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# Ethnomathematics on floating Kelong from Malang Rapat

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**Abstrak**

Mathematics taught in schools is often associated with the material needs of students; mathematics not only does not have to be understood in the school environment but also understood in other surrounding environments, such as culture and others. This study aimed to determine the ethnomathematics of Malay traditional floating kelong in Malang Rapat, Bintan Regency. The research method used is a descriptive qualitative method with an ethnomathematical approach. The research instruments used are observation sheets, interviews and documentation. Based on the research results presented, the author concluded, namely, the use of mathematical concepts in certain cultures and societies, such as the use of addition and subtraction in calculating the amount of wood used or the number of barrels used in floating kelongs. Making floating kelongs using basic mathematics, especially addition and subtraction operations, can be used to calculate the amount of wood used to construct floating kelongs and the number of barrels applied. Taxonomy is also applied to analyze and categorize certain elements in research, concerned with understanding how the components of floating kelong are classified or organized. The role of mathematics in identifying and calculating pesky components (materials that bring good luck or maintain security) used in floating kelongs. Ethnomathematics can also involve understanding the cultural themes underlying the use of mathematics in everyday life, such as how mathematical concepts are integrated with cultural beliefs and practices in the construction of floating kelongs.

*Keywords:* ethnomathematics; kelong; mathematical activities; mathematical concept

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## I. Introduction

Education and culture cannot stand alone, so in essence, education means a single entity that relates to other entities according to the prevailing era and context. Mathematics has an existence that can stand alone without being influenced by any factor. However, in a cultural context, mathematics can be interrelated with various aspects of life, suggesting that elements of mathematics can be found in the activities of such societies (Pratiwi, 2019).

The word "Ethnomathematics" is formed from several words, namely "ethno", which means a cultural group of a tribe along with the profession, community and language contained in their daily lives. Furthermore, the word "mathema" explains, interprets, and manages things encountered by calculating, measuring, classifying, sorting and modelling certain patterns in an environment. Lastly, "tics" is a technique in art. Ethnomathematics is a study that takes a cultural group's ideas, concepts, and activities as the focus of its research. In this context, ethnomathematics can be used as an exploratory tool to explore mathematical concepts related to Indonesia's diverse cultural heritage (Andriono, 2021). This approach can be a bridge that connects culture, education, and mathematics to enrich mathematics learning through relevant cultural contexts. However, ethnomathematics itself has a weakness, namely regional people who especially use ethnomathematics in their activities; some of them do not have confidence in the relics of their ancestors because the mathematical elements contained in the culture do not have a definition, has no theorem, and does not have a formula that is usually found in academic mathematics (Pratiwi, 2019).

In this context, ethnomathematical studies have a significant role in efforts to strengthen the relationship between students' concrete life experiences and abstract mathematical concepts through the incorporation of cultures and traditions in the mathematics learning process. This research is expected to provide a deeper understanding of local cultural values implicit in the exploration and utilization of floating Kelong, through tracing ethnomathematical aspects. The application of mathematics is interdependent with everyday life because humans need daily life; researchers hope to be able to reveal mathematical concepts inherent in Malay culture (Hardiani & Putrawangsa, 2019). It can also provide valuable input in preparing mathematics learning materials that are more connected to local cultural heritage.

Fishing communities in the Malang Rapat village area tend to develop unique adaptation patterns that are often difficult for people outside their community to understand. This is done to face various risks and a life full of uncertainty. In addition to exploring the ethnomathematical value of floating Kelong, this research is expected to be a foundation to broaden further horizons about local cultural diversity related to mathematics. Thus, this study highlights traditional cultural practices and relates them to mathematical concepts, making mathematics learning more contextual and relevant to students' daily lives (Aqmal et al., 2018).

