the criteria for fishing vessels, including wide loading space, easy loading - unloading of fish, good maneuverability, and stability following the provisions of seaworthiness, worthy of capture, and worthy of storage to be able to maintain the comfort, security, and safety of the crew and ensure the quality of the catch while operating and sailing in any water conditions (Anonymous, 2008). According to Ayodhyoa (1972), one of the important things in the design of a ship is the comparison of ship dimensions (L/B, L/H, B/H). If the L/B value decreases it will harm the ship's speed, and if the L/H value increases it will negatively affect the longitudinal strength of the ship. It is different from the B/H value, if the value is enlarged, it will have a positive effect on the stability of the ship but negatively affect the propulsive ability of the ship.

Research on the characteristics and ratios of comparisons of the main dimensions of ships is mostly done on fishing vessels, research on the characteristics and ratios of the main dimensions of river vessels, especially in the

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waters of the Musi River, it felt to be very necessary so that this study will analyze the characteristics of ships operating in the waters of the Musi River and the comparison ratio. its main dimensions, besides that it is hoped that there will be data on the characteristics of ships operating in Palembang. Characteristics of river vessels operating in the waters of the Musi River are needed to facilitate decision making in the development of river transportation in Palembang, such as increasing the width and depth of the channel but information on vessel characteristics in several interesting agencies sometimes does not have the same data, this is due to the absence of a ship measuring document issued by the shipyard and the lack of a ship measuring expert at the agency. This study aims to explain the characteristics of river vessels, namely Getek Boat, jukung, and speed boats operating in the waters of the Musi River, and compare the ratios of the main dimensions of the ship to determine the ability of stability, loading capacity, resistance, and maneuverability.

It is hoped that this research can become a treasure trove of knowledge in the field of river transportation and become an information system for the characteristics of river vessels operating in the waters of the Musi River, making it easier for researchers and decision-makers to obtain data on the characteristics of river vessels in Palembang.

The results of this study are expected as a first step to establish a safe and comfortable prototype of river vessels so that the results of this study are beneficial for decision-makers to improve the safety of river transportation. In addition, the results of this study can be a database of the dimensions of river vessels for the Inland waters and ferries transport Polytechnic of Palembang and Crossings and add to the treasures of knowledge about the characteristics of river transportation in Palembang.

II. LITERATURE REVIEW

2.1. River Boat Characteristics

According to Law No. 17 of 2008 concerning Shipping, ships are water vehicles with certain shapes and types, which are driven by wind power, mechanical power, other energy, towed or suspended, including vehicles with dynamic support capacity, vehicles under the water surface, as well as floating equipment and floating buildings that do not move. While riverboats are water vehicles that operate on rivers.

River vessels that will operate must meet the following requirements:

a. Meet the applicable technical requirements.
b. Having facilities following the technical specifications of port infrastructure on the routes served.
c. Have a crew that meets the requirements for manning river and lake transportation.
d. Have main facilities and/or supporting facilities following applicable technical requirements for the needs of the crew, passengers, goods, and/or animals.

The characteristics of river and lake ships are divided into physical characteristics consisting of dimensions or ship size and shipshape and operational characteristics consisting of carrying capacity, speed, type, and type of ship. The types and types of ships are distinguished based on the dimensions and functions of the ship. The ship type consists of length in meters and tonnage or GT. The function of the ship is to transport passengers, transport goods, transport passengers and goods or other functions, such as patrol boats, fishing vessels, or health/health centers. The dimensions of river and lake ships are made based on the characteristics of the shipping lanes they pass through. Examples of river and lake vessel dimensions can be seen in Table 2.1 below.

Table 2.1. River and Lake Ship Dimensions

No	Type	GT	Transport Capacity		Draft(m)	Power (HP)	Speed (Km/h)
			goods (tons)	Passenger (person)			
1	Speed boat	1 - 5	-	< 14	0.35 – 0.6	>2x200	< 40
2	Longboat	5 – 10	-	< 60	0.4 – 0.6	< 85	20 – 30
3	Water Bus	< 200	< 10	< 200	0.8 – 1.5	75 – 100	12 – 15
4	Klotok	< 15	< 5	-	0.5 – 0.65	5 – 15	7 – 12
5	Water Truck	15 – 200	20 – 70	-	1 – 1.6	22 – 33	7 – 8
6	Barges (steel)	50 -190	50 -150	-	1 – 1.6	-	-
7	Barge (Tung)	20 – 50	15 – 30	-	1 – 1.6	-	-
8	Tug Boat	20 – 50	-	-	0.8 – 1.4	< 100	30 - 60

Source: LAPI ITB, 2004

2.2 Main Dimensions of Ship

The characteristics of the ship are following its main dimensions which consist of length/length (L), width/beam (B), draft H, freeboard (F).

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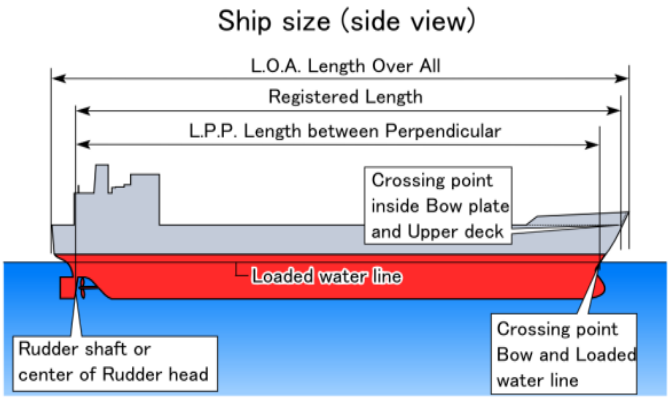


Figure 2.1. Main Dimensions of Ship

2.2.1. Ship Length

The length of the ship is the length measured at 96% of the length of the waterline with a draft of water *(draft)*85% of the largest and lowest inner dimension is measured from the top of the keel, or the length of the waterline is measured from the front side of the bow height to the axis of the steering axle if this length is the greater. Ship explained. The length of the ship consists of the total length of the ship or length overall (LOA), the length of the water line or the length of the waterline (LWL), and the length between the perpendicular lines or the length between perpendicular (LBP).

a. *Length Over All* (LOA)

Length Over All or LOA is the main measure needed to determine the length of the pier and the capacity of the ship. LOA is the length of the ship measured from the bow of the ship at the front to the stern of the ship at the rear.

b. *Length Water Line* (LWL)

Length Water Line or LWL is the length of the ship measured from the bow of the ship at the waterline to the stern of the ship at the waterline.

c. *Length Between Perpendicular* (LBP)

Length Between Perpendicular or LBP is the length of the ship measured from the bow of the ship at the waterline to the height of the rudder.

2.2.2. Ship Width

Based on the Regulation of the Minister of Transportation number PM 8 of 2013 concerning Ship Measurement, the width of the ship is the part of the ship measured at the center of the ship, namely the widest part to the outside of the tusks for ships whose skin is made of metal or fiberglass or up to to the outer surface of the hull for ships whose skin is made of materials other than metal or fiberglass.

2.2.3. In (*depth*)

In (depth) is the distance measured vertically from the bottom of the ship to the top of the deck.

