

ASSESSING RECREATIONAL FISHERIES ALONG THE KELANTAN COASTLINE FOR ENHANCING ENVIRONMENTAL RESOURCE MANAGEMENT

Ebrahim Al-Qadami¹, Mohd Adib Mohammad Razi^{2*}, Syed Muzzamil Hussain Shah³, Mohamad Fahmi Mohamad Ideris⁴, Mahran Mahamud⁵

Abstract

Recreational fisheries play a significant role in the cultural, social, and economic fabric of many communities worldwide. Proper management and conservation efforts are crucial to ensure the long-term sustainability of this sector and its associated economic benefits. Herein, recreational fisheries along the Kelantan coastline were explored to provide an in-depth overview on this sector aiming to develop proper management strategies. A site survey was performed between March and July 2020 to collect the primary data for this study. The results showed that the highest number of anglers was recorded during the daytime of the weekends with a percentage value of 83%, compared with 17% during the weekdays. In terms of bait, live shrimp, small fish, and squids were noticed to be the most commonly used bait, while the standard fishing gear used was rod-and-line. The total recreational fishing efforts amounted to 65,287 person-days/year, where 58.6 % was shore-based angling, while 41.4% was from boat-based angling with a total economic value of RM7.5 million/year. It is believed that the presented results offer valuable insight into the recreational fisheries along the Kelantan shoreline which help to understand the current situation and improve its sustainability and economic impact.

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^{1,2}*Faculty of Civil Engineering & Built Environment, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, Malaysia.*

^{1,2}*Eco Hydrology Technology Research Centre (Eco-Hytech), Faculty of Civil Engineering & Built Environment, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, Malaysia.*

³*Interdisciplinary Research Center for Membranes and Water Security, King Fahd University of Petroleum and Minerals, Dhahran, 31261, Saudi Arabia.*

^{4,5}*Department of Irrigation and Drainage Malaysia, Coastal Division, Kuala Lumpur, Malaysia.*

***Corresponding author:**
adib@uthm.edu.my

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1.0 INTRODUCTION

Recreational fishing is the fastest-growing segment in the tourism industry, with a global annual growth rate of 5% (Patiyal & Pauline, 2023; Pita *et al.*, 2018; Zeelie, 2018). Its sustainability hinges on conservation-driven practices and the enforcement of regulations and management strategies designed to safeguard fish populations and their habitats (Soldo, 2022). Through catch-and-release, fish populations are preserved, and the overall health of ecosystems is maintained (Policansky, 2002). Regulations and management measures further prevent overfishing and ensure the long-term sustainability of fish populations which helps restore fish habitats, reduce pollution, and promote responsible angling practices (Methot Jr *et al.*, 2014). These efforts collectively contribute to minimising the

environmental impact of recreational angling and ensure the long-term viability of recreational angling while minimising its ecological footprint (Cooke *et al.*, 2016).

Recently, recreational fisheries studies play a crucial role in enhancing environmental resource management by providing valuable insights into the interactions between human activities and natural ecosystems (Arlinghaus, 2006). These studies focus on understanding the dynamics of recreational fishing activities and their impact on marine and freshwater environments, as well as identifying strategies to mitigate negative effects and promote sustainable management practices (Lewin *et al.*, 2019). Recreational fisheries studies also examine socio-economic aspects such as angler

behaviour, preferences, and spending patterns (Brown, 2016; Pita *et al.*, 2018). By understanding the motivations and preferences of recreational anglers, resource managers can create policies and regulations that effectively balance conservation goals with the needs and interests of the fishing community. Furthermore, economic analyses help quantify the value of recreational fisheries to local economies, providing policymakers with valuable information for decision-making and resource allocation (Hutt *et al.*, 2013; Toivonen *et al.*, 2004). Environmental resource management can also benefit from studies that explore the ecological impacts of recreational fishing practices. Research on habitat disturbance, bycatch, and the spread of invasive species can inform the development of regulations and management strategies aimed at minimising environmental harm.