Ethnography research with floating along objects was carried out with the aim of knowing ethnomathematics in Malay floating snails in Malang Rapat related to the concept of Mathematics in the process of Malay culture and society in Malang Rapat. This study aims to understand how mathematical concepts are applied in Malay cultural and community activities related to floating snails. Ethnomathematics is a field of study that combines mathematics and culture. In the context of this study, ethnomathematics is used to study how mathematical concepts are applied in Malay cultural and community activities related to floating kelong. In this study, researchers will observe and analyze how mathematical concepts are applied in Malay cultural and community activities related to floating kelong. In this study, researchers will collect data from observation, interview, and documentation analysis. The collected data will be analyzed using an ethnomathematical approach to understand mathematical concepts related to Malay cultural and community activities in Malang Rapat. The results of this study can provide a better understanding of how mathematical concepts are applied in Malay cultural and community activities related to floating snails. The results of this research can also contribute to the development of mathematics education that is more contextual and relevant to local culture and society.

## II. Research Method

The type of research used is descriptive research with a qualitative approach where researchers try to study symptoms in their natural state on the subject under study as it is without making it up.

The research used is qualitative descriptive research with an ethnographic approach. This research type combines descriptive qualitative methods with ethnomathematical concepts and approaches so that researchers can uncover and obtain comprehensive, widespread, and in-depth information. The ethnographic approach involves the systematic collection of data about lifestyles, social activities, and various cultural elements in a society (Lusiana et al., 2019)

In the process, this research uses an ethnographic approach, namely an empirical and theoretical approach aimed at obtaining a comprehensive picture and analysis of culture based on field research. Data collection techniques in research consist of two parts: library data collection obtained from literature studies and field data collection consisting of three parts: observation, documentation and interviews. The results of observation and documentation in the form of ethnographic records (field notes) are writings made during observation and documentation activities. This research instrument includes interview guidelines, observation guidelines, and documentation.

Using data collection techniques through observation sheets, interviews, documentation and literature reviews as a benchmark for researchers in the field, the data obtained will be more complete so that all data is noticed. The observations carried out were in the form of three activities, namely (1) observing the shape of the wood used, (2) observing the preparation technique or structure in the floating kelong, and (3) observing the mathematical concepts contained in the floating kelong form. In this study, the data analysis techniques used were domain analysis, taxonomy, cultural components and themes. In domain analysis, it is done by analyzing the part of the structure on the floating kelong. Taxonomic analysis is carried out by grouping ornaments of floating kelong shapes.

Taxonomic analysis focuses on a specific domain that is very useful for describing the phenomenon or problem to which the study is subjected. Taxonomic analysis is carried out to create categories of cultural symbols in the culture under study. The component analysis is done by finding certain meanings in kelong in Malang Rapat. Cultural themes are analyzed by finding mathematical ideas or concepts involved in the culture of the society under study.

Table 1. The ethnographical framework of ethnomathematical study

| Guide Questions | Initial Response | Analysis Steps | Viewpoint | Activity |
|---|---|---|---|---|
| Where to start observing it? | In the floating kelong design research activities made by fishermen in Teluk Bakau village, Malang Rapat, and Bintan Regency, there is potential for mathematical practice that can be explored. | **Domain** | Highlighting the practice of mathematics in the context of the local culture of kelong making in Tanjungpinang, paying attention to how mathematics is applied in the manufacturing process, which refers to local wisdom. | Conduct observations and interviews with floating kelong, the Bintan Regency's local community . |