1.2.4. Water Loaded Ship (*draft*)

The ship's water draft (draft) is the distance measured vertically from the bottom of the ship to the waterline. River ships that do not have a waterline boundary then the water draft/draft of the ship is obtained using the following equation:

$$Draft\ (H) = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (2.1)\ 0{,}77\ X\ \sqrt{\frac{D}{L}}$$

Information :
D = in the ship
L = total length of the ship (LOA)

Ships that will operate are required to be measured by a surveyor from the Ministry of Transportation so that the dimensions of the ship are known, such as length, width, depth, and tonnage of the ship. In addition to the function and place of operation, the size of the ship is related to the safety requirements that must be met by the ship, for example, the requirements for lights or lighting for ships with a length of more than 20 meters are different from the requirements for ships with a length of fewer than 20 meters or the navigation requirements of ships with a gross tonnage or a gross tonnage of more than 7 (GT > 7) is different from a vessel with a gross tonnage of less than 7 (GT < 7).

Based on the Regulation of the Minister of Transportation number: PM. 8 of 2013 concerning Ship Measurement explains that there are 3 kinds of ship measurement methods, namely:

a. Domestic Method

The domestic measurement method is used for ships that have a length of fewer than 24 meters.

b. International Measurement Method

Ship measurement using the international method is used for ships with a length of more than 24 meters or ships with a length of fewer than 24 meters, the shipowner is asked to measure using the international method.

c. Special Method

A special method is used for ships passing through certain canals.

The unit of measure for ships is usually marked with tonnage. Vessel tonnage is the volume of a vessel expressed in gross tonnage (Gross Tonnage/GT) and net tonnage (Net Tonnage/NT).

a. Gross Tonnage (GT)

Gross Tonnage (GT) is a calculation of the volume of all spaces located below the ship's deck and enclosed spaces above the ship's deck. Finding gross tonnage or GT using the domestic method by multiplying a factor of 0.25 by the volume of space below deck and volume of enclosed spaces above deck.

The value of GT using the international method is determined by multiplying the factor (K1) by the volume of the space below the deck and the enclosed spaces above the deck.

b. Net Tonnage (NT)

Net tonnage or Net Tonnage (NT) is a calculation of the volume of the ship's room that can be loaded or cargo space. The calculation of net tonnage using the domestic method is 30% of GT.

2.3. Ship's Main Dimension Comparison Ratio

The relationship between the main dimensions of the ship, in theory, can be derived from four main dimensions, including the length of the ship or Length (L), width or breadth (B), in the ship or depth (H), and draft or draft (T). The effect of the main dimensions on ship performance can be seen in Table 2.1.

Table 2.1. The Effect of the Main Dimensions of the Ship on the Performance of the Ship

MAIN DIMENSIONS OF THE SHIP	EFFECT ON SHIP PERFORMANCE
Length (L)	*Resistance, longitudinal strength, maneuverability, sea keeping, hull volume, capital cost.*
Width/ Breath (B)	*Transverse stability, hull volume, resistance, maneuverability, capital cost*
Height/Depth (H)	*Hull volume, longitudinal strength, transverse stability, capital cost, freeboard.*
Ship Load/Draft (T)	*Displacement, transverse stability freeboard, resistance.*

Source: Boulougouris F., Papanikolau A (2009)

A comparison of the main dimensions that are very influential on the characteristics of the ship is L/B, L/H, T/B, and T/H. The length of the ship (L) affects the speed and longitudinal strength of the ship, the addition of the length of the ship will reduce the ship's maneuverability, reduce the resistance experienced by the ship in fixed displacement and reduce the longitudinal strength of the ship. A large L/B ratio is suitable for ships with high speed and has a fairly good space ratio, but the drawback is that it reduces the maneuverability and stability of the ship. While the L/B ratio with a small value will result in better stability but increase the ship's resistance. A large L/H ratio will reduce the longitudinal strength of the ship, whereas a small L/H ratio will increase the longitudinal strength of the ship.

The width of the ship (B) affects the metacenter height of the ship. The increase in width is generally used to get additional space on the ship's hull. A small B/T ratio will reduce the stability of the ship, whereas a large B/T ratio will make the ship's stability better. The addition of the ship's deck height (H) increases the longitudinal strength of the ship. The water load or draft (T) will greatly affect the center of buoyancy (KB), the addition of the water draft (T) with displacement, the length of the ship, and the fixed width of the ship will generally increase the price of KB. The H/T ratio is related to the buoyancy reserve.

According to Santoso and Sudjono in Ship Building Theory (1982) that the ratio of the main dimensions of ships for different types or types of ships can be grouped into several categories as follows:

a. Big fast ship
b. Big cargo ship
c. Mediumship
d. Short distance fast boat
e. fishing boat
f. Ocean tugboat
g. Harbor tugboats
h. Small ships
i. Small motorboats

The list of comparisons of the main sizes of ships is obtained from observations of ships that have been built or designed so that they can be used as guidelines in shipbuilding.

Table 2.2. Main Size Comparison of Ship

No	Ship Type	L/B	N/B	B/H	N/H	L/H
1	Big fast boat Vd = 22 knots	8.50 - 9.90	0.37 - 0.43	1.45 - 1.55	0.58 - 0.66	12.80 - 19.40
2	Large freighter Vd = 15-18 knots	8.90 - 9.00	0.40 - 0.50	1.50 - 1.70	0.64 - 0.80	13.30 - 15.00
3	Big cargo ship Vd = 10-15 knots	7.00 - 8.50	0.40 - 0.50	1.50 - 1.80	0.66 - 0.82	11.60 - 14.00
4	Medium ship	6.00 - 8.00	0.40 - 0.50	1.55 - 2.20	0.70 - 0.99	11.00 - 15.40
5	Short distance fast boat Vd = 16 - 23 knots	7.50 - 8.50	0.25 - 0.35	1.60 - 1.70	0.41 - 0.58	12.40 - 14.00
6	fishing boat	5.00 - 6.00	0.45 - 0.48	1.60 - 1.80	0.74 - 0.84	8.50 - 10.00
7	Ocean tugboat	4.50 - 6.00	0.37 - 0.47	1.65 - 1.85	0.65 - 0.82	7.90 - 10.50
8	Harbor tugboats	3.50 - 5.50	0.37 - 0.46	1.73 - 2.20	0.73 - 0.90	7.80 - 10.00
9	Small ships	6.00 - 8.50	0.35 - 0.45	1.50 - 1.70	0.56 - 0.72	9.60 - 13.60
10	Small motor boats (sail)	3.20 - 6.30	0.30 - 0.50	-------	0.60 - 0.30	6.00 - 11.00

Source: Santoso and Sudjono, 1982

2.4. Population and Sample Calculation

According to Kadir, 2015, a population is a set consisting of individuals/variables/data with characteristics determined by researchers so that it can be stated whether the individual/variable/data is a member or not. Meanwhile, according to Agung, 2003 Population is the set of all individuals who can provide data and information for a study. The sample is a subset or part of the population whose characteristics are investigated. The sample must represent the characteristics of the population, the characteristics or conditions of the population must be described in the sample.