Several studies have been conducted worldwide to investigate the recreational fisheries. For instance, Pérez-Bote and Roso (2014) conducted a survey investigating recreational fishing in rural areas of the South-Western Iberian Peninsula during the 2008-2009 fishing seasons. The survey highlighted that a significant portion of anglers engaged in fishing year-round or during the warmer months (37.43%), particularly on weekends and holidays. Shoreline fishing was the favoured method (89.47%), typically involving the use of natural bait (worms) either alone or in combination with artificial or live bait. Expenditure on equipment, permits, baits, and fuel displayed considerable variation, with some individuals spending between 100 and 300 euros per year (Pérez-Bote & Roso, 2014). Papadopoulos *et al.*, 2022 underscored the social and economic significance of marine recreational fishing in Greece. The study estimated that marine recreational fishers (MRF) constitute 7.93% of Greece's resident population, totalling an estimated 730,514 individuals. Primary fishing methods employed by MRF in Greece include shoreline fishing, boat fishing, and spearfishing. Annually, MRF in Greece undertakes approximately 11,461,765 fishing trips, resulting in a total catch of 9350 tons per year. The study advocates for meticulous planning and the implementation of a comprehensive management strategy, with a key component being the adoption of a licensing system covering all modes of marine recreational fishing (Papadopoulos *et al.*, 2022).

Malaysia has a rich history of fishing, whether for commercial purposes or leisure (Ahmad *et al.*, 2003) especially with the long coastal line the country has (Wan-Afnizan *et al.*, 2024; Yusoff *et al.*, 2024). Hoppy fishing in Malaysia took place in nearby ponds, rivers, disused mining pools, swamps, and rice fields inland, or in tidal lagoons and estuaries along the shoreline. These traditional practices have deep cultural roots and are essential to the Malaysian way of life, connecting angling to the cultural landscape of the majority of Malaysians (Abu Talib & Alias, 1997). While there is limited available data on angling in Malaysia, the activity holds strong traditional linkages and is deeply embedded in the cultural landscape of the country. The recreational fisheries along the Kelantan shoreline present an intriguing subject for investigation due to the lack of comprehensive understanding regarding the specific locations, levels of participation, and economic value associated with this activity. Identifying the gaps in

current knowledge is essential for informed management and sustainable development of recreational fisheries in the region.

This paper focuses on the need to conduct a detailed study that systematically explores and analyses the various aspects of recreational fishing along the Kelantan shoreline, aiming to provide insights into its spatial distribution, participant demographics, and economic contributions. The present work is believed to cover the lack of detailed information on recreational fishing along the Kelantan shoreline, which will have direct implications for current management practices. Without a systematic study that explores the spatial distribution, participant demographics, and economic contributions of recreational fishing, managers may struggle to allocate resources effectively, plan sustainable development, or create policies that balance economic growth with environmental conservation. Inadequate understanding of these factors could lead to inefficient regulation, missed opportunities for tourism promotion, and potential environmental degradation due to poorly managed fishing activities.

2.0 METHODOLOGY

In the present study, recreational fisheries along the Kelantan state coastal area were investigated to understand the pattern, locations, and economic value of this sector. Figure 1 shows the location of the study area which extends from Thailand's southwest border to Terengganu state north prodder with a total shoreline length of 96 km. The study area was divided into five zones, namely (i) Reach 1 which extends between Pengkalan Kubur and Pantai Sri Tujuh areas, (ii) Reach 2 which extends between Pantai Sri Tujuh and Pengkalan Datu areas, (iii) Reach 3 which extends between Pengkalan Datu and Kemasin areas, (iv) Reach 4 which extends between Kemasin and Tok Bali areas, and (v) Reach 5 which extends between Tok Bali and Besut areas. The study area was divided into these 5 reaches following the concept of management unit (MU) which refers to a specific stretch of shoreline that shares similar characteristics in terms of natural coastal processes and land use. By grouping sections of the shoreline into MUs, planners can make decisions that are more tailored to the unique needs and behaviours of each specific section, ensuring better, more coherent management practices. This approach recognises that different parts of the coast may require different management strategies based on their characteristics.

Fisheries assessment along the study area was performed based on a site survey which was conducted on 13th-16th March 2020 and 20th-24th July 2020. The survey focused on collecting data about the locations of the recreational fisheries along the coastal area, accounting average number of anglers, and estimating the economic value of this activity. In the present study, the angling was divided based on the used method which includes shore-based angling and boat-based angling.