| | | | | |
|---|---|---|---|---|
| How do we observe it? | Observe the various shapes in the kelong, such as wood construction, net installation, and equipment such as pulleys, barrels, and ropes. | **Taxonomy** | Alternative thinking | Determine what potential ideas, ways, or techniques fishermen use in the form of Kelong Apung related to mathematical practices or activities. |
| How is mathematics applied to the shape of the floating kelong and the structure of buildings of this dimension considered in the manufacturing process? | Application of mathematics in kelong making, such as how geometric concepts are used in designing structures, measurements to ensure proper proportions, and mathematical calculations to build solid structures. | **Componential** | Focus on identifying and explaining the mathematical elements of the cladding manufacturing process, such as geometry, measurement, proportion, and building structure. | Observe and identify the mathematical aspects involved in making kelongs, such as wood construction, net installation, tools such as pulleys, barrels, and ropes, and applying geometry and measurement principles in the manufacturing process. |
| Is it? | Proof of mathematical concept as a result of alternative thinking in building kelong structures and fishing gear. | **componential** | Mathematics and Mathematical Philosophy | Analyze and describe the relationship between mathematical practices and local cultural contexts, highlighting the relationship between traditions, activities, and the use of mathematics in kelong making. |
| What does it mean? | Learn about existing cultural values. | Cultural themes | **Antropology** | Describe ethnomathematics in terms of kelong form and its relationship to mathematical practice. |

## III. Results and Discussion

Figure 1. Kelong buoyancy

Figure 1 above is a picture of a floating kelong. Kelong apung, or kelong, is a traditional fishing gear from Lingga, Bintan Regency, and the Riau Islands. This kelong has been used by fishermen in fishing activities for generations. One of the uniqueness of the floating kelong is that it has a floor in the form of wooden boards equipped with a kitchen and floating house.

Floating kelongs are usually pulled by boats into waters that are thought to have many fish. Fishermen use this kelong as a temporary residence and centre of their operations while at sea. Kitchens and floating houses in Kelong allow fishermen to cook food and rest comfortably in the middle of the sea.

The fishing community of Pengudang Village uses fishing gear in the form of floating kelong. However, the process of making floating kelongs requires much investment. As a result, several fishermen chose to work as fishermen in the kelongs owned by tauke. They earn income through a profit-sharing agreement that has been agreed between tauke and the labor fishermen. In the research, we studied the parts present in floating longs and their size. Making floating snails takes about 1 month, costing around 130 million. The Length of the wood used is about 12 meters. For wooden bases, pillow wood or barrel clamping wood is usually used. Other parts, such as lawai wood, pinwood, and other types of wood, are used for specific purposes in kelong (Laborer et al., n.d.)

The size of the rope used in floating kelongs may vary. Some use a rope with a size of 20 ML, while there are also those who use a rope with a size of 18 ML. However, the size of 18 ML may not be ideal because it can break easily and is still relatively short.

In addition, floating kelongs are also equipped with anchors. The commonly used anchor size in snails is about 12 ML. This anchor keeps the kelong in the desired position in the middle of the sea, so fishermen can fish more effectively.

Thus, floating kelong is a traditional fishing gear that has its uniqueness. With floors in the form of wooden planks, kitchens, and floating houses, this kelong is a temporary residence and operation center for fishermen while they are at sea. The process of making kelong requires considerable time and cost, but its existence allows fishermen to carry out fishing activities more efficiently. Usually, fishermen go to Kelong if it is dark (evening to night) because there is no lighting anymore, so it is easy to get fish using lights from Kelong.

Figure 2. Net pulley

Ethnomathematics in tools used to lift or pull and lower objects with the help of ropes is a net pulley, involving several mathematical aspects in the use and construction of the tool.

The mathematical aspect related to the use of pulleys involves the calculation of mechanical gain ratios. This ratio can be calculated as a division between the Length of the rope being pulled and the Length of the rope going down. This understanding allows users to estimate how much mechanical advantage can be gained from the use of pulleys. Mathematics is involved in determining the number of windings of the rope on the pulley, especially about the size or size of the wood used. The number of windings can be calculated by considering the wood's diameter and the rope length required to lift or lower the load efficiently.