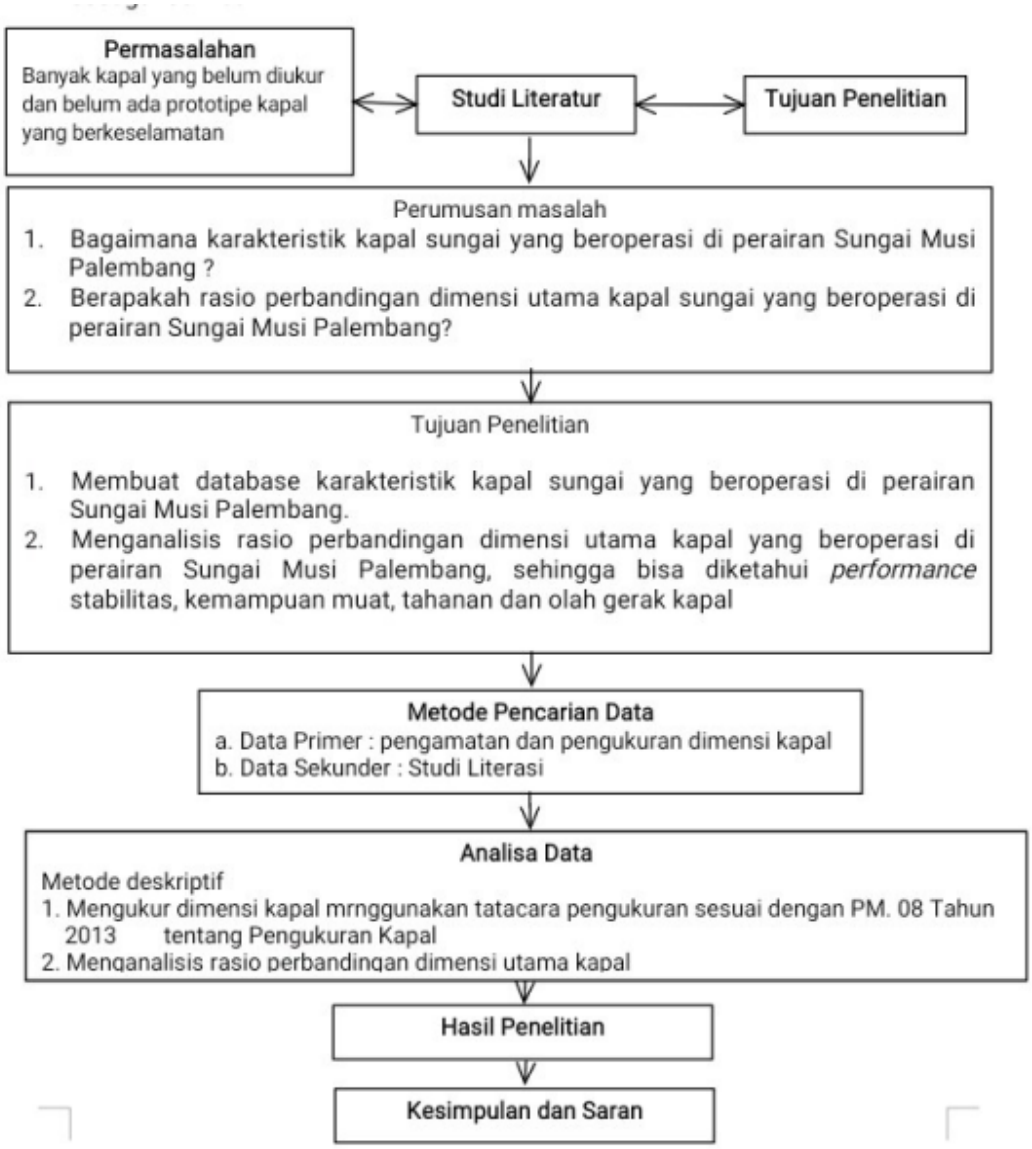
The sample calculation equation can be done using the following Slovin Equation:

$$n = \frac{N}{1+Nd^2} \quad \text{..... (2.2)}$$

Information :
n = Number of samples
N = Total population
d = Set precision (10%)

III. RESEARCH METHODS

The research flow as a systematic guide for this research method is as follows:



Gambar 3.1. Alur Penelitian

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3.2 Research Objects and Locations

This research was conducted at Pier 16 Ilir Palembang. The object of this research is river transportation that operates in the waters of the Musi River, namely speed boats, long boats, Getek Boat, and jukung.

3.3 Method of collecting data

3.3.1 Calculation of Number of Samples

The sample calculation is carried out using the Slovin equation as in Equation 2.1 as follows:

$$n = \frac{N}{1+Nd^2}$$

Information :
n = Number of samples
N = Total population
d = Set precision (10%)

a. Speedboat Sample Calculation

Based on the 2020 ship registration data from the Palembang City Transportation Service, it is known that the number of registered speedboats is 26 units so that a sample of 21 speedboats is obtained with the following calculations:

$$n = \frac{26}{1 + 26\,x\,0{,}01}$$

n = 20.63 21 units

b. Longboat Sample Calculation

Based on ship registration data in 2020 from the Palembang City Transportation Service, it is known that the number of longboats is 77 units so that a sample of 44 longboats is obtained with the following calculations:

$$n = \frac{77}{1 + 77\,x\,0{,}01}$$

$n = 43.50$ 44 units

c. Jukung Sample Calculation

Based on the 2020 ship registration data from the Palembang City Transportation Service, it is known that the number of jukung is 134 units so that a sample of 57 jukung is obtained, as calculated as follows:

$$n = \frac{134}{1 + 134\,x\,0{,}01}$$

$n = 57.26$ 57 units

d. Calculation of Getek Boat Samples

While the number of underarms registered at the City Transportation Service is 203 units so that a sample of 67 units is obtained, as calculated as follows:

$$n = \frac{203}{1 + 203\,x\,0{,}01}$$

$n = 66.99$ 67 units

3.3.2 Primary and Secondary Data Collection

Primary data was obtained by conducting in-depth interviews about the dimensions of the ship to the crew and related agencies such as the Palembang City Transportation Service and BPTD Region VII South Sumatra and Bangka Belitung Provinces, while secondary data was obtained by conducting literature studies, both research, and regulations related to the measurement and ratio of the main dimensions of the ship.

3.4. Calculation of the Main Dimensions of the Ship

3.4.1. Ship Length

The length of the ship used is the overall length or Length overall (LOA) is the overall length of the ship measured from the end of the stern to the end of the bow.

Gambar 3.1. Pengukuran Panjang Kapal

3.4.2. Ship Width Size

Breath overall or maximum width (BOA) is the largest width of the ship measured from the skin of the hull on the left side to the skin of the hull on the starboard side.

Gambar 3.2. Pengukuran Lebar Kapal di Dermaga 16 Ilir Palembang

3.4.3. Size of the Deck Height

Deck height or *depth*(H) the lowest height of the deck is the vertical distance from the bottom line to the lowest deck line, generally measured in the middle of the length of the ship.

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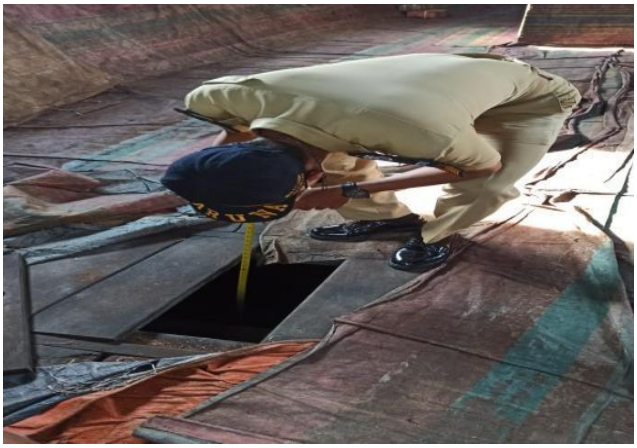

Figure 3.3. Ship Deck Height Measurement

3.4.4. Loaded with Water or Draft (T).

The water load or draft (T) is the vertical distance from the baseline to the load waterline. Most of the loading water lines for ships operating at Pier 16 Ilir Palembang are no longer visible, so the water load is carried out using Equation 2.1.

$$Draft\ (H) = 0{,}77\ X\ \sqrt{\frac{D}{L}}$$

Information :
D = in the ship
L = total length of the ship (LOA)

3.5. Ship's Main Dimension Comparison Ratio

The comparison of the main dimensions of the ship greatly affects the performance of the ship, for example, the ratio between length and width (L/B) is large, good for ships with high speed because it has a good ratio of space, but reduces the ability of the ship to move and reduces ship stability. . Meanwhile, if the L/B ratio of a small ship provides the ability ship stability which is good but adds to the ship's resistance. The ratio between length and depth (L/H) affects the longitudinal strength of the ship. A large L/H price will reduce the longitudinal strength of the ship, on the contrary, a small L/H price will increase the longitudinal strength of the boat.