In terms of economic value, previous studies estimated RM50 payout per person-day, however, this estimation is clearly outdated. In the present study, for shore-based angling, RM100/day/anglers was estimated, while, for boat-based angling and according to the survey, the boats were rented out at RM1,200 to 1,500 for 10 anglers based on the angling location, which averages out at RM120 to 150/angler/ day.

Thus, in this study RM150/ angler/day was adopted for boat-based angling. To estimate the yearly economic value, firstly, the average number of anglers was estimated for each location for both weekdays and weekends. Secondly, the average time spent per angler was identified and according to the survey it was around 3 hours per day. Thirdly, the total person days were calculated by multiplying the number of anglers by the number of weekdays (261 each year) or weekends (104 each year) by 3 hours (the average angling time per day).

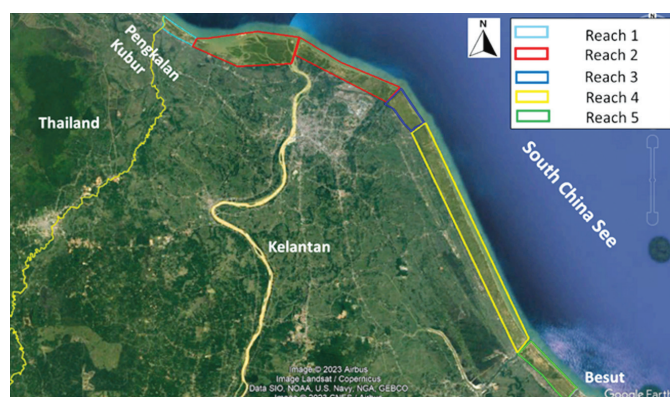


Figure 1: Study area and reaches boundaries

3.0 RESULTS AND DISCUSSION

3.1 Reach 1: Pengkalan Kubur to Pantai Sri Tujuh

For Reach 1, the site survey outcomes showed that the shore-based angling was mainly undertaken at Pantai Sri Tujuh, while the staging point for boat-based angling was at Kompleks LKIM Getting as shown in Figure 2. For shore-based angling, the activity was commonly undertaken during the weekends at which around 5-10 anglers were recorded undertaking the activity in the morning and increasing to about 15 anglers during the evening period. These observations are in agreement with the study conducted by Pérez-Bote and Roso, 2014 (Pérez-Bote & Roso, 2014). However, during nighttime, no fishing activities were recorded. During weekdays, only 3-5 daytime

anglers were observed. Small shrimp, fishmeal, small fish, hermit crabs, and squid were used as bait. Normally, live bait (shrimps, small fish) were purchased from the aquarium shops at around RM0.50-RM1.00/individual, while fish, prawns, and squid were purchased at the wet markets for around RM5-RM10. The standard fishing gear used by anglers was noticed to be rod-and-line which costed around RM100-RM500. The survey showed that the most common species caught were *Johnius* spp., *Mugil* spp., *Liza* spp., *Valamugil* spp., *Himantura* spp., *Gymnura* spp., and *Dasyatis* spp. As for boat-based angling, there were 25 operators at Kompleks LKIM Geting. Rental rates were about RM1,500/day. Usually, recreational fishing is concentrated between March and November, especially during the weekends. However, no angling activities were undertaken during the monsoon season (December–February). Each boat could accommodate around 10 anglers/boat. Even though there are 25 boats available for rental, only 5 trips (boats)/week were recorded. The main fishing gear used was rod-and-line with 3 to 5 rods per angler.

For boat-based angling, the average catch was estimated to be around 10 to 20 kg/boat. However, sometimes, the catch could exceed 100kg/boat, especially during the squid season. Overall, the investigation indicated that the total fishing effort amounted to 6,689 person-days a year, where 80.7% was contributed by boat-based angling and the remaining 19.3% by shore-based angling as listed in Table 1. The economic value of shore-based and boat-based angling was calculated by considering an average payout of RM100/person-day for shore-based angling and RM150/person-day for boat-based angling. Therefore, it can be found that the estimated direct financial value of recreational fisheries amounted to RM0.939 million per year for Reach 1 (refer to Table 1).