Mathematics is used to choose the right size of wood to support the load being lifted. It involves calculating the structural strength of the wood, including the durability and safety of the resulting structure. Mathematical aspects related to calculating load capacity can include determining the maximum weight that is safe to lift. This involves factors such as rope strength, pulley durability, and the characteristics of the wood used. Mathematical aspects can also be found in symmetry or geometry patterns in tool design. Using symmetrical patterns or geometric principles can involve mathematical concepts such as rotational or reflexive symmetry. Mathematics is involved in adjusting the Length of the rope according to the needs. This may involve simple calculations to ensure that the

Length of the rope is sufficient to overcome the required distance.

Thus, ethnomathematics in tools such as pulley nets include mathematical aspects integrated into understanding and using such tools. These calculations may vary depending on the cultural and traditional context of the tool's use.

Mathematics also affects logic. Logic is the study of correct arguments and reasoning. Mathematics uses logic to prove theorems and develop consistent thought structures. In mathematics, we use the principles of logic to construct valid arguments and avoid misreasoning. Using the language of mathematics and logic, we can reach objective and universal agreement. Mathematics provides a clear and structured framework for thinking and communicating, thus enabling us to reach a deep understanding and agreement acceptable to all parties involved (Research et al., n.d.)

In addition, this kelong house not only functions as a resting place, but also functions as a headquarters or operational headquarters for fishermen. The interior is designed to provide coolness and comfort for its residents to restore optimal conditions before continuing fishing activities at sea. The houses contained in floating kelongs can be seen in picture 3 below.

Figure 3. Kelong floating house

Fishermen need to use geometric formulas to calculate the area of net cover. This involves calculating the area that can be covered by nylon or plastic nets about 6 fathoms long. Mathematics is involved in determining the effective Length of the net to cover the desired area. This can involve calculations related to water depth and environmental characteristics of the catch. A mathematical understanding related to the strength of mesh materials, such as nylon or plastic, is needed to withstand seawater pressure. The ratio of material to water pressure needs to be considered in the net design. Placing lights and lighting patterns requires a mathematical approach to ensure enough light to attract fish into the net. It involves calculations related to the intensity of light and the distance between lamps. Fishermen can analyze fishing probability by mathematically understanding fish behaviour, environmental conditions, and net design. This helps increase the chances of success. Mathematics is used to optimize the technique of laying the net. The selection of the distance between the nets, the tension level, and the placement efficiency involves mathematical calculations. The cycle of net replacement and treatment is managed using mathematical understanding. This involves calculating the life of the net, replacement frequency, and maintenance to ensure the kelong functions optimally.

Mathematical understanding in all these aspects helps fishermen improve fishing effectiveness and keep kelong functioning properly. Fishermen's skills and experience in applying net installation and management techniques carefully are essential to achieve maximum fishing results.

The advantages of lights in water, when juxtaposed with above water, are: Lights that are turned on in water very many advantages: (1) the time needed to collect fish is less because the place where the lamp is cultivated is close to the place of fish. (2) light can be attempted more efficiently because no light bounces off or is absorbed by the air (3) the fish approaches the lamp, then swims towards the lamp until the fish is caught and the fish is likely to be calm (4) the fish that gather rarely scatter anymore.

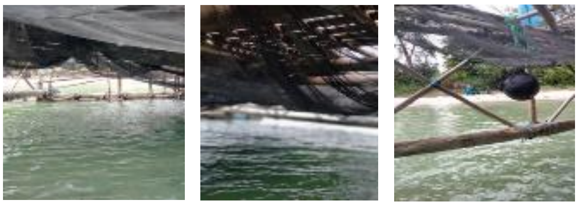

Figure 4. Fishing nets, derigen, and ballast

Around the net, there are also yellow derigens and stones that have special functions. This device is installed to prevent the net from turning backwards and the ballast of the net due to currents and sea breezes. By using approximately 4 directions, fishermen can control the position and orientation of the net effectively, keeping the fishing gear in the best position to catch fish. The combination of sophisticated nets and the use of conductors as positioning tools makes floating Keron an effective and efficient fishing gear for fishermen when carrying out fishing activities at sea.