The Indonesian Classification Bureau (BKI) 2004 requires the comparison of ship sizes as follows:

a. L/H = 14 For ocean shipping area
b. L/H = 15 For coastal shipping areas
c. L/H = 17 For local shipping area
d. L/H = 18 for the limited shipping area

From the above provisions, areas that have large waves or other external influences that are larger than a ship have a lower L/H ratio price requirement.

IV. ACHIEVEMENTS

4.1. RIVER SHIP CHARACTERISTICS

Several types of riverboats operating at Pier 16 Ilir Palembang are speed boats, long boats, jukung, and Getek Boat. Speed boats, long boats, and Getek Boat are used to transport passengers and their luggage, while jukung is used to transport goods. Speed boats, long boats, and jukung operate on fixed and non-fixed routes, while armrests operate on non-fixed routes. Cross-regency/city riverboat routes in Palembang can be seen in Table 4.1.

The route for riverboats in Palembang is determined by the Governor of South Sumatra through the Decree of the Governor of South Sumatra Number: 456/KPTS/IV/2008 concerning ……. or a city in South Sumatra so that the supervision of the operation of the ship is carried out by the City Transportation Service for ships operating within the city of Palembang and the South Sumatra Provincial Transportation Service for ships operating between cities/districts in South Sumatra.

Table 4.1. River Boat Routes in Palembang, South Sumatra

No	Route	Distance (KM)
1	Palembang - Sungai Pinang	23
2	Palembang - Muara Lematang	65
3	Palembang - Kijing Bay	134
4	Palembang - Muara Teladan	168
5	Palembang - Pkl. Bulian	267
6	Palembang – Pamulut	15
7	Palembang - Tanjung Raja	41
8	Palembang - Muara Kuang	102
9	Palembang – Sekayu	178
10	Palembang – Tripe	224
11	Palembang - Muara Rawas	260
12	Palembang – Pauh	293
13	Palembang - Banyan Bay	359
14	Palembang - Muara Rupit	388
15	Palembang - Tulung Selapan	105
16	Palembang - Mud River	173
17	Palembang - Muara Batun	25
18	Palembang - Sp. field	50
19	Palembang – Pampangan	70
20	Palembang - Estuary Lakitan	292
21	Palembang - Muara Kelingi	342
22	Palembang - Mount Megang	85
23	Palembang - Muara Enim	272
24	Palembang - Muara Padang	75
25	Palembang - Air Sugihan	80
26	Palembang - Muara Sugihan	208
27	Palembang – Upang	44
28	Palembang - Makati Jaya	71
29	Palembang – Breech	85
30	Palembang - Simpang PU	75
31	Palembang – Telang	80
32	Palembang - Bayung Lincir	200
33	Palembang – Penuguan	115
34	Palembang - Rimau Island	130
35	Palembang - Sungai Lilin	180

36	Palembang - Karang Agung	160

Source: South Sumatra Governor
Decree number: 456/KPTS/IV/2008

a. Speed boat

speed boat is a type of river ship used to transport passengers over relatively long distances, between regencies within the province of South Sumatra. Speed boats have a high speed compared to other types of ships. Speed boats operating in Palembang have 2 sizes, namely speed boats with an average length of 5.2 meters with an engine power of 40 PK are called speed boats and ships with an average length of 8 meters and engine power of 200 PK are called long boats. The 40 PK speed boat is made of wood, the engine used is Yamaha.

Picture 4.1. Speed Boat at Pier 16 Ilir Palembang

speed boat operating in Palembang has the following dimensional characteristics:

a. The overall length of the ship (LOA) is 5.0 – 6.0 meters
b. The width of the ship (B) is 1.5 – 1.0 meters
c. Ship height (H) 1.0 – 0.8 meters
d. The water load (T) is 0.8 and 0.6 meters
e. Passenger capacity 8 people
f. Engine power 40 PK

The characteristics of the speed boat dimensions can be seen in Appendix 3 of this study.

b. Long Boat

This type of longboat has the same function as a speed boat, which is to transport passengers over relatively long distances. The size of the longboat is larger than the speed boat, so it has a load capacity of more passengers and a larger engine power, which is 200 PK. Passenger carrying capacity is 20, 30, 35, 36, 38, 40, 45 and 70 people. The ship's material is made of wood, fiber, and aluminum.

The characteristics of the longboat dimensions are as follows:

a. The overall length of the ship (LOA) is 5.25 – 12 meters
b. The width of the ship (B) is 1.0 – 3.4 meters
c. Ship height (H) of 0.5 – 1.5 meters
d. The water load (T) is 0.3 - 0.7 meters

The characteristics of the longboat dimensions can be seen in Appendix 4 of this study.

Figure 4.2. Long Boat 200 PK

c. Jukung

The type of Jukung ship is a means of transportation used by people in South Sumatra to transport goods. Usually, the goods brought are in the form of necessities, electronic goods, building materials, household appliances, and others purchased from around Pasar 16 Ilir Palembang. This ship is made of wood with an engine power of 16, 26, 28, 30, 63, 67, 100, 125, 145 PK. The characteristics of the jukung dimensions are as follows:

a. The overall length of the ship (LOA) is 9.0 – 15.0 meters
b. The width of the ship (B) is 1.5 – 3.0 meters
c. Ship height (H) is 0.9 – 1.4 meters
d. The water load (T) is 0.4 - 0.7 meters

The characteristics of the jukung dimensions can be seen in Appendix 5 of this study.

Figure 4.3. Jukung at Pier 16 Ilir Palembang

c. Getek Boat

Getek Boat-type ships are made of wood, used to transport passengers and their luggage over short distances. In Palembang, this type of ship is called Getek Boat because of the sound emitted from the ship's engine, while in other areas such as Kalimantan this type of ship is called klotok. The power of the Getek Boat machine is 12, 16, 20, 22, 24, 30, 48, 63, 67 PK.

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Figure 4.4. Getek Boat at Pier 16 Ilir Palembang

The dimensional characteristics of Getek Boats are as follows:

a) The overall length of the ship (LOA) is 8.0 – 14.0 meters
b) The width of the ship (B) is 1.5 – 3.0 meters
c) Ship height (H) is 0.8 – 1.2 meters
d) The water load (T) is 0.3 - 0.8 meters

Getek Boat characteristics can be seen in Appendix 6.