3.2 Reach 2: Pantai Sri Tujuh to Pengkalan Datu

Along Reach 2 coastal area, the highest number of shore-based angling was observed when compared with other reaches along the Kelantan shoreline. Shore-based angling was observed at four locations including Pengkalan Nangka Lagoon, Pantai Cahaya Bulan, Pantai Sabak, and Tanjung Kuala Sabak as shown in Figure 2. Pantai Cahaya Bulan recorded the highest number of shore-based anglers, especially on Fridays and Saturdays around 9.00 pm to 1.00 am. An average of 90 anglers were recorded undertaking the activities during this time frame. However, during weekdays, the numbers dropped drastically to only 3-5 anglers during the daytime and 7-10 anglers at nighttime. These observations in terms of angling during the weekdays and weekends are in agreement with the reported results by Pérez-Bote & Roso (2014) and Papadopoulos *et al.* (2022).

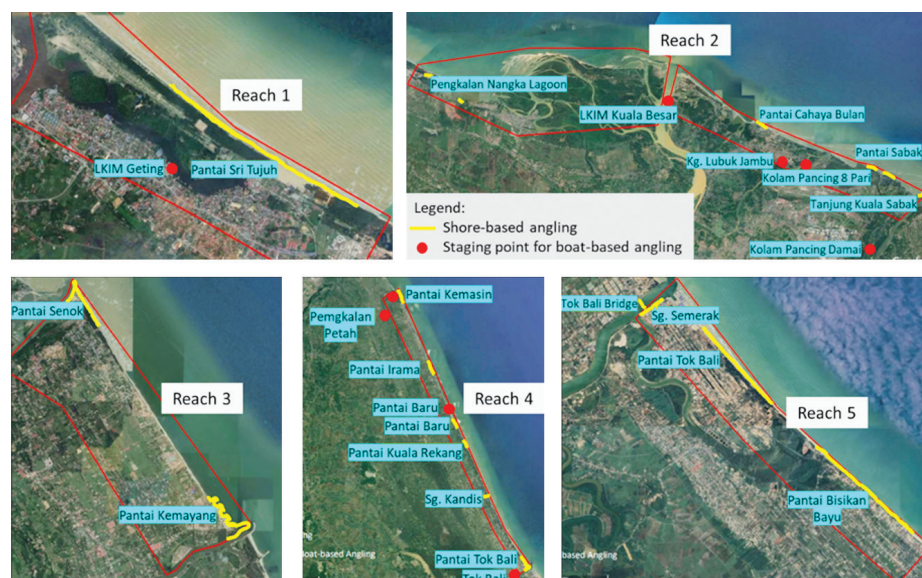


Figure 2: Locations of shore-based and boat-based anglings along the study area

At the Pengkalan Nangka Lagoon, Pantai Sabak, and Tanjung Kuala

Sabak, angling activities were only carried out during the daytime. At each location, approximately 3-5 anglers were observed during weekdays, however, the numbers increased to about 20-50 anglers during weekends at Pengkalan Nangka Lagoon and 20-30 anglers at Pantai Sabak and Tanjung Kuala Sabak. Most of the anglers spent about 3 hours/angling session. The most common bait used are live shrimp, small fish, shrimp, fishmeal, hermit crabs, and squids and the standard fishing gear used was rod-and-line. The best catch was reported to be obtained during the incoming tides, particularly springs, with catches ranging from 0.5-5 kg/person. Among the common species caught include the *Alectis* spp., *Gnathanodon speciosus*, *Lates calcarifer*, and *Pomadasys* spp.