Thus emerged the mathematical aspects of fluids and the principle Archimedes involved in calculating the weight of ballast and buoyancy force needed to keep the floating kelong on the water's surface stable. Mathematical concepts from mechanics, such as Newton's laws, can be used to understand the forces acting on fishing nets, especially when exposed to currents or sea breezes. Mathematical algorithms or control systems might be applied to calculate and adjust the position and orientation of the net. This can involve using sensors to detect wind direction and ocean currents and then calculating the necessary changes in net position. The use of coordinates and geometric concepts may be involved in setting the position and orientation of the net. This can involve trigonometric calculations or linear algebra to determine the necessary change in angle or position.

Figure 5. Barrel

Figure 5 is a picture of a barrel so that the kelong can float; 1 kelong uses 60 barrels. Some of the barrels are blue, and some are black. How to install it on land, we fill the barrel with wind. If on one side it sinks and one of the other sides it floats, it means that on the side that sinks the barrel is leaking and there is much water. After that, dismantle the barrel if there is a deflated one in the refill.

In the floating kelong design research activities made by fishermen in Teluk Bakau village, and Malang Rapat, Bintan Regency, there is potential for mathematical practice that can be explored. Highlighting the practice of mathematics in the context of the local culture of kelong making in Tanjungpinang, paying attention to how mathematics is applied in the manufacturing process, which refers to local wisdom. Observe the various shapes in the kelong, such as wood construction, net installation, and equipment such as pulleys, barrels, and ropes. Application of mathematics in kelong making, such as how geometric concepts are used in designing structures, the use of measurements to ensure proper proportions, and mathematical calculations to build solid structures.

Table 2. The results

| Domain | Mathematical Ideas, Methods, Techniques | Mathematical activities of Kelong Apung | Mathematical Concepts |
|---|---|---|---|
| Floating Kelong construction form | - Determination of the form of the base of the float kelong as a whole<br>- The characteristics of the building space and the nature of balance and symmetry.<br>- Adjusting the position of the parts of the Floating Kelong | - Determine the basic shape of the kelong, namely the beam | - Build flat side spaces (blocks, cubes, spheres, tubes and prisms)<br>- Nets build flat-side space |
| Account | - Cost of making kelong<br>- Amount of wood used<br>- Number of barrels used<br>- Calculating the number of pulley rope windings used<br>- Calculating anchor weight | - Before making a floating kelong, we calculate the cost of making it<br>- Counting the amount of wood used. For example, the abundance of Sengkang wood, penti wood, and other wood<br>- Calculate the number of barrels to be used, where the barrels used ad next to the kana and left of the floating kelong<br>- Before using the anchor, we must calculate the weight first because if the anchor is lighter, the net will be carried away by sea currents | - The concept of addition, enumeration |
| Measurement | - Measure the dimensions of Length, width, and thickness *of floating kelongs* using non-standard units (fathoms) and express the results in eye units<br>- Measuring the Length of the rope | - Measuring the Length of the wood to be used in making floating kelongs<br>- Measuring the Length of the rope to be used for the catastrophic | - Length Measurement Concept |

| | | | |
|---|---|---|---|
| Comparison | - Comparison of the number of barrels<br>- Comparison of ballast with net | - Compare the number of barrels on the right and left. The comparison is that 30:30 is simplified to 1:1, because the ratio of the right and left barrels affects the buoyancy force of a kelong. If the barrel used is 1:2, one part of the barrel will sink<br>- Comparing the weight of the stone with the weight of the net, because if the stone is heavier, then he will carry the net to the sea | - Comparative concept |

Based on the table above, researchers describe the floating kelongs with several findings detailed as floows:

**Kelong Making**

**a. Wood Selection**

The selection of wood types for structural building material purposes is based on consideration of properties such as durability, strength, density, and moisture of wood. The defects, as well as the ease of formation of wood, are also factors to consider (Paputungan et al., 2022). This field research is based on interviews with kelong manufacturing experts who have carefully selected the type of wood used. They consider two main factors, buoyancy and wood strength, to ensure that the selected wood meets the technical requirements required in kelong making. The ethnomathematical approach also recognizes variations in the way mathematics is conducted in community activities. The application of mathematical concepts includes grouping, calculating, measuring, designing buildings or tools, games, and various other activities, according to West Sulawesi, n.d. (2020) (Zahroh Umy, 2018).

