[1]Nor Suraya Aini Ngah
[1]Ramly Hasan
[2]T.A.T. Mohd
[3]Nor Syamaliah Ngah
[4]C. M. Azmi Ngah

Traditional Maritime Technology: A Boatbuilder's Perspective on the Classification of Terengganu's Sea and Riverine *Perahu*

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Abstract: - Terengganu's rich maritime history has led to the development of various watercraft designs, with local researchers extensively studying the history, types, and decoration of traditional boats, known as *perahu*. However, the classification of *perahu* based on their specific usage remains underexplored. Given the scarcity of written records on Terengganu's traditional *perahu*, this study combines interviews and observations to gather essential data. In line with the Sustainable Development Goal (SDG) 11.4, which focuses on the need to protect and preserve the world's cultural and natural heritage, the study aims to contribute to existing research by focusing on the classification of Terengganu's traditional *perahu* according to their construction methods and specific river and sea applications. This study refers sea perahu as both; coastal and seaworthy. Adopting a qualitative approach, the research observes 15 traditional *perahu* and one prototype housed at the Terengganu State Museum, while one type is only represented through verbal accounts and is excluded. Interviews with 4 experienced boatbuilders in Kuala Terengganu provide additional insights into the features of riverine and sea *perahu*. The study finds that, of the 16 types of *perahu* examined, five were designed for river navigation, while 11 were intended for the sea. The data were presented to the Maritime Unit at the Terengganu State Museum for validation. The variety of *perahu* in Terengganu is largely influenced by the region's geography, featuring both rivers and vast coastlines. These findings open avenues for further research into the evolution of Terengganu's traditional *perahu*.

Keywords: Malay Traditional watercraft, Malay Heritage, Terengganu traditional *perahu*, sea *perahu*, riverine *perahu*.

I. INTRODUCTION

Terengganu is located along the South China Sea, was home to Syahbandar, a key maritime port during its peak Maritim [1]. As noted by Mohd Yusof [2], it is unsurprising that Terengganu has achieved excellence in boatbuilding and design. Historically, the region was also connected by rivers, from Kuala Berang to Kuala Terengganu, and from Kemaman to Kuala Besut. Given the necessity of water transport dating back hundreds, if not thousands, of years, various types of watercraft, known as *Perahu*, were developed to meet the demands of daily life.

Water transportation in Terengganu played a critical role in connecting places, such as from Seberang Takir to Bandar Kuala Terengganu. Before the Sultan Mahmud Bridge was constructed, the bot *penambang* was the go-to option for such trips. From the 1960s to the 1970s, ferries were commonly used to travel to Kuala Lumpur. Nine ferry systems operated across different districts, enabling the movement of people and goods Fauzi [3]. This highlights the deep-rooted connection between Terengganu and water transportation. Sadly, no ferries have been preserved as historical artifacts for future generations to appreciate.

Unfortunately, like the ferries, many traditional *Perahu* have disappeared over time [4]. Some exist only in old photographs, while others survive as prototypes. Tragically, certain types, like the *Perahu* Keci, are known only through the memories of elders, with no physical evidence left behind. Recently, Rozita Che Rodi [5] highlighted that two major types of Malay sea-going ships; Jongs and the Galleys; have vanished from history, primarily due to their declining utility. The vanishing of maritime heritage, particularly traditional watercraft, does not occur only in Malaysia. Horridge [6] observed that such losses have been ongoing also in Indonesia. This implies that the traditional *perahu* risks being dismissed as myth or folklore.

Hence, this study aims to preserve and share the technology of Terengganu's maritime heritage by providing valuable insights into the traditional boat designs of the region. This study aims to highlight the various types of traditional *perahu* in Terengganu, classify them based on their construction methods, and categorize them according

[1]*Corresponding author: Faculty of Architecture and Ekistics, Universiti Malaysia Kelantan, Kampus Bachok, Beg Berkunci 01, 16300 Bachok, Kelantan, Malaysia. Email: cloudciksu@gmail.com
[2]Politeknik Ungku Omar, Jalan Raja Musa Mahadi, 31400 Ipoh, Perak, Malaysia.
[3]Faculty of Administrative Science & Policy Studies, UiTM Negeri Sembilan, Malaysia.
[4]Lembaga Muzium Negeri Terengganu, 20566 Bukit Losong, Terengganu, Malaysia.

to their specific uses in sea and river environments. It is a resource for researchers, historians, and those interested in safeguarding Terengganu's cultural legacy, contributing to a greater appreciation of its unique maritime identity.