In addition to shore-based angling, angling activities were also recorded at the recreational fee ponds located at Kg. Lapang Pari (Kolam Pancing 8 Pari) and Kg. Pulau Gajah (Kolam Pancing Damai) as shown in Figure 2. Around 20-50 anglers were noticed during weekdays, however, the number of anglers increased to around 80-100 anglers/day during the weekends at these fee ponds. The minimum angling hours are around 3 hours; however, some anglers could spend around 4-5 hours/entry. The entry fee is RM40 (3 hours) with an additional RM10 for the deposit and RM10/hour for subsequent hour for Kolam Pancing Damai and RM35 (3 hours) with an additional RM5 for the deposit and RM10/hour for an additional subsequent hour at Kolam Pancing 8 Pari. At Kolam Pancing Damai, the fish species stocked at the fee ponds are *Lates calcarifer*, *Lutjanus argentimaculatus*, *Lutjanus* spp., and *Epinephelus* spp., while at Kolam Pancing 8 Pari, only *Lates calcarifer* was noticed to be stocked.

Boat-based angling was also observed in this area, where the main staging point is at Kompleks LKIM Kuala Besar and Kg. Lubuk Jambu as shown in Figure 2. At Kompleks LKIM Kuala Besar, there were five outboard-powered boats available for rental. Rental rates were RM1,200/day. Recreational fishing was reported to be concentrated from March to November, especially during weekends, however, no angling activities were undertaken during the monsoon season (December – February). Each boat could accommodate around 10 anglers/boat. Angling is carried out at least 3-5 trips/week.

The main fishing gear used was rod-and-line with 3 to 5 rods per angler. Anglers mainly used live fish and shrimp as baits and the main target species were *Loligo* spp., *Lutjanus* spp., *Alectis indicus*, *Caranx ignobilis*, and *Alepes* spp. The average catch was noticed to be about 10-20 kg/boat and sometimes, the catch could exceed 50kg/boat, especially during the squid season. Overall, the investigation indicated that the total fishing effort amounted to 31,065 person-days a year, where 44.7% is contributed by fee pond-based angling, followed by shore-based angling (33.6%), and the remaining 21.7% by boat-based angling. From the investigation, the total economic value for recreational fisheries in this area amounted to RM3.371 million per year as listed in Table 2.

Table 1: Recreational fishing effort at Reach 1 (Pengkalan Kubur to Pantai Sri Tujuh)

Location	Weekdays [a]	Weekends [b]	Total Person Days [c]	Unit Economic Value [d]	Economic Value (RM) [e]
Shore-based angling					
Pantai Sri Tujuh	4 anglers	23 anglers	1,289	RM100	128,900
Boat-based angling					
LKIM Getting	0 anglers	50 anglers	5,400	RM150	810,000
Total			6,689		938,900

$$c = (a \times 3 \times 261) + (b \times 3 \times 104), e = c \times d$$

Table 2: Recreational fishing effort at Reach 2 (Pantai Sri Tujuh to Pengkalan Datu)

Location	Weekdays [a]	Weekends [b]	Total Person Days [c]	Unit Economic Value [d]	Economic Value (RM) [e]
Shore-based angling					
Pengkalan Nangka Lagoon	4 anglers	35 anglers	1,757	RM100	175,650
Pantai Cahaya Bulan	13 anglers	90 anglers	5,952	RM100	595,238
Pantai Sabak	4 anglers	25 anglers	1,367	RM100	136,650
Tanjung Kuala Sabak	4 anglers	25 anglers	1,367	RM100	136,650
Fee pond-base angling					
Kolam Pancing 8 Damai	35 anglers	90 anglers	6,936	RM100	693,563
Kolam Pancing Pari	35 anglers	90 anglers	6,936	RM100	693,563
Boat-based angling					
LKIM Kuala Besar	-	40 anglers	4,320	RM120	648,000
Kg. Lubuk Jambu		15 anglers	2,430	RM120	291,600
Total			31,065		3,370,913

$$c = (a \times 3 \times 261) + (b \times 3 \times 104), e = c \times d$$

3.3 Reach 3: Pengkalan Datu to Kemasin

Along Reach 3 coastal area, only shore-based angling was recorded at two main locations, namely (i) Pantai Senok, and (ii) Pantai Kemayang as shown in Figure 2. The angling activity was mostly undertaken during weekends, where approximately 20-35 anglers were observed. During weekdays, only 5-10 anglers undertook the angling activity. The most common bait used was live shrimp, small fish, shrimp, fishmeal, hermit crabs, and squids. The standard fishing gear used by anglers

was noticed to be rod-and-line. The most target species were *Alectis* spp., *Gnathanodon speciosus*, *Lates calcarifer*, and *Pomadasys* spp.