4.2. Comparison Ratio Analysis Main Dimension

The ratio analysis of the main dimensions of river vessels at Pier 16 Ilir Palembang uses the limits of small motorboats. The guidelines for limiting the ratio of the main dimensions for the types of small motorized vessels are as follows:

a. L/B = 3.20 - 6.30
b. N/B = 0.30 - 0.50
c. N/H = 0.60 - 0.80
d. L/H = 6.00 - 11.00

4.2.1. Main Dimension Comparison Ratio Analysis *Speed boat*

The calculation results The ratio of the main dimensions of the speed boats operating at Pier 16 Ilir Palembang from the 21-speed boats that were sampled is known as follows:

a. The ratio of the dimensions of the length to the width of the ship (L/B) required is 3.20 – 6.30. Based on the calculation of the L/B ratio, it is known that all speed boats meet the L/B ratio, so that all speed boats have good maneuverability and stability.
b. The ratio of the dimensions of the height to the width of the ship (T/B) required is 0.30 – 0.50. Based on the calculation of the ratio of T/B speed boats that as many as 95% or 20 units of 21 units of speed boats meet the ratio T/B ratio, so that the ship meets the standard of ship stability, the center of gravity of the whole ship is in a normal position.
c. The ratio of water draft or draft to the ship (T/H) required for small ships is 0.60 – 0.30. have buoyancy within normal limits, while 48% or as many as 10 ships have poor buoyancy.
d. The ratio of the length dimension to the inside of the ship (L/H) required for small ships is 6.00 – 11.00. Based on the L/H calculation, it is known that as many as 43% or 9 units of ships have the strength of the longitudinal construction of the ship meeting the standards.

The results of the measurement of the dimension ratio to 1 (one) speed boat sample unit obtained are as follows:

Main size:
Overall length (L) : 60.0 meters
Ship width (B) : 1,2 meters
Ship height (H) : 0.75 meters
Water laden (T) : 0,6 meters

The comparison of ship sizes is as follows:

L/B = 5.1 The magnitude of this comparison ratio shows that the ship is slimmer but has good maneuverability and ship stability.
L/H = 8.0 This ratio shows that the ship's construction is quite high and can affect the stability and longitudinal strength of the ship
N/B = 0.5 The magnitude of this comparison ratio shows that the ship's construction meets the ship's stability standards with the assumption that the center of gravity of the entire ship is in a normal position.
T/H = 0.8 The magnitude of this ratio shows that the ship has a large reserve of buoyancy.

The shape of the line plan of the speed boat measurement can be seen in Figure 4.1.

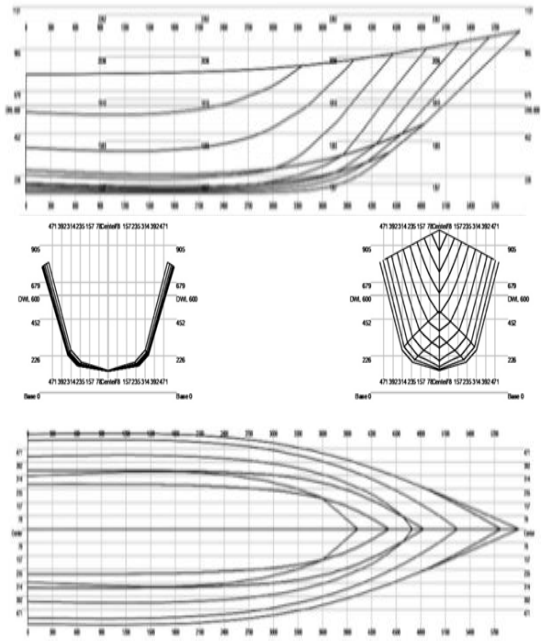

Figure 4.1. Speed Boat Line Plan

Based on Figure 4.1 shows the slender ship-shape so that the hull is V-shaped (Cb = 0.3), the hull with this shape can resist resistance and increase the speed of the ship. The bottom of the ship is flat which causes passenger discomfort when the ship is sailing at high speed. The advantage of this bottom, the ship can sail in shallow grooves and has good maneuverability.

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Table 4.6. Speed Boat Main Dimension Comparison Ratio

No	Nama Kapal	Ukuran (M)				Nilai Rasio Perbandingan			
		L	B	H	T	L/B (3,2 - 6,3)	T/B (0,30-0,50)	T/H (0,30-0,60)	L/H (6,00-11,00)
1	ALDI PUTRA	5,3	1,3	0,8	0,6	4,2	0,5	0,8	6,6
2	HARI PUTRA	5,25	1,3	0,7	0,6	4,0	0,4	0,8	7,5
3	ALDI PUTRA	5,0	1,0	1,0	0,8	5,0	0,8	0,8	5,0
4	ISAH PUTRI	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
5	SULTAN ADAM	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
6	ANUGRAH ILAHI	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
7	ANUGRAH ILAHI	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
8	SULTAN ADAM	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
9	PUTRA TUNGGAL	5,2	1,2	0,8	0,6	4,3	0,5	0,8	6,9
10	CENDY	5,3	1,3	0,7	0,6	4,2	0,5	0,8	7,5
11	AKTIF	5,0	1,3	0,8	0,6	4,0	0,5	0,8	6,3
12	SUMATERA	6,0	1,2	0,8	0,6	5,0	0,5	0,8	8,0
13	CAMAR LAUT	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
14	SETULUS HATI	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
15	AMORA	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
16	AMPHIBI	5,25	1,5	0,8	0,6	3,5	0,4	0,7	6,6
17	BERKAT YAKIN	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
18	AFVARISAL PUTRA	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
19	ANUGRAH	5,0	1,5	1,0	0,6	3,3	0,4	0,6	5,0
20	ADI PUTRA	5,7	1,2	0,8	0,6	4,8	0,5	0,8	7,1
21	MUSI RAYA	5,7	1,2	0,8	0,6	4,8	0,5	0,8	7,1
RATA – RATA		5,2	1,4	0,9	0,6	3,8	0,5	0,7	5,7

4.2.2. Main Dimension Ratio of Long Boat

The calculation results The ratio of the main dimensions of longboats operating at Pier 16 Ilir Palembang from 44 longboat units that were sampled is known as follows:

a. The ratio of the dimensions of the length to the width of the ship (L/B) required is 3.20 – 6.30. Based on the calculation of the L/B ratio, it is known that 72% or as many as 32 units of 44 units of longboats meet the L/B ratio, so that the longboat has good maneuverability and stability.
b. The ratio of the dimensions of the height to the width of the ship (T/B) required is 0.30 – 0.50. Based on the calculation of the ratio of T/B longboats that as many as 16% or 7 units of 44 units of longboats meet the ratio of T/B, so that the ship meets the standard of ship stability, the center of gravity of the whole ship is in a normal position.
c. The ratio of water draft or draft to the ship (T/H) required for small ships is 0.60 – 0.30. Based on the calculation of the T/H comparison, it is known that 52% or 11 units of ships meet the ratio of T/H, so that the ship has buoyancy within normal limits, while 48% or as many as 10 ships have poor buoyancy.
d. The ratio of the length dimension to the inside of the ship (L/H) required for small ships is 6.00 – 11.00. Based on the L/H calculation, it is known that as many as 68% or 30 units of ships have the strength of the ship's longitudinal construction.