II. LITERATURE REVIEWS

A. Riverine and Sea Boats

Fauvelle, Sasaki [7] highlighted the adaptability of traditional boat designs to their respective environments by contrasting the features of riverine and sea boats in Goa. Fauvelle, Sasaki [7]et al. further described, riverine boats in Goa are typically smaller and designed for narrow rivers and shallow waters. Their U-shaped midsection and V-shaped bow and stern improve maneuverability, while traditional sewn-plank or log boat techniques dominate their construction. These boats often feature decked areas at the bow and stern with an open central section for transporting cargo. In contrast, Rozita Che Rodi [5]and Kimura [8] observed that Chinese riverine boats are flat-bottomed with blunt bows and sterns, prioritizing stability in calm river conditions. These features make them suitable for riverine use and limited coastal navigation. Despite differences in hull design, both Goan and Chinese boats are primarily propelled by poles or paddles, though they occasionally incorporate sails for added versatility.

Sea boats in Goa and China exhibit distinct features that reflect their adaptation to maritime environments and their respective cultural and geographical contexts. Both regions illustrate evolution from riverine to sea designs in addressing the demands of the sea [7, 8]. According to Fauvelle, Sasaki [7] in Goa, sea boats are larger and sturdier, with sharp bows designed to cut through waves and tall structures to withstand high seas. These boats incorporate keels and use strong fastening techniques, such as nailed planking, to enhance durability. Reinforcements like iron rods and strengthened ribs are also common features. Propulsion primarily relies on sails for long voyages, supplemented by rudders for better control. Goan sea boats were primarily used for fishing, trade, and cargo transportation along coastal and open sea routes, highlighting their exclusivity to maritime applications. Their larger size allowed them to carry heavier loads and accommodate more crew members, aligning with the region's focus on coastal trade and fishing.

In contrast, Rozita Che Rodi [5] and Kimura [8] noted that Chinese sea boats incorporated advanced construction features such as bulkheads and reinforced hulls, enhancing durability and enabling navigation in open waters. While sails remained the primary mode of propulsion, versatile vessels like the *sha-chuan* (sand ships) demonstrated adaptability, serving both riverine and coastal purposes. Similarly, Amer, Barr [9] highlighted that in California, flat-bottomed, transom-sterned ship hulls of conventional European design were specifically constructed for both local riverine navigation and short coastal travel. These boats were tailored to suit their environments, further illustrating how ship designs often bridged multiple functions and contexts.

B. Early Records of Terengganu Traditional Perahu

Currently, there is limited published material on *Perahu*. Most existing literature has centered on the various types of traditional *Perahu* that have existed over time. Wallace [10], Alfred Alfred [11] identified twelve types of boats used by coastal fishermen in Pahang, while Firth [12] noted that coastal fishermen in Kelantan and Terengganu utilized nine distinct types. Other researchers, such as Gibson [13], Gibson [14], Burdon, Parry [15],Ismail Ismail and Muhamad [16] and Mohd Yusof [2], have also conducted studies on boats from the East Coast of Peninsular Malaysia. Later studies by Wahab and Bahauddin [17], Ramli Wahab and Ramli [18]et al. (2018) focused on the ornamentation and philosophical aspects of traditional *Perahu* in Terengganu. Additionally, researchers such as Maidin [19], Maidin [20] Longuet [21] and Abd Wahab Abd Wahab, Bahri [22]explored the boatbuilding teams and construction processes. However, these studies did not specifically address the classification of *Perahu* based on their construction methods and application in rivers versus the sea.

C. Perahu within the Context of Terengganu

Perahu, as described by Fraser [23] is a generic Malay term that refers to traditional native boats or vessels, sometimes including houseboats. In the context of Terengganu, *perahu* specifically denotes traditional Malay watercraft that are built using time-honored techniques and operated with oars, sails, and/or a rudder [2, 19, 24]. Any traditional Malay watercraft that uses an engine for propulsion is categorized as a boat. While Gibson [13], Gibson [14] and Horridge [6] referred to all traditional vessels as boats rather than *perahu*, Fraser [23]noted that

the term *perahu*, in its various spellings, is commonly used throughout Southeast Asia and the western Pacific. Other variations include prahu, perau, pairau, paro(e), prau(h), praw(e), and prau.