The total fishing effort at this location was estimated at 3,710 person-days per year, with a direct economic value of RM0.371 million as listed in Table 3.

3.4 Reach 4: Kemasin to Tok Bali

Along reach 4 coastal areas, both shore and boat-based angling activities were observed. Shore-based angling was recorded at Pantai Irama, Pantai Melawi, Pantai Kuala Rekan, Sg. Kandis and Pantai Tok Bali as shown in Figure 2. The angling activities were noticed to be undertaken during the daytime of the weekends only. At each location, there were 20-30 anglers, most of them spent around 3 hours/angling session. The most common bait used were live shrimp, small fish, and squids and the standard fishing gear used was rod-and-line. Among the

common species caught from shore-based angling include the *Johnius* sp., *Mugil* spp., *Liza* spp., *Valamugil* spp., *Arius* spp., and *Himantura* spp.

As for boat-based angling, the staging points for boat rental were noticed to be at Kuala Kemasin, Pengkalan Petah, Pantai Baru, and Tok Bali as shown in Figure 2. The boats available for rental at Kuala Kemasin, Pengkalan Petah, and Tok Bali were inboard-powered boats, while at Pantai Baru, only outboard-powered boats were available. At Kuala Kemasin and Pengkalan Petah, the rental rate was around RM1,200/day, while RM1,500/day at Tok Bali. Each boat could accommodate around 10 anglers, and the average trips were reported to be between 3-5 trips/week. Recreational fishing was concentrated between March and November, especially during weekends however no angling activities were undertaken during the monsoon season (December – February). The main target species were *Loligo* spp., *Lutjanus* spp., *Alectis indicus*, *Caranx ignobilis*, *Alepes* spp., and *Scomberoides* spp. The angling hotspots were within Sg. Raja Gali and Sg. Kelantan as well as 5 nautical mile (nm) from the shoreline. In Reach 4, the total fishing effort was estimated at 19,723 person-days per year, with a direct economic value of RM2.432 million as listed in Table 4.

Table 3: Recreational fishing effort at Reach 3 (Pengkalan Datu to Kemasin)

Location	Weekdays [a]	Weekends [b]	Total Person Days [c]	Unit Economic Value [d]	Economic Value (RM) [e]
Shore-based angling					
Pantai Senok	7 anglers	30 anglers	1,855	RM100	185,513
Pantai Kemayang	7 anglers	30 anglers	1,855	RM100	185,513
Total			3,710		371,025

$$c = (a \times 3 \times 261) + (b \times 3 \times 104), e = c \times d$$

Table 4: Recreational fishing effort at Reach 4 (Kemasin to Tok Bali)

Location	Weekdays [a]	Weekends [b]	Total Person Days [c]	Unit Economic Value [d]	Economic Value (RM) [e]
Shore-based angling					
Pantai Irama	-	25 anglers	975	RM100	97,500
Pantai Melawi	-	25 anglers	975	RM100	97,500
Pantai Kuala Rekan	-	25 anglers	975	RM100	97,500
Sg. Kandis	-	25 anglers	975	RM100	97,500
Pantai Tok Bali	-	25 anglers	975	RM100	97,500
Boat-based angling					
Kuala Kemasin	40 anglers		4,320	RM120	518,400
Pengkalan Petah	40 anglers		4,320	RM120	518,400
Pantai Baru	15 anglers		810	RM120	97,200
Tok Bali	50 anglers		5,400	RM150	810,000
Total			19,725	-	2,431,500

$$c = (a \times 3 \times 261) + (b \times 3 \times 104), e = c \times d$$

Table 5: Recreational fishing effort at Reach 5 (Tok Bali to Kuala Besut)