First, consider the buoyancy of the wood used. Buoyancy is the ability of an object to float on the surface of water. In making kelong, choosing the type of wood with enough buoyancy to support the kelong structure and the load that will be placed on it is important. In interviews, it was explained that they had chosen the type of wood that had optimal buoyancy to ensure that the kelong could float stably on water. Next, consider the strength of the wood used. Wood strength is the ability of wood to withstand pressure, pull, and other loads. In manufacturing kelongs, the wood used must have sufficient strength to withstand the pressure of water, waves, and loads placed on it. Selection of wood types with optimal strength to meet technical requirements in making kelong.

In addition, in making kelong, we must buy wood in the Lingga area. This is because wood suitable for making kelong is rarely found in the Bintan area. Because the wood available in the Lingga area has better quality and is more in line with the technical requirements of making kelong. Overall, field research shows that making kelong requires a careful selection of wood types, considering the wood's buoyancy and strength. Thus, purchasing wood in the Lingga area is the right choice to meet the technical requirements in making kelong, considering the availability of suitable wood in the Bintan area which is increasingly rarely found

**b. Dimension Calculation**

Mathematical concepts are necessary to ensure that the kelong has an optimal structure. Examples in using available tools, such as hammerheads, to measure the necessary parts of wood. In the context of measurement, concepts such as reflection, translation, and congruence of flat shapes are related. For example, such concepts can be applied in measuring the distance between two boards on a kelong. The concept of reflection can be used to understand how a board located on one side of the kelong can reflect the board's position on the other. The concept of translation can be used to understand how a board can be shifted or moved in a cladd. The concept of flat build congruence can be used to compare and determine whether two boards are the same size or congruent. By understanding these concepts, measurements of the distance between the boards on the kelong can be done better and more accurately.

In applying mathematical concepts to calculate the wood dimensions needed to make kelong, the resource person considered the desired stability and strength factors in the kelong structure. On the principles of geometry and mathematical calculations to determine the right size and proportions for each piece of wood to be used. For example, calculating the Length, width, and thickness of wood required based on the load to be borne by the kelong can be seen in Figure 1.

In making kelongs, the resource person uses available tools, such as hammerheads, to measure the distance between wooden parts. The hammerhead is used as a simple but effective measuring device. Using a hammerhead head, fishermen can measure the Length and width of wood with sufficient accuracy. They can also use hammerhead to measure the thickness of wood by comparing it to the standard size they have predetermined.

Interviewees rely on the experience and knowledge they have gained from previous generations. They have observed and learned from experience in kelong making for many years. This allows them to develop a deep intuition and understanding of selecting and measuring wood appropriately to achieve the desired stability and strength in kelong.

Overall, the results of this field research show that fishermen are actively involved in calculating wood dimensions for kelong making using mathematical concepts and simple tools such as hammerheads. They ensure that the kelong has an optimal structure, considering the desired stability and strength. The experience and knowledge they gained from previous generations also played an important role in this process.