For centuries, Terengganu has been a key player in international trade, with water transportation serving as the primary means of travel. According to Mohd Yusof [2], three significant ports were established in Terengganu as early as the 2nd century: *Kole* (Kemaman), *Perimula* (Kuala Terengganu), and Kua Dun *Kun* (Kuala Dungun). Additionally, Shafie [25] noted that Kuala Berang, referred to as Fo-lo-an in Chinese historical records, was a prominent international trade hub during the 7th and 8th centuries. These historical accounts provide strong evidence of Terengganu's active engagement in maritime activities.

Gibson [13]characterized the *Perahu* from the east coast as being more robust than those found in other regions of Malaya. He noted that these boats are constructed using carvel methods without seam ribbands or stringers, featuring pointed bows and sterns, equal ends, and a distinct yet shallow keel. He concluded that these local *perahu* are built by Malays for Malays and reflect natural preferences in their decoration and design. The boats are predominantly made of chengal, with the exception of the pegs and decorative elements (Gibson-Hill 1954). Each boat is easily recognizable [13]by its *linggi* (stem and stern post) [2, 26, 27].

D. Geographical aspects of Terengganu

Terengganu is located along the coast facing the South China Sea. The presence of Syahbandar, a significant and active port in its prime Sabri [4], underscores the remarkable advancements in boat building and design achieved in Terengganu. This state is positioned on the eastern coast of Peninsular Malaysia and consists of eight districts: Besut, Setiu, Kuala Nerus, Kuala Terengganu, Marang, Dungun, Kemaman, and Kuala Berang. It shares its northern and northwestern borders with Kelantan and its southern and southwestern borders with Pahang.

Terengganu is characterized by its distinctive geographical features, which include a network of rivers and expansive sandy beaches. According to TREVICOSTA [28], the state is home to 25 rivers and 14 sandy beaches. Furthermore, Terengganu [29]notes that its sandy coastline extends 225 km from Besut to Kemaman. This unique geographical environment has played a significant role in the development of various *perahu* designs tailored for both river and sea conditions.

The local marine industry is significantly influenced by geographical factors and weather patterns. Smyth [30] and Gibson (1949, 1954) emphasized the differences between the east coast and other areas of Peninsular Malaysia, particularly concerning the closed and open fishing seasons. Gibson [14]elaborated that the northeast monsoon (*musim tutup kuala*/shut season) and the coastal formations have allowed local fishermen to dominate the coastal traffic. Additionally, Abd Wahab, Bahri [22]highlighted how the unique culture of Terengganu has contributed to the development of superior *perahu*, designed to be more robust and comfortable.

E. Traditional Sea and Riverine Perahu

In a wider scope, Rozita Che Rodi [5] listed 6 types of Malay small size perahu for coastal and riverine activities namely i) *Kolek* or *Golek*, ii) *Baluk*, iii) *Jalur*, iv) *Kajangan/Setok*, v) *Kakap* and vi) *Sekoci*. In a more specific context, Gibson [13] and Mohd Yusof [2]indirectly classified traditional perahu into sea and river perahu. The information provided, nevertheless, could be contradictory. The Table 1 below summarizes the findings from both researchers' analyses.

Table 1: Classification of traditional perahu from literature

Gibson [13]		**Mohd Yusof [2]**	
River *perahu*	**Sea *perahu***	**Riverine *perahu***	**Sea *perahu***
Kolek Pengayer	*Perahu Payang*	Perahu Jalur	*Perahu Jongkong*
Jalorar	*Perahu Buatan Barat (Payang Barat)*	Setak	*Kolek Lincang*
	Kolek Lichang	Kajangan	*Kolek Kuel*
	Kolek Gelibat	Perahu Hulu	*Perahu Payang*

	Sekochi	Kolek Pengayer	*Perahu Payang Barat*
	Bedar	Perahu Bedar	*Kolek Gelibat*
Kolek kueh	*Kolek kueh*	Perahu Jalural	*Perahu Sekoci*
		Perahu Haluan Katup	*Perahu Besar*

The variations in the spelling of *perahu* names can be traced back to the differences in time and location between the two researchers. Gibson [13] identified eight types of traditional *perahu* from the east coast, specifically including wooden plank *perahu*, locally referred to as *perahu* timbal. Later, Mohd Yusof [2] recognized 16 types of traditional *perahu*; however, not all of these pertain to Terengganu traditional *perahu*, which is the primary focus of this research. *Perahu Hulu* is excluded from this study as it is not found in the research area.

