

Traditional Knowledge of Marine Resources and Their Relations to the Coastal Community's Economic Well-Being in Peninsular Malaysia



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ABSTRACT

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This study was conducted to analyse the practice of associated use of traditional knowledge (TK) on marine resources as new sources of wealth to enhance the economic well-being of the coastal communities. This study employed a qualitative research approach with a total of 117 respondents in Peninsular Malaysia. Convenience and purposive sampling methods were used to identify potential respondents and thematic analysis for the data analysis. The data was gathered through telephone interviews during the Movement Control Order (MCO) in Malaysia due to the COVID-19 pandemic. The results of the study reveal that the associated use of traditional knowledge on marine resources does play an essential role in the economic well-being of coastal communities. This was assessed through the perspective of living standards and livelihood improvement. The potential of TK based on marine resources illustrates the opportunity for this practice to become a valuable economic resource and create employment opportunities among coastal communities to generate a sustainable source of income. This study can also change modern society's perception of the importance and benefits of TK based on marine resources. The implications of this study can be viewed from the theory, practice, and policy. Future studies could be expanded to the Borneo region of Malaysia to gather different perspectives, and a quantitative approach could be used to gather more extensive opinions.

1. INTRODUCTION

Traditional knowledge (TK) is often regarded as a cultural tradition that distinguishes one society from another. It is used to sustain the community and its cultural value, as well as preserve valuable resources for the community's survival. TK has a unique cultural and social value to the local communities and contributes to the development of economic opportunities through domestic and international trade [1]. The World Intellectual Property Organization defines "traditional knowledge" as knowledge, information, skills, and practices that are developed, maintained, and inherited from generation to generation in a community, as well as becoming part of its cultural identity [2]. TK in this study refers to the information, innovation, and practices of coastal and local communities around the world, as well as to the conservation and sustainable use of marine resources [3].

In Malaysia, local communities build a unique system covering social, economic, spiritual, and customary aspects within their community [4]. This system has long been practiced among the local community to maintain a cultural tradition, especially among the older generation. The preservation and conservation of TK based on marine resources plays a crucial role in improving the economy among coastal communities in Malaysia. TK of marine resources not only acts as an economic catalyst but potentially be used as a health solution for the local community. In

particular, the coastal community in Terengganu, Malaysia, continues to use TK based on marine resources to address health issues and there is opportunity to learn more about its advantages for modern society [5].

Coastal communities have developed an innovative system encompassing both social and economic aspects [6]. This practice is maintained by the local community to promote their well-being while preserving marine resources and the environment, which is crucial since, under the notion of a Blue Economy, these marine resources could drive economic growth for coastal countries like Malaysia. The conservation of marine resources contributes to health, food security, job opportunity, economic and social benefits, as well as awareness and knowledge of environmental sustainability.

While local communities strive to preserve their traditions or traditional values, modernisation challenges are unavoidable. Certain TK has become extinct or is increasingly being forgotten due to many factors, among them is a lack of awareness of the importance of preserving such TK that are crucial to economic well-being [3]. The importance of preserving TK as part of the local communities is proven, and there is a positive correlation between participation in cultural activities and health [7, 8]. TK is also a measure of subjective well-being and cultural identity among local communities [8]. A range of physical and mental health outcomes was associated with participation [9, 10], while observed a decreased likelihood of violent re-offending because of

cultural engagement and cultural identity in local communities [11].

Traditional medicines can also generate income for the local communities that are relying on marine resources for their livelihood. Nevertheless, traditional marine-based medicines are still unpopular among the local communities and are less commercialised despite many past studies that have proven that marine products have been in use for years [12]. This indicates the general unawareness of traditional marine-based medicine, and studies in terms of human perspectives are still underdeveloped.

Therefore, this study aims to analyse the associated use of TK on marine resources as a new source of wealth to enhance the coastal communities' economic well-being. It is relatively crucial to identify this associated use of TK and the contribution of marine resources among the selected coastal communities, as well as to determine how such knowledge contributes to their livelihood and living standard.

2. LITERATURE REVIEW

Malaysia is one of the world's megadiverse countries, and it is ranked 12th in the world in terms of country biodiversity [13]. While Malaysia is regarded as one of the most prosperous countries in Southeast Asia for its abundance of marine resources, this treasure also serves as a significant source of income for coastal communities and seafood traders. The biodiversity of Malaysia has made the country as a premier ecotourism destination through the integration of social sustainability growth of the local population with the economic outcomes [6]. Importantly, the marine resources provide numerous benefits to coastal communities, including seafood resources, ecotourism industry, coastal protection, and income sources for coastal communities, all of which contribute to their economic well-being.