Table 4.6. Long Boat Main Dimension Comparison Ratio

No	Ship name	Comparison Ratio Value (M)			
		L/B (3.2 - 6.3)	N/B(0.30-0.50)	N/H (0.30-0.60)	L/H (6.00-11.00)
1	SRIWIJAYA	4.80	0.22	0.44	9.60
2	BEAUTIFUL GIRI	6.67	0.39	0.47	8.00
3	ENC KALIJAPAT 3	3.53	0.11	0.47	15.00
4	VALMET 1	3.75	0.19	0.40	8.08
5	MAHAM	4.00	0.23	0.65	11.43
6	GREAT	3.56	0.20	0.57	10.00
7	HARAS GROUP	6.40	0.55	0.69	8.00
8	FAJRI PUTRA	4.00	0.37	0.41	4.44
9	THOUSAND DINAR	5.00	0.27	0.54	10.00
10	NAVY BLUE	6.67	0.39	0.47	8.00
11	BARCELONA	4.00	0.19	0.49	10.00
12	MULYA SOURCE	6.00	0.27	0.54	12.00
13	DELA MARINDA	4.00	0.24	0.61	10.00
14	AMORA	6.67	0.39	0.47	8.00
15	SEI SEMBILANG-03	6.00	0.27	0.54	12.00
16	SAME STRUGGLE	6.00	0.27	0.54	12.00
17	LOYAL FRIEND	4.00	0.22	0.43	7.69
18	ARETHA	3.64	0.17	0.73	16.00
19	HOPE ETERNAL	4.25	0.24	0.61	10.63
20	SEI NINE	6.00	0.27	0.54	12.00
21	ARETHA 2	3.57	0.12	0.65	20.00
22	AWARA	8.00	0.77	0.77	8.00
23	DIYEN	4.00	0.24	0.40	6.67
24	INTERVIEW SON	4.00	0.27	0.54	8.00
25	LOVE-02	9.00	0.77	0.77	9.00
26	KALFIN	4.15	0.23	0.65	11.86
27	KALVIN	5.00	0.27	0.54	10.00
28	LOVE-01	9.00	0.77	0.77	9.00
29	AMPHIBI 01	6.67	0.39	0.47	8.00
30	SON OF LOVE	3.18	0.20	0.62	10.00
31	CV. DENY MULYA MANDIRI	2.92	0.25	0.74	8.75
32	HOPE ETERNAL 06	5.00	0.27	0.54	10.00
33	HEART'S DREAM	2.40	0.17	0.54	7.50
34	CHARISMA	4.32	0.28	0.59	9.11
35	BAROKAH DAYA	4.53	0.29	0.56	8.60

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36	ARJUNA	4.47	0.29	0.56	8.50
37	KARTIKA	4.56	0.32	0.57	8.20
38	ANSWER LOVE JAYA	4.37	0.29	0.56	8.30
39	JAIPONGAN	4.00	0.21	0.44	8.33
40	EAST LIGHT	2.80	0.17	0.54	8.75
41	JAIPONGAN	4.44	0.25	0.74	13.33
42	CHARISMA	5.33	0.23	0.51	12.00
43	BUKID BATU INTERNUSA	5.67	0.42	0.63	8.50
44	DIVINE LIGHT	4.00	0.21	0.44	8.33

The measurement results of 1 (one) unit longboat are as follows:
Main size:
Overall length (LOA): 12 meters
Ship width (B): 2.5 meters
Ship height (H): 1.25 meters
Water load (T): 0.54 meters

The comparison of ship sizes is as follows:
L/B = 4.8 The magnitude of this comparison ratio shows that the ship has sufficient maneuverability and ship stability.
L/H = 9.6 This ratio shows that the ship's construction is quite high and can affect the stability and longitudinal strength of the ship
N/B = 0.22 The amount of this comparison ratio is still sufficient for ship stability standards assuming that the center of gravity of the entire ship is in a normal position.
T/H = 0.44 This ratio shows that the ship has a large enough buoyancy reserve.

The shape of the line plan of the speed boat measurement can be seen in Figure 4.2.

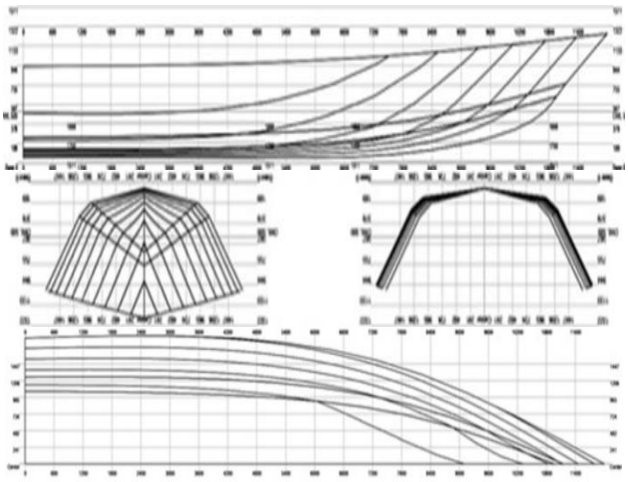

Figure 4.2. Long Boat Line Plan

The design of a longboat is the same as a speed boat, which has a V-shaped hull so that it can sail at high speeds.

4.2.3. Jukung Main Dimension Ratio

The calculation results The ratio of the main dimensions of the jukung operating at Pier 16 Ilir Palembang from the 57 units of jukung that became the sample is known as follows:

a. The ratio of the dimensions of the length to the width of the ship (L/B) required is 3.20 – 6.30. Based on the calculation of the L/B ratio, it is known that 94.7% or as many as 54 units of 57 units of jukung meet the L/B ratio, so that the ship has good maneuverability and stability.
b. The ratio of the dimensions of the height to the width of the ship (T/B) required is 0.30 – 0.50. Based on the calculation of the ratio of the T/B jukung that as many as 19.3% or as many as 11 units of the 57 units of the jukung meet the ratio of T/B, so that the ship meets the standard of ship stability, the center of gravity of the whole ship is in a normal position.
c. The ratio of water draft or draft to the ship (T/H) required for small ships is 0.60 – 0.30. Based on the calculation of the ratio of T/H, it is known that 100% or all of the jukung meet the ratio of T/H, so that the ship has good buoyancy.
d. The ratio of the length dimension to the inside of the ship (L/H) required for small ships is 6.00 – 11.00. Based on the L/H calculation, it is known that as many as 21% or 12 units of ships have the strength of the longitudinal construction of the ship.

The measurement results obtained in the form of a longboat are as follows:
Main size:
a. Overall length (L): 12.5 meters
b. Ship width (B): 3 meters
c. Ship height (H): 1 meter
d. Water Load (T): 0.4 meters

The comparison of ship sizes is as follows:
a. L/B = 4.17 The magnitude of this comparison ratio shows that the ship has good maneuverability and ship stability.
b. L/H = 12.5 This ratio shows that the ship's construction is quite high and can affect the stability and longitudinal strength of the ship.
c. N/B = 0.13 The magnitude of this comparison ratio affects the stability of the ship, so it is necessary to pay attention to the laying of cargo on the ship's deck so that the center of gravity of the whole ship is in a normal position.
d. T/H = 0.4 This ratio shows that the ship has a large enough buoyancy reserve.

The shape of the line plan of the speed boat measurement can be seen in Figure 4.3.

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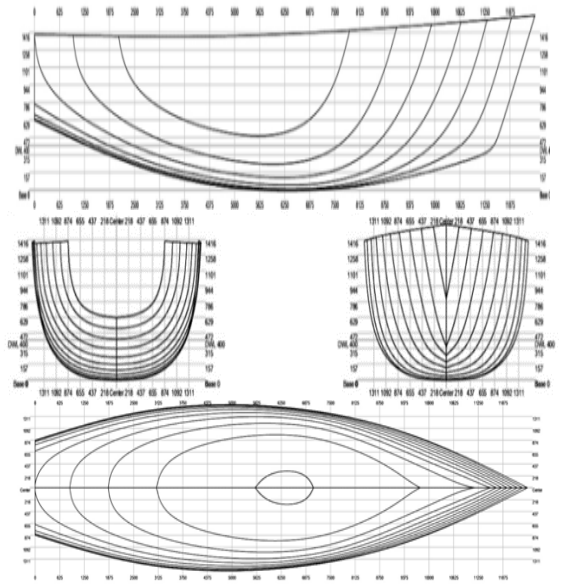

Figure 4.3. Jukung Line Plan

The shape of the body of the jukung is U-shaped with the aim that the ship's capacity is large, but the ratio of T/B is small so it is necessary to pay attention to the placement of cargo along the ship's deck.