**Compilation Technique or Kelong Structure**
**a. Application of Geometry**

In the process of utilizing wood material on floating kelongs, it is noticed that the wood used to manufacture ship walls and floors requires a large amount of wood material. The use of geometric concepts in compiling kelong structures is very necessary. Especially in selecting angles and patterns of wood arrangement that involve understanding mathematics to achieve an even weight distribution. Here is an example of using the concept of geometry in the kelong (Paputungan et al., 2022)

1. The main part of Kelong is block-shaped: the concept of geometry is used to select the optimal angle and pattern of wood arrangement. Taking into account the right angles ensures the stability and strength of the kelong structure. A mathematical understanding of angles and weight distribution is necessary in determining the proper position and orientation for each piece of wood.
2. The roof of the kelong house is in the form of a prism: On the roof of the kelong house, using the concept of prism in composing the structure. In considering the optimal shape of the prism to achieve the desired stability and strength. A mathematical understanding of prisms helps them determine the exact dimensions and angles for each section of the kelong roof. On Figure 3
3. Ball shape on the ballast part of the net: the use of the ball concept in choosing the ballast stone of the net. They consider the optimal shape of the ball to achieve even weight distribution. A mathematical understanding of the ball helps them determine the size and amount of ballast stones needed to keep the net stable in the water.
4. Shape tube on barrel to float kelong: In this section, use the tube concept in selecting barrel

to float kelong. Considering the tube's optimal shape to achieve buoyancy, a mathematical understanding of the tube is required, which can help determine the size and number of barrels required to keep the kelong afloat steadily.

5. Square on the shape of the kelong area: In this section, the square concept is used to calculate the area of the kelong, taking into account the optimal size and dimensions of the square to achieve the desired area. A mathematical understanding of squares helps them calculate the surface area of kelongs accurately.
6. Cube in kelong house: In the kelong house section, the cube concept is used to structure the structure, considering the optimal cube shape to achieve the desired stability and strength. A mathematical understanding of the cube helps them determine the exact dimensions and angles for each part of the kelong house.

Overall, kelong making uses geometric concepts and mathematical understanding in compiling kelong structures. In considering the optimal angle, pattern and shape to achieve the stability, strength, weight distribution and buoyancy required to manufacture kelongs.

**b. Stability Optimization**

A mathematical concept to calculate the strength of the net required in maintaining the balance of the kelong shape. They can consider factors such as the load borne by the net, water pressure, and other external forces. This calculation uses physical and mathematical principles, such as Hooke's law and the principles of stress and strain, to determine the exact thickness for the net used.

The barrel serves as a support and balancer to keep the kelong stable on the water. In this case, mathematical concepts are used to calculate the buoyancy required to keep the kelong afloat steadily. It can be done by considering the weight of the kelong and the number of barrels; using the principles of physics and mathematics, they can determine the required number of barrels and take into account possible damage or leaks in the barrels that can affect the balance of the kelong. In case of repair or leaking or damaged barrels, they can be replaced, taking into account the many damaged barrels and lost buoyancy. Using precise mathematical calculations, they determined the size and thickness of the new barrel to maintain kelong balance.

Research in this field can involve empirical data collection, measurement, and mathematical analysis to produce findings that can be applied in kelong-making and rearing practices

**Mathematical Concepts in Kelong Form**

**a. Application of Proportions and Comparisons**

An understanding of the concepts of proportion and comparison is needed in designing the shape of the kelong. One example of applying the concept of proportion is using ballast stones on all four sides of the net. In kelong design, fishing communities understand that nets must reach the seabed in order to catch fish effectively. Therefore, proportion calculations are used to determine the amount and size of ballast stones needed for the net to reach the seabed properly. Using proper mathematical calculations, they can ensure that the nets remain tense and effective in catching fish.

Fishing communities use lamps as a lure. Because fish tend to gather around light sources, such as lights, this attracts plankton and other small organisms that fish feed on. In this case, knowledge of the concept of proportion is used to determine the optimal number and location of lamps in the kelong. The use of lamps as a lure can increase the efficiency and catchability of their kelong.

The results show a good understanding of the concepts of proportion and comparison in designing the shape of the kelong. Interviewees use mathematical calculations to ensure sustainability and efficient capture in their kelong. Understanding this concept allows them to design effective kelongs and increase their fish catch.