III. Problem Statement

The use of traditional Malay boats among fishermen is gradually diminishing due to various factors, , as discussed by Wahab and Ramli [18]. These include the effects of modernization, difficulties in obtaining timber resources, and the rising costs associated with boat construction Fauzi [3]. As a result, there has been a marked decline in the demand for traditional boat building, leading to reduced income for local artisans. Currently, traditional Malay boats are rarely seen in use by fishermen, with some exceptions in specific regions of Kelantan and Terengganu, as highlighted by [18]. In light of this trend, this study aims to investigate and preserve the traditional technology of the Malay ancestors. This effort aligns with Baba [31] who called for a comprehensive examination of traditional Malay boats.

Additionally, Awani [32]emphasizes the ongoing importance of these vessels, particularly in Terengganu, where they have proven to be crucial during rescue operations in major flooding events. Their strength and stability are vital for navigating turbulent waters filled with debris, enabling the evacuation and rescue of flood victims. In line with that, Maidin [19]and Longuet [21]have recommended documenting Terengganu's traditional *perahu* while they are still in existence. Therefore, this study aims to enhance the understanding of Terengganu's traditional *perahu* by adding to the data on riverine and sea *perahu* previously provided by [15] and [2]; but from perspectives of local boatbuilders. As pointed out, creating a Gibson [14]comprehensive list of Malay native boats is a challenging task, therefore, the findings of this research will help fill knowledge gaps and contribute to a deeper understanding of the wisdom of Malay ancestors in developing suitable types of *perahu* for river and sea use. This study addresses the urgent need to preserve the invaluable maritime traditions and cultural heritage embedded in Malay culture, particularly in Terengganu, while also conveying the importance of these traditional boats to future generations.

IV. Research Methodology

The scarcity of written records on this topic has resulted in fragmented and dispersed information. Thus, it is essential to foster collaboration among higher education institutions, such as the Kementerian Pengajian Tinggi, Universiti Malaysia Kelantan, Universiti Teknologi Mara Seremban, and Politeknik Ungku Omar, as well as the government agency Terengganu State Museum to collect relevant data. This effort aligns with Sustainable Development Goal 11.4, which focuses on enhancing the protection and preservation of cultural and natural heritage, and Sustainable Development Goal 17, which underscores the importance of cooperation among various institutions.

The study employs a qualitative approach, collecting data through observations and open-ended interviews with four experienced boatbuilders from Pulau Duyong and Pulau Ketam in Kuala Terengganu. Observations on 16 samples; 16 perahu and 1 prototypes; to observe the features of samples. The collected data were analyzed using Atlas.Ti 24 to fulfill the study's objective of identifying the various types of Terengganu traditional *perahu* and classifying them based on their construction and use in river and sea environments. The sea environment in this study refers to both seaworthy and coastal. To ensure the reliability and validity of the findings, the final data was presented to the Maritime Unit of the Terengganu State Museum for validation.

V. Result and Discussion

A. Types of Terengganu Traditional Perahu based on construction methods

A total of 15 types of traditional *perahu* are on display, along with one prototype and one *perahu* with no physical remains, the *Perahu Keci*. The findings of this study identify 17 distinct types of traditional *perahu* in Terengganu. In addition to this local traditional *perahu*, the *Perahu Sekoci Siam* is also showcased in the museum yard. This specific perahu is excluded from the traditional Terengganu *perahu* collection, as it was a gift from King Rama V of Siam to Sultan Zainal Abidin III (1881-1918) and was not constructed locally. Moreover, its clinker-built design differs from the customary carvel construction method traditionally practiced in Terengganu boatbuilding.

Therefore, the total number of Terengganu traditional *perahu* stands at 17, as detailed in Table 2.

Table 2: Types and Dimension of Terengganu Traditional Perahu

No.	**Picture (Source: Terengganu State Museum, Photographic Unit)**	**Types**	**No.**	**Picture (Source: Terengganu State Museum, Photographic Unit)**	**Types**
1.		Bark boat	2.		*Perahu* Jalur
3.		*Perahu* Jongkong	4.		*Perahu* setak/ *perahu* haluan katup Closed bow boat
5.		*Perahu* Kajangan Roofed boat	6.		*Perahu* Kolek Kuel
7.		*Perahu* Kolek Lincang/ Kolek Tangkul Lincang' dinghy boat	8.		*Perahu* Kolek Gelibat Missing dinghy boat
9.		*Perahu* Payang Dragnet Boat	10.		*Perahu* Payang Barat Dragnet Boat
11.		*Perahu* Sekoci Sloop boat	12.		Sampan *Perahu Besar* *Perahu* Besar Life Saving Boat

13.		*Perahu Jalural*	14.		*Perahu Bedar*
15.		*Perahu Kolek Pengair*	16.	Not applicable	*Perahu Keci* No information on its dimension. However the record has shown that it voyaged through the ocean to Penang Island as ordered by Sultan Mansur ([2] Known as *Perahu* Kichi (Smyth 1902)
17.		*Perahu Besar Terengganu*			

In local practice, the length is defined as the measurement of the keel or *lunas* [2, 19, 21, 26, 33], while the width is determined at the amidship of the *perahu*, and the height is measured from the amidship of the *lunas* to the hull of the *perahu*, as shown in Fig. 1.