Table 4.7. Jukung Main Dimension Comparison Ratio

No	Nama Kapal	Nilai Rasio Perbandingan (M)			
		L/B (3,2 - 6,3)	T/B (0,30-0,50)	T/H (0,30-0,60)	L/H (6,00-11,00)
1	DUA PUTRA DUA PUTRI	5,6	0,2	2,5	0,5
2	SEJARAH HIDUP	6,0	0,3	2,0	0,5
3	MS.PUTRI JIHAN	4,3	0,1	3,0	0,4
4	DOA KELUARGA	6,0	0,3	2,2	0,6
5	MS.PUTRA TUNGGAL	8,0	0,5	1,3	0,6
6	IMAM	5,2	0,2	2,1	0,4
7	ADIL-01	4,2	0,1	3,0	0,4
8	ARKANA PUTRA-02	7,5	0,3	1,5	0,5
9	ANDRA SAPUTRA	5,6	0,2	2,5	0,5
10	PUTRI SAKIRA	5,0	0,2	2,5	0,4
11	KENANGAN INDAH	4,3	0,1	3,0	0,4
12	PUTRA KEMBANG -02	5,0	0,2	2,8	0,5
13	MS.SANDI RIANSYAH	5,6	0,2	2,5	0,5
14	JIMI DESTA	6,0	0,2	2,5	0,5
15	PELITA BAHARI	4,3	0,1	3,0	0,4
16	ALAM INDAH	6,0	0,2	2,9	0,5
17	SINAR RAFA	5,0	0,2	2,8	0,5
18	JASA UTAMA	5,0	0,2	2,8	0,5
19	DUA PUTRA 09	7,5	0,3	1,5	0,5
20	ADITIYAH JAYA	6,0	0,2	2,5	0,5
21	MS. MANDALA	7,0	0,3	2,0	0,5
22	MS. DO'A KELUARGA-02	5,0	0,2	2,8	0,5
23	SETIA BERSAMA	4,2	0,2	2,4	0,5
24	KURNIA ILAHI	5,6	0,2	2,5	0,5
25	HARAPAN BARU	5,2	0,2	2,9	0,5
26	FIRDA JAYA	5,6	0,2	2,5	0,5
27	PUTRA BUNGSU	6,0	0,2	2,5	0,5
28	PUTRA PUTRI	6,1	0,2	1,9	0,5
29	AZQIARA	6,1	0,2	1,9	0,5
30	YUDA PUTRA 01	4,0	0,1	3,0	0,4
31	MS. TUNAS JAYA	4,8	0,2	1,9	0,4
32	DUA SAUDARA	5,0	0,2	2,8	0,5
33	TERSANJUNG	5,6	0,2	2,5	0,5
34	TUNAS MULIA ANGGUN 02	4,8	0,2	1,9	0,4
35	MS. TUNAS MULIA	4,8	0,2	1,9	0,4
36	MEYLISA	5,6	0,2	2,7	0,5
37	MS. EMPAT PUTRA	4,3	0,1	3,0	0,4
38	ALFAKIH	4,3	0,2	2,0	0,4
39	MS. ANTON PUTRA	3,0	0,1	3,0	0,4
40	NABILA PUTRI	5,6	0,2	2,7	0,5
41	RASYA	6,4	0,2	2,5	0,5
42	MUSIM SEMI	5,0	0,2	2,8	0,5
43	DOA KELUARGA	4,3	0,1	3,0	0,4
44	TIGA PUTRA	4,3	0,1	3,0	0,4
45	YUDI PUTRA	4,0	0,1	3,0	0,4
46	MUTIA JAYA – 03	7,0	0,3	1,4	0,5
47	AZRIL PUTRA	4,0	0,2	2,7	0,4
48	ADJIE PUTRA	5,6	0,2	2,3	0,5
49	MS. MAMA JAYA-02	4,3	0,1	3,0	0,4
50	MUTIA JAYA-03	7,0	0,3	1,4	0,5
51	MS. GALANG	4,3	0,2	2,8	0,5
52	DOA IBU	4,0	0,1	3,0	0,4
53	JAYA MIRINDA	7,0	0,3	2,0	0,5

Source: analysis results, 2021

4.2.4. Main Dimension Ratio of Getek Boat

The calculation results The ratio of the main dimensions of the Getek Boats operating at Pier 16 Ilir Palembang from the 56 jukung units that became the sample is known as follows:

a. The ratio of the dimensions of the length to the width of the ship (L/B) required is 3.20 – 6.30. Based on the calculation of the L/B ratio, it is known that 83.9% or as many as 47 units of the 56 Getek Boats meet the L/B ratio, so that the ship has good maneuverability and stability.
b. The ratio of the dimensions of the height to the width of the ship (T/B) required is 0.30 – 0.50. Based on the calculation of the ratio of T/B Getek Boats that as many as 89.3% or as many as 50 units of Getek Boats meet the ratio of T/B ratios, so that the ship meets ship stability standards, the center of gravity of the whole ship is in a normal position.
c. The ratio of water draft or draft to the ship (T/H) required for small ships is 0.60 – 0.30. Based on the calculation of the ratio of T/H, it is known that 83.9% or 47 Getek Boats meet the ratio of T/H, so that the ship has good buoyancy.
d. The ratio of the length dimension to the inside of the ship (L/H) required for small ships is 6.00 – 11.00. Based on the L/H calculation, it is known that as many as 19.6% or 11 units of the ship have the strength of the longitudinal construction of the ship.

The measurement results of 1 (one) Getek Boat unit obtained are as follows:

Main size:

a. Overall length (L) : 12 meters
b. Ship width (B): 3.7 meters
c. Ship height (H): 0.97 meters
d. Water load (T): 0.5 meters

The comparison of ship sizes is as follows:

a. L/B = 3.24 The magnitude of this comparison ratio shows that the ship has good maneuverability and ship stability.
b. L/H = 12.37 This ratio shows that the ship's construction is quite high and can affect the stability and longitudinal strength of the ship
c. N/B = 0.13 The magnitude of this ratio affects the stability of the ship, so it is necessary to pay attention to the laying of cargo on the ship's deck so that the center of gravity of the entire ship is a normal position.
d. T/H = 0.52 The magnitude of this comparison ratio shows the ship has a good buoyancy reserve.

The shape of the line plan of the speed boat measurement can be seen in Figure 4.4.

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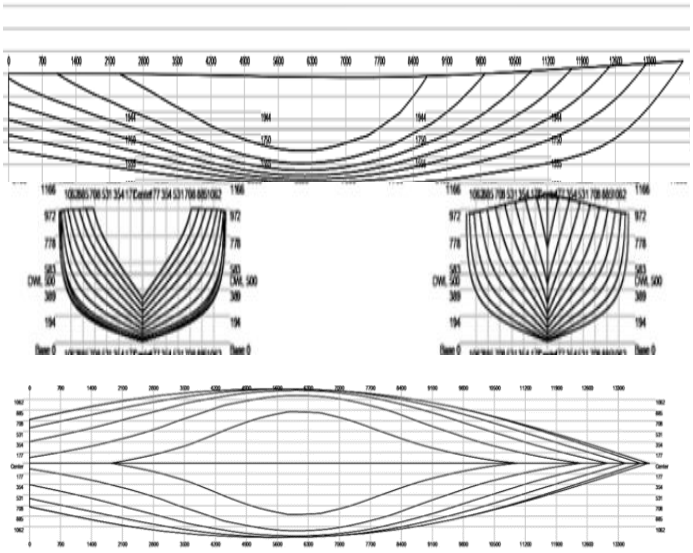

Figure 4.4. Getek Boat Plans

The ship's Getek Boat is used to transport goods and/or passengers over short distances so that the existing armature dimensions are sufficient to meet the stability and maneuverability of the ship, but the ship's compartment is open and the roof is only covered with a tarpaulin so that rainwater or splashing waves can enter the passenger deck or goods.