**b. Net Strength Calculation Comparisons**

In applying mathematical concepts in calculating net strength to reach the seabed. One method fishermen use is the Length of the depa to calculate the Length of wood and net needed. The net system used consists of a net, upper rope, lower rope, buoy, and ballast and has a construction involving the net body. This mesh body is formed from a combination of mesh links, which can be assembled with or without knots, either manually or using factory machinery. The net is made of Monofilament or Multifilament material. Based on research in Panipahan Upstream, fishermen tend to use nets produced manually or in a factory with a white Monofilament nylon base material (Maulana et al., n.d.)

Length of fathoms is a unit of Length, where one fathom is equivalent to 6 feet or about 1.8 meters. In calculating the Length of the net and wood, fishermen can use the Length of the fathom as a unit of measurement to determine the Length of the net needed for the net to reach the seabed properly. Mathematical concepts in the calculation of net thickness use physical and mathematical principles, such as Hooke's law and the principles of stress and strain, to determine the exact thickness for the net used. taking into account the load borne by the net, water pressure, and other external forces that can affect the strength of the net. Using precise mathematical calculations, determine the net thickness adequate to reach the seafloor and catch fish effectively.

The results of this study can provide insight into how fishermen apply mathematical concepts in calculating net strength, including thickness and Length, to reach the seafloor. Using precise mathematical calculations, they can design strong nets and effectively catch fish. However, for more information on the latest research results, it is advisable to refer to scientific publications, journals, or sumber of relevant information in this field.

## IV. Conclusion

From the above research, it can be concluded that the activity of observing and identifying mathematical aspects involved in the design (shape) of kelong, such as wood construction, installation of nets, the use of tools such as pulleys, barrels, and ropes, as well as the application of geometry and measurement principles in the manufacturing process.

Ethnographic studies of the design and shape of floating kelongs using traditional measuring instruments found that applying local knowledge and traditional wisdom plays an important role in developing kelong structures. Traditional measuring instruments such as depa function as measuring instruments and reflect cultural heritage and local wisdom in understanding marine ecosystems and fish behavior.

The study concluded that floating kelong designs based on traditional wisdom can combine aspects of function, durability, and environmental sustainability. The use of depa in measurement bridges genetic knowledge and modern technology in developing kelong. These results provide a deeper understanding of Chelon's structural adaptation to the dynamic marine environment. Thus, this research can preserve and utilize local knowledge for fishing technology innovation to produce Keron designs that are technically efficient and harmoniously integrated with the environment and life of fishing villages.

The measurement process carried out is by measuring the dimensions of the Length, width, and thickness of floating kelongs using non-standard units (fathoms) and expressing the results in eye units - Measuring the Length of the rope, Measuring the Length of the wood to be used in making floating kelongs - Measuring the Length of the rope to be used for pulleys, by comparing the number of barrels on the right and left. The ratio is 1:1 because the ratio of the right and left barrels affects the buoyancy force of a kelong. If the barrel used is 1:2, one part of the kelong will sink. Comparison concept Comparing the weight of the stone with the weight of the net because if the stone is heavier, then he will carry the net up to the sea

There is an analysis of a domain, taxonomy, componential and cultural themes in floating kelong research thatresearchers have carried out to produce conclusions in floating kelong research, such as the use of mathematical concepts in certain cultures and societies, such as the use of addition and subtraction in calculating the amount of wood used or the number of barrels used in floating kelong. Making floating kelongs using basic mathematics, especially addition and subtraction operations, can be used to calculate the amount of wood used to construct floating kelongs and the number of barrels applied. Taxonomy is also applied to analyze and categorize certain elements in research, concerned with understanding how the components of floating kelong are classified or organized. The role of mathematics in identifying and calculating pesky components (materials that bring good luck or maintain security) used in floating kelongs. Ethnomathematics can also involve understanding the cultural themes underlying the use of mathematics in everyday life, such as how mathematical concepts are integrated with cultural beliefs and practices in the construction of floating kelongs.

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