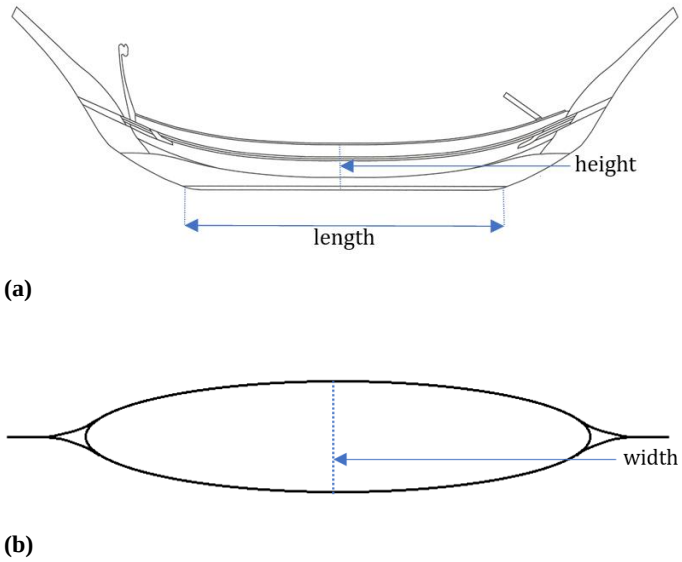

Figure 1: Dimension of perahu based on (a) Elevation; (b) Plan view

While there has been some different views regarding the differences between the *Perahu Setak* and *Perahu Haluan Katup* [2] observations indicate that they are essentially the same type of boat, with variations only in the size of the duck's bill ornamentation on the *linggi* (stem head). Rozita Che Rodi [5]grouped *Kajangan* and *Setok* as a single entity; however, in the Terengganu context, they are classified as two distinct types. This discrepancy may arise from the researcher's focus on Malay *perahu* across the broader Malay Peninsula rather than specifically on Terengganu, which could explain the differing perspectives. This finding is corroborated by interviews with all respondents; who are experienced boatbuilders. Additionally, *Perahu Keci* is excluded from this study's sample due to the insufficient available records and sources, as well as the absence of physical remains.

Through observations, it has been determined that all traditional Terengganu *perahu* can be categorized into three types: (i) *perahu kulit* (bark boat), (ii) dug-out, and (iii) *perahu timbal* (planks boat). These findings also support Gibson [13] claims that East Coast planks boats are carvel-built without seam ribbands or stringers, featuring pointed bows and sterns, equal ends, and a distinct but shallow keel. He further noted that these boats are constructed entirely from chengal wood, with pegs and decorations made from *penaga* wood [2, 34] or *penaga laut (Calophyllum inophyllum)*, as mentioned by Gibson [13] (1954). Each boat can be easily identified by its *linggi* (stem, stem head, and stern) [24, 26]. However, these observations primarily pertain to *perahu timbal* or wood plank *perahu* and exclude bark boats or dug-out canoes (*perahu jalur* and *perahu jongkong*), which planks and *linggi* are absent.

B. Riverine Perahu

Perahu for river transportation is different from boats for the ocean transportation. The features as different so as to cater different nature of both places. As travelling along the river, our forefathers had to consider a few aspects of nature such as timing for high and low tide. This is in line with the discussion by earlier researchers such as Smyth [30], Burdon, Parry [15] and Gibson [14], and Gibson [13] who highlighted the local population's ability to understand and adapt to the local climate and nature. Burdon, Parry [15],Gibson [13] further emphasized that this understanding allowed the local maritime industry to be dominated by the locals, in contrast to the west coast of the peninsula, which was influenced by Chinese boat designs.