Based on a comparative analysis of the main dimensions of river vessels operating at Pier 16 Ilir Palembang, it is known that most of these vessels do not meet the ratio of length to ship (L/H), resulting in reduced longitudinal strength of the ship which will result in hogging and sagging. . If the ship is hit by a big wave, it will break the hull. The draft (T) of the river vessels is small so that they can sail in the waters of the Musi River. The ship has a width (B) large enough so that it can carry a lot of goods and passengers. The ratio of T/B affects the stability of the ship, so it is necessary to pay attention to the placement of cargo along the ship's deck.

The safety standards of river vessels, namely speed boats, long boats, jukung, and Getek Boat are not following applicable regulations, such as the absence or lack of life jackets and lifebuoys, the absence of lights and radios.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusion

The conclusions of this study are as follows:

a. Characteristics of river vessels operating at Pier 16 Ilir Palembang

The ships operating at Pier 16 Ilir Palembang are speed boats, long boats, jukung, and Getek Boat with the following characteristics:

1) **Speed boat**

speed boat is a type of river ship used to transport passengers over relatively long distances, between regencies within the province of South Sumatra. Speed boats have a high speed compared to other types of ships. The dimensions of the speedboat are as follows:

a) The overall length of the ship (LOA) is 5.0 – 6.0 meters
b) The width of the ship (B) is 1.5 – 1.0 meters
c) Ship height (H) 1.0 – 0.8 meters
d) The water load (T) is 0.8 and 0.6 meters
e) Passenger capacity 8 people
f) Engine power 40 PK

2) **Long Boat**

This type of longboat has the same function as a speed boat, which is to transport passengers over relatively long distances. The size of the longboat is larger than the speed boat, so it has a load capacity of more passengers and a larger engine power, which is 200 PK. Passenger carrying capacity is 20, 30, 35, 36, 38, 40, 45 and 70 people. The ship's material is made of wood, fiber, and aluminum. The characteristics of the longboat dimensions are as follows:

a) The overall length of the ship (LOA) is 5.25 – 12 meters
b) The width of the ship (B) is 1.0 – 3.4 meters
c) Ship height (H) of 0.5 – 1.5 meters
d) The water load (T) is 0.3 - 0.7 meters

3) **Jukung**

The type of Jukung ship is a means of transportation used by people in South Sumatra to transport goods. Usually, the goods brought are in the form of necessities, electronic goods, building materials, household appliances, and others purchased from around Pasar 16 Ilir Palembang. This ship is made of wood with an engine power of 16, 26, 28, 30, 63, 67, 100, 125, 145 PK. The characteristics of the jukung dimensions are as follows:

a) The overall length of the ship (LOA) is 9.0 – 15.0 meters
b) The width of the ship (B) is 1.5 – 3.0 meters
c) Ship height (H) is 0.9 – 1.4 meters
d) The water load (T) is 0.4 - 0.7 meters

4) **Getek Boat**

Getek Boat-type ships are made of wood, used to transport passengers and their luggage over short distances. In Palembang, this type of ship is called Getek Boat because of the sound emitted from the ship's engine, while in other areas such as Kalimantan this type of ship is called klotok. The power of the Getek Boat machine is 12, 16, 20, 22, 24, 30, 48, 63, 67 PK. The dimensional characteristics of Getek Boats are as follows:

a) The overall length of the ship (LOA) is 8.0 – 14.0 meters
b) The width of the ship (B) is 1.5 – 3.0 meters
c) Ship height (H) is 0.8 – 1.2 meters
d) The water load (T) is 0.3 - 0.8 meters

b. Ship's Main Dimension Comparison Ratio

1) Speed Boat Comparison Ratio

The ratio of the main dimensions of the speed boat is as follows:

a) Based on the calculation of the L/B ratio, it is known that all speed boats meet the L/B ratio, so that all speed boats have good maneuverability and stability.

b) Based on the calculation of the ratio of T/B speed boats that as many as 95% or 20 units of 21 units of speed boats meet the ratio T/B ratio, so that the ship meets the standard of ship stability, the center of gravity of the whole ship is in a normal position.
c) Based on the calculation of the T/H comparison, it is known that 52% or 11 units of ships meet the ratio of T/H, so the ship has buoyancy within normal limits, while 48% or as many as 10 ships have poor buoyancy.
d) Based on the L/H calculation, it is known that as many as 43% or 9 units of ships have the strength of the longitudinal construction of the ship meeting the standards.

2) Long Boat Comparison Ratio

The comparison ratio of the main characteristics of longboats is as follows:

a) Based on the calculation of the L/B ratio, it is known that 72% or as many as 32 units of 44 units of longboats meet the L/B ratio, so that the longboat has good maneuverability and stability.
b) Based on the calculation of the ratio of T/B longboats that as many as 16% or 7 units of 44 units of longboats meet the ratio of T/B, so that the ship meets the standard of ship stability, the center of gravity of the whole ship is in a normal position.
c) Based on the calculation of the T/H comparison, it is known that 52% or 11 units of ships meet the ratio of T/H, so that the ship has buoyancy within normal limits, while 48% or as many as 10 ships have poor buoyancy.
d) Based on the L/H calculation, it is known that as many as 68% or 30 units of ships have the strength of the ship's longitudinal construction.

3) Jukung Comparison Ratio

The ratio of the main dimensions of the jukung is as follows:

a) Based on the calculation of the L/B ratio, it is knowin that 94.7% or as many as 54 units of 57 units of jukung meet the L/B ratio, so that the ship has good maneuverability and stability.
b) Based on the calculation of the ratio of the T/B jukung that as many as 19.3% or as many as 11 units of the 57 units of the jukung meet the ratio of T/B, so that the ship meets the standard of ship stability, the center of gravity of the whole ship is in a normal position.
c) Based on the calculation of the ratio of T/H, it is known that 100% or all of the jukung meet the ratio of T/H, so that the ship has good buoyancy.
d) Based on the L/H calculation, it is known that as many as 21% or 12 units of ships have the strength of the longitudinal construction of the ship.

4) Getek Boat Comparison Ratio

The ratio of the main dimensions of the Getek Boats is as follows:

a) Based on the calculation of the L/B ratio, it is known that 83.9% or as many as 47 units of the 56 Getek Boats meet the L/B ratio, so that the ship has good maneuverability and stability.
b) Based on the calculation of the ratio of T/B Getek Boats that as many as 89.3% or as many as 50 units of Getek Boats meet the ratio of T/B ratios, so that the ship meets ship stability standards, the center of gravity of the whole ship is in a normal position.
c) Based on the calculation of the T/H ratio, it is known that 83.9% or 47 Getek Boats meet the T/H ratio, so the ship has good buoyancy.
d) Based on the L/H calculation, it is known that as many as 19.6% or 11 units of the ship have the strength of the longitudinal construction of the ship.

5.2. Recommendation

This research is expected to be continued to create a prototype of a river ship that is safe following the Musi River shipping line. Recommendations for future research are as follows:

a. It is necessary to research the Musi River flow according to the route of river ships in Palembang.
b. Make a prototype of a riverboat that is suitable for the flow of the Musi River voyage.

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