Location	Weekdays [a]	Weekends [b]	Total Person Days [c]	Unit Economic Value [d]	Economic Value (RM) [e]
Shore-based angling					
Pantai Tok Bali	7 anglers	30 anglers	1,855	RM100	185,513
Pantai Bisikan Bayu	7 anglers	40 anglers	2,245	RM100	224,513
Total			4,100		410,025

$$c = (a \times 3 \times 261) + (b \times 3 \times 104), e = c \times d$$

3.5 Reach 5: Tok Bali to Kuala Besut

Along Reach 5 only shore-based angling was observed at two locations, namely (i) Pantai Tok Bali (including Tok Bali Bridge and Sg. Semerak), and (ii) Pantai Bisikan Bayu as shown in Figure 2. The angling activity was mostly undertaken during weekends, where approximately 20-35 anglers were observed at Pantai Tok Bali (including Tok Bali Bridge and Sg. Semerak) and 30-50 anglers along the Pantai Bisikan Bayu. During weekdays, only 5-10 anglers were noticed to be involved in this activity. The most common bait used was noticed to be live shrimp, small fish, shrimp, fishmeal, and squids. The standard fishing gear used by anglers was rod-and-line. These observations are in agreement with the reported results by (Mike & Cowx, 1996).

The most target species were *Johnius* spp., *Mugil* spp., *Liza* spp., *Valamugil* spp., *Himantura* spp., *Gymnura* spp., and *Dasyatis* spp. In terms of economic value, Reach 5 contributed to the economy with a total amount of RM0.410 million each year which corresponds to 4100 person-day per year as listed in Table 5.

3.6 Comparison Between Shore-Based and Boat-Based Angling

Figures 3a and 3b show a comparison between shore-based and boat-based angling in terms of total person days and total economic value, respectively. Firstly, it can be noticed that for reaches 3 and 5 there was no boat-based angling and only shore-based angling was recorded. Secondly, it can be seen that the shore-based angling recorded the highest economic value at Reach 2 with a total amount of RM2,431,314 corresponding total which corresponds to 24315 total person days. On the other hand, boat-based angling recorded the highest economic value at Reach 4 with a total amount of RM1,944,000 which corresponds to 14850 total person days. Overall, both angling activities contribute to almost the same economic value in total at which the total economic values were found to be RM3,828,766 and RM3,693,600 for shore-based and boat-based angling, respectively.

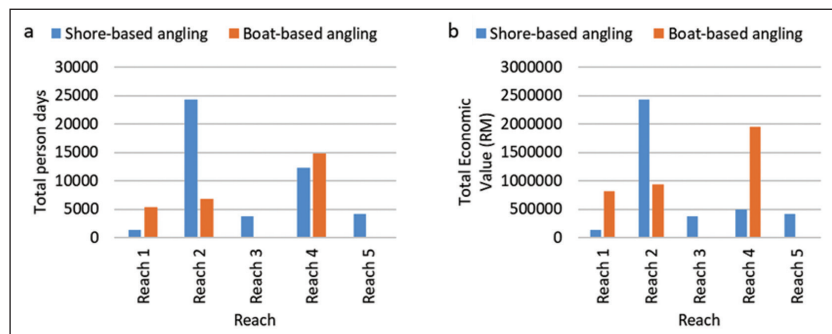


Figure 3: Comparison between shore-based and boat-based angling (a) total person days, and (b) total economic value

The present study's limitations, particularly regarding data and data collection methods, are important to acknowledge. Field surveys were conducted only during limited periods in March and July 2020, which introduces certain constraints, particularly related to seasonal variability. This seasonal limitation may affect the representativeness of the data. A key shortcoming is that the surveys did not cover the monsoon season (December-February), a time when no angling activities were observed. As a result, the study may not fully capture the annual dynamics of recreational fishing, potentially overlooking important seasonal fluctuations in angler participation and fish availability. To address these limitations, it is recommended that a long-term monitoring program be established. Such a program should take into account seasonal variations, particularly during the monsoon season, to provide a more comprehensive understanding of recreational fishing patterns and their broader ecological and economic impacts.