River *perahu* were characterized by specific features identified through observations and interviews. All respondents highlighted four primary characteristics of river *perahu* emerged: shallow decking (low hull), a narrow shape when viewed from above (V shaped), the use of oars for propulsion, and infrequent use of sails. Notably, both the *Perahu Jalorar* and *Haluan Katup* have a *lesung* (mast step), suggesting that these river *perahu* can also utilize sails. This observation aligns with the illustration of *Perahu Jalorar* in Gibson [13]and the photograph of *Haluan Katup* in Mohd Yusof [2]. However, no *lesung* was observed on *Perahu Kulit*, *Perahu Jalur*, and *Perahu Kajangan*. The interviews uncovered that sails are seldom employed. This suggests that these boats primarily rely on oars for movement.

The operation of riverine *perahu* is influenced by tidal conditions, which determine the appropriate times for traveling upstream or downstream, aided by the use of oars. From the 16 samples of Terengganu Traditional *Perahu*, interviews revealed that only five qualify as river *perahu*. A summary of these river *perahu* and their propulsion methods is presented in Table 3 below.

Table 3: Propelling components of the traditional riverine perahu

No.	River *perahu*	Oars	Sail	Rudder
1	*Perahu Kulit* (Barkboat)	/	*X*	*X*
2	*Perahu Jalur* (Dugout canoe)	/	*X*	*X*
3	*Perahu Jalural*	/	/	/
4	*Perahu Haluan Katup/ Setak* (Closed Bow Boat)	/	/	/
5	*Perahu Kajangan* (Roofed Boat)	/	*X*	*X*

C. Features of Sea Perahu

As humans are always full of curiosity, they started to explore the ocean [35, 36].All respondents noted that, unlike the river, the ocean is a wide-open space with wavy water that is more challenging as compared to the river. Traditional Watercrafts on the ocean depends on the wind to move and rudder to tackle the wavy water. Based on observation and interviews, among 16 types of sample *Perahu*, 11 types of that are categorised as sea *perahu*.

Sea *Perahu* can be divided into 2 categories that also sign the evolution of. The categories are: dug out and *Perahu Timbal* (wood plank boat). Among those, *Perahu Jongkong* is only one categorized as dug out *perahu*. It is believed that this was the first *perahu* invented to explore the ocean with one sail and without rudder.

Sea *perahu* hold certain features unlike riverine *perahu*. All respondents highlighted that features of sea *perahu* can be summarized as; deep decking (high hull), wider in shape (wider V shape), rely on oars and sails to move and using rudder to steer. However, *Perahu Besar* is the only type that does not use any oars, instead it relies on sails n stern rudder to move and propel. Then, among Terengganu Traditional *Perahu*, 11 of them have been identified as sea *perahu* as presented in Table 4 below.

Table 4: Propelling components of traditional sea perahu

No.	Sea *perahu*	Oars	Sail	Rudder
1	*Perahu Jongkong*	/	/	*X*
2	*Perahu Kolek Kuel*	/	/	/
3	*Perahu Kolek Lincang / Kolek Tangkul*	/	/	/
4	*Perahu Kolek Gelibat*	/	/	/
5	*Kolek Pengayer*	/	/	/
6	*Perahu Payang*	/	/	/
7	*Perahu Payang Barat*	/	/	/
8	*Perahu Sekoci*	/	/	/
9	*Sampan Perahu Besar*	/	/	/
10	*Perahu Bedar*	/	/	/
11	*Perahu Besar*	*X*	/	/

VI. DISCUSSION

The findings of this study enhance the data presented in [13] and Mohd Yusof [2] but partially contradict aspects of the literature reviews. For instance, while Document 2 classifies *haluan katup* and *setak* as distinct entities, this study uncovered that, from the boatbuilders' perspective, they are considered a single entity. These discrepancies likely arise from the differing perspectives and experiences of historians and boatbuilders. While historical classifications often emphasize usage contexts and documented practices, boatbuilders focus on design and functional adaptability.

The *perahu* of Terengganu exhibits remarkable versatility.; except for *Perahu* Besar; a schooner [14, 21] are specifically built for deep-sea voyages and lack this dual functionality. Other coastal or sea *perahu* can be used in both river and sea settings, though the riverine is not to used in coastal or sea due to safety concerns. For example; the *Kolek Pengayer*, typically employed for line fishing, is designed for coastal use but may also be used in rivers(as noted in Mohd Yusof, (2021)), especially in areas like the Kuala Terengganu River. *Perahu Payang* and *Payang Barat*, while classified as sea *perahu*, are versatile enough for both sea and river navigation. The discrepancy of data may stem from the versatility of sea *perahu*, which in during the study was carried out, it might be used as riverine *perahu*, while in other parts of Terengganu, they serve as coastal or sea *perahu*. These findings align with those of Amer, Barr [9], Kimura Kimura [8], as well as Rozita Che Rodi Rozita Che Rodi [5], who observed that coastal boats can function as riverine boats. Such versatility is attributed to the geographical features of Terengganu,