Economic opportunities arise from traditional knowledge and cultural development when applied in the context of international trade, and they have a particular cultural and social significance relevant to coastal communities. It is possible to define TK as the collective and passed down information, experience, and wisdom of human societies that have a long-term attachment to a particular location or situation [14]. TK, which is also known as indigenous knowledge, is defined as a "systematic way of thinking applied to phenomena through, physical, cultural, and spiritual systems" that have been passed down through generations [15]. Local communities' traditional knowledge refers to the information and practices that have evolved over time and are traditionally passed down to younger generations in real-world working and living conditions.

The potential of coastal areas, which are mostly inhabited by fishing communities, has not been fully explored [16]. This could be due to the reason that the marine resources, such as fish, seaweed, and sea cucumbers, captured are mostly consumed by the communities themselves. Under the notion of a blue economy, the marine resources must be preserved because of their economic benefits to the local community [17]. The blue economy also propagates for the protection of TK for the community's survival [18]. Marine resources provide food and improve the living standards of coastal communities through TK as well as traditional medical processing methods create employment opportunities [3].

Nevertheless, coastal areas, particularly in developing

countries, have been unscrupulously exploited since they are viewed as safety nets for food production and to provide for livelihood and economic well-being [19]. "Economic well-being" is defined by the Council on Social Work Education as having financial security in the present and the future [20]. Existing financial security refers to an individual's, families, or community's ability to meet their basic needs on a consistent basis (including food, housing, healthcare, transportation, and education). Additionally, it encompasses the capacity to make economic decisions and to experience a sense of security, satisfaction, and personal fulfillment in connection with employment pursuits. This could also be indirectly due to the recent global movement towards the development of a blue economy strategy, which stresses coastal resources to address the issue of insufficient resources [21].

The commercial value of TK can be realised through its associated use in the development of herbal products and applications in healthcare, nutraceutical, cosmeceutical, and pharmaceutical product development [22]. In addition to influencing a community's diet and food preferences, religion and TK have an impact on intra-household food distribution patterns, child feeding practices, food processing and preparation techniques, health and sanitation practices, traditional medicine, and the accessibility and utilisation of biomedical and public health services [23]. Moreover, the incorporation of TK into the global stream is becoming increasingly popular because it has the potential to mitigate climate change through the concept of a blue economy and is regarded as a significant contributor to the societal well-being as a whole [24].

In line with technological advancement, the role of TK in improving living standards has gained global attention as it has been repeatedly proven that these are often the most optimal for societies [24]. For instance, traditional practices in developed rural areas using locally available ingredients have over time offered improved survival along with good climate control [24, 25]. Recently, many authorities have realized the interrelation between the notion of sustainability and traditional tradition of information, practices, and beliefs about the human-environment interaction, and how the connection is crucial for human well-being and economic growth [26].

The wealth of traditional marine knowledge developed by these communities has been passed down through generations, and both the communities and the surrounding marine environment have thrived sustainably, thereby preserving the marine ecosystem. People in remote villages continue to rely on their TK to support their families and maintain their livelihoods [27].

3. METHODOLOGY

Qualitative research involves collecting and analyzing non-numerical data to understand concepts, opinions, or experiences [28]. It can be used to gather deep insights into problems and generate new ideas. Qualitative research relies on data obtained from observations, interviews, questionnaires, and focus groups [28]. In this study, the qualitative research methodology was employed, and in-depth interviews were used to identify potential essential elements or dimensions related to the application of TK based on the objectives of the use of marine resources for the economic well-being of the coastal communities. Respondents were asked about the use of

TK related to marine resources that are considered vital for their economic sustainability. The respondents' criteria were set according to the objectives, which are to study the potential use of TK related to marine resources and identify knowledge, experience, and influencing factors in using marine resources as a source of their economic income.

In the interview session, the topics and questions asked are divided into four sections, which are 1) perceptions of traditional knowledge, 2) traditional knowledge based on marine resources, 3) traditional knowledge based on marine resources for well-being, and 4) traditional knowledge based on marine resources to improve the economy. The details of the questions were in the Appendix.

Respondents were selected from people who live in coastal areas in the 11 states in Peninsular Malaysia including fishermen, and traditional medicine practitioners. This criterion was established with the understanding that these groups have the knowledge to answer the objectives that led to the practice of investigating the potential use of TK related to marine resources. Due to the MCO imposed by the Malaysian Government, which restricted travel and the ability to conduct face-to-face interviews, the respondents were selected through a combination of convenience and purposive sampling.

The interview was conducted through telephone calls to all respondents and the conversation was recorded using a digital audio tape recorder. The interviews were in the form of semi-structured interviews and were begun by asking one or more general, open-ended questions and expanded based on the respondents' feedback. The