4.0 CONCLUSIONS AND SUMMARY

In the present study, recreational fisheries along the Kelantan shoreline were investigated through field survey which was conducted between 13th-16th March 2020 and 20th-24th July 2020. The study covered around 96 km shoreline length which was divided into 5 reaches including reach 1 (Pengkalan Kubur to Pantai Sri Tujuh), reach 2 (Pantai Sri Tujuh to Pengkalan Datu), reach 3 (Pengkalan Datu to Kemasin) reach 4 (Kemasin to Tok Bali), and reach 5 (Tok Bali and Besut). The results showed that there are two main types of angling in the study area, namely (i) shore-based angling, and (ii) boat-based angling. The angling activities were commonly concentrated during the daytime of the weekends where the highest number of anglers were observed. The average angling time is around 3 hours/day however the angling time could reach up to 5 hours. Furthermore, it was noticed that no angling activity during monsoon seasons (December- February). The survey showed that the most common bait used were live shrimp, small fish, and squids and the standard fishing gear used was rod-and-line. Recreational fisheries in Kelantan shoreline accounted for 45709 total person days/year with a total economic value of RM3,828,766/year for shore-based angling, while 27000 total person days/year and RM3,693,600 economic value for boat-based angling.

Overall, the recreation fisheries in Kelantan state coastal area accounted for a direct economic value of around RM7.5 million each year. The findings of the current study provide valuable insights into the sustainable management of recreational fisheries along the Kelantan shoreline. To ensure the long-term viability of this resource, several key recommendations are proposed, such as establishing a comprehensive, long-term monitoring program to track trends in recreational fishing activities and assess their impact on local fish populations and habitats. This program should include seasonal variations, with a particular focus

on understanding the factors influencing angling during the monsoon seasons. Additionally, conducting ecological impact assessments to evaluate the ecological footprint of recreational fishing will contribute to the effective management of recreational fisheries in the Kelantan state coastal area.

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PROFILES



EBRAHIM AL-QADAMI is a postdoctoral research fellow at the Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia (UTHM). Dr. Al-Qadami obtained his Ph.D. from Universiti Teknologi PETRONAS (UTP) in 2022 and his master's degree from Universiti Putra Malaysia (UPM) in 2017. Dr. Al-Qadami does research on coastal engineering, flood risk modelling, urban stormwater management, and water resources management.
Email address: ebrahim@uthm.edu.my



MOHD ADIB MOHAMMAD RAZI is an associate professor at the Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia (UTHM), and the head of the Eco Hydrology Technology Research Centre (Eco-Hytech). He obtained a PhD in Civil Engineering from Universiti Teknologi Mara, Malaysia. He is a registered professional engineer with the Board of Engineers, Malaysia. Ap. Ir. Dr. Mohd Adib Mohammad Razi does research on coastal engineering, flood risk modelling, urban stormwater management, hydraulics, and hydrology.
Email address: adib@uthm.edu.my



SYED MUZZAMIL HUSSAIN SHAH is a postdoctoral research fellow at the Interdisciplinary Research Center for Membranes and Water Security, King Fahd University of Petroleum and Minerals. Dr. Shah obtained his master's and Ph.D. from Universiti Teknologi PETRONAS (UTP) in 2014 and 2019. Dr. Shah is a member of the Pakistan Engineering Council, Institute of Engineers - Malaysia, American Society of Civil Engineers, Australian Water Association, and World Society of Sustainable Energy Technologies.
Email address: syed.shah@kfupm.edu.sa



MOHAMAD FAHMI MOHAMAD IDERIS is the Principal Assistant Director at the Coastal Zone Management Division, Department of Irrigation and Drainage (DID) Malaysia. He obtained bachelor's and master's degrees in civil engineering, specializing in sustainable water resource engineering from Universiti Kebangsaan Malaysia (UKM). He is a Registered Professional Engineer (P.Eng.) with the Board of Engineers, Malaysia (BEM), and a corporate member of the Institution of Engineers, Malaysia (MIEM). Ir. Ideris is also a member of the Malaysian StormWater Organisation (MSO) and the Malaysian National Committee on Irrigation & Drainage (MANCID).
Email address: mfahmi@water.gov.my



MAHRAN MAHAMUD is a Chief Assistant Director at River Basin Management Division, Department of Irrigation & Drainage. He has been working in the Coastal Zone Management Division for several years and obtained a Master's in Civil & Structural Engineering in 2016 from Universiti Kebangsaan Malaysia. He is a registered professional engineer with a practicing certificate from the Board of Engineers, Malaysia. Ir Mahran has managed and supervised several coastal management studies and detailed designs.
Email address: mahran@water.gov.my