with its long coastline and interconnected rivers, as noted by TREVICOSTA [28], just as discussed by Kimura [8] that related the geographical influence on the versatility of boat usage. This versatility can also be influenced by the ability of local population in understanding an adapt to the local climate and nature as discusses by Smyth (1902), Burdon et al. (1954) and Gibson [13], Gibson [14]. The versatility may also stem from the robustness of the coastal and sea *perahu* hulls as discussed by Fauvelle, Sasaki [7], Kimura [8], Amer, Barr [9], which are designed to withstand the challenges of the open sea, making them equally capable of handling river conditions without damage. Despite their versatile usage, understanding the differences between riverine and sea *perahu* is crucial for gaining deeper insight into the principles behind their design and functionality. Preserving this knowledge is essential for future research and for passing it on to future generations.

In Terengganu, riverine boats do not feature flat bottoms which are typical in riverine boats elsewhere, such as California by Amer, Barr [9], or in China as noted by Kimura [8] and Rozita Che Rodi [5]. Terengganu riverine boats also have a narrow shape with V-shaped bows and sterns that in line with Gibson [13] who claimed that East Coast boats are featuring pointed bows and sterns, equal ends, and a distinct but shallow keel. This features consistent with Goan designs highlighted by Fauvelle, Sasaki [7] and in contrast with Chinese riverine boat as noted by Kimura [8] and Rozita Che Rodi [5].

Terengganu sea *perahu* are larger and sturdier than their riverine counterparts, with sharp bows for cutting through waves and high decks to handle rough seas. These features align with the sea boats in Goa, as noted by Fauvelle, Sasaki [7]. While both Goan and Chinese sea boats use nailed planking and iron reinforcements, Terengganu boats do not incorporate these features. Instead, they rely on dowel joints in plank joints. This is in line with Gibson [13] who claimed that East Coast carvel-built without seam ribbands or stringers. However, the propulsion system for Terengganu sea *perahu* aligns with practices observed in Goa and China, primarily relying on sails for long voyages, with rudders assisting in navigation and oars used for short-range propulsion. Nevertheless, the *Perahu Besar* is an exception, as it depends solely on sails and a stern rudder for propulsion, without the use of oars.

VII. CONCLUSION

The findings of the study can be summarized in Fig. 2 and Fig. 3 below:

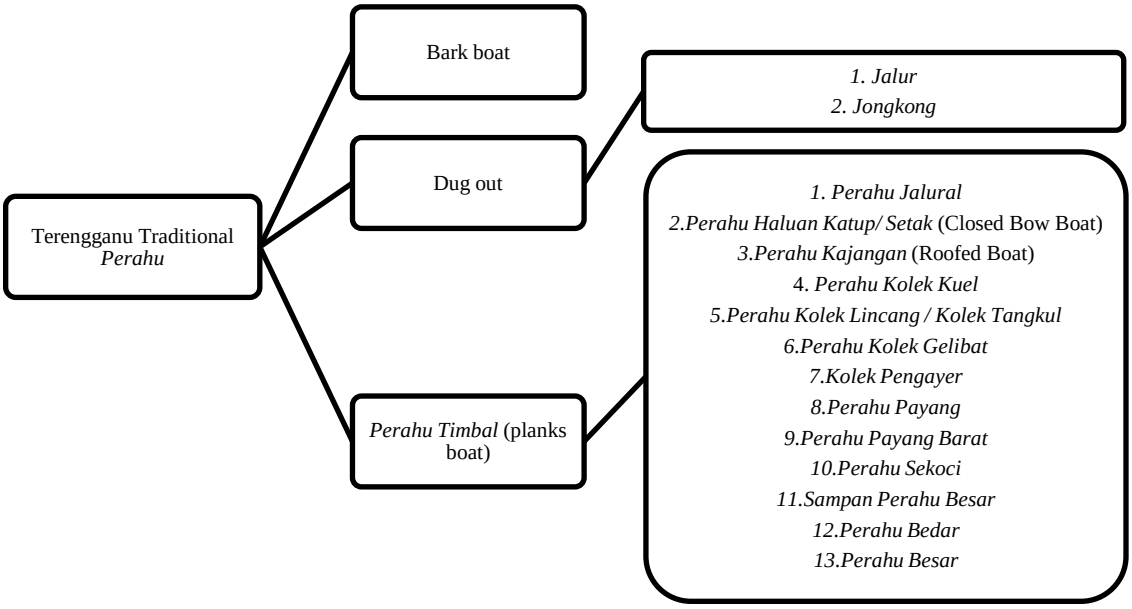

Figure 2: *Classification of Terengganu Traditional Perahu by Construction method*

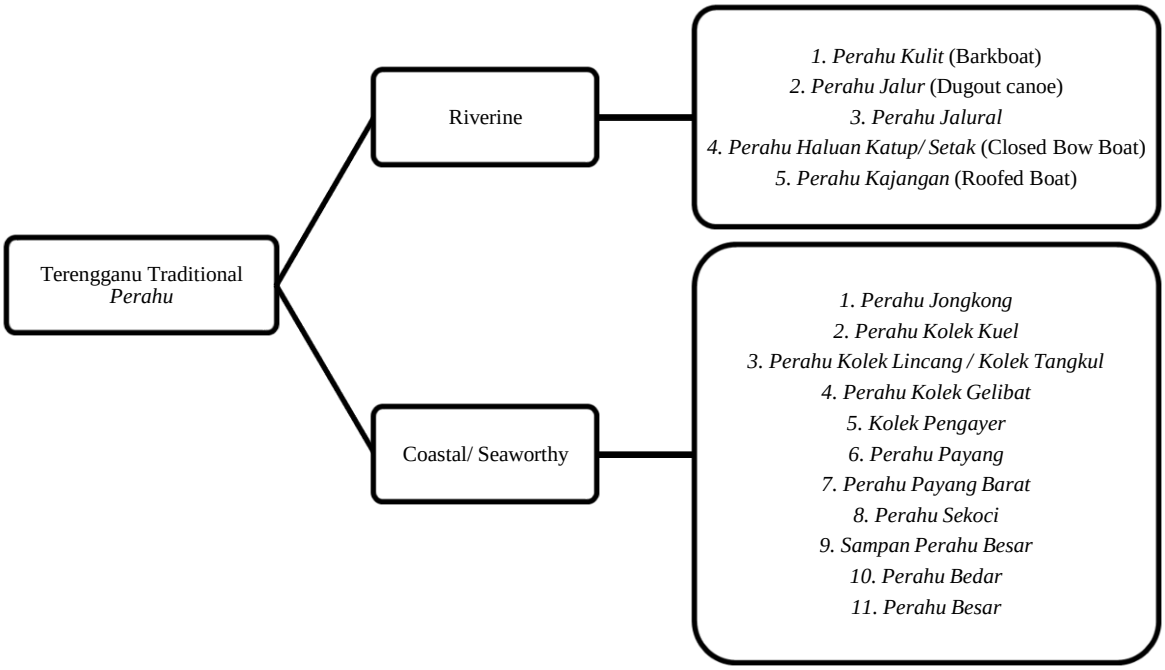

Figure 3: Classification of Terengganu Traditional Perahu by Usage

In conclusion, this paper has offered a thorough exploration of the technology and typology of Terengganu traditional *perahu* by identifying and classifying them according to their specific functions in river and sea environments from boatbuilder's perspectives. River *perahu* are distinguished by their shallow decks and streamlined shapes, designed to adapt to the dynamics of water flow and tides—enabling downstream travel during low tide and upstream navigation during high tide. Conversely, sea *perahu* are built to withstand the challenges of ocean conditions, featuring higher decks and employing oars, sails, and rudders for navigation in rough waters. Even so, sea *perahu*; except *Perahu Besar* Terengganu; can be used also as riverine *perahu* despites they are designed for sea or coastal *perahu*. Despite sharing common features with other *perahu* worldwide, the distinctive characteristics of Terengganu *perahu* lie in their unique design and construction methods. This aligns with Horridge's observation that these local *perahu* are built by Malays for Malays, reflecting their cultural preferences in both decoration and design.

The findings of this study underscore the significance of examining traditional *perahu* to gain insights into the knowledge and wisdom of our ancestors, strengthen our cultural identity, and preserve traditional maritime practices. Additionally, this research opens avenues for future studies, such as the identification of deep-sea and coastal *perahu*. Just as iconic vessels like the Titanic and contemporary giants like the Icon of The Seas are celebrated, our remarkable traditional *perahu* also merit recognition. It is essential to further investigate the history and other aspects of these boats to honor our heritage for future generations while promoting sustainable development goals (SDGs) such as safeguarding cultural heritage (SDG 11) and fostering collaborations (SDG 17) among governments, private organizations, and civil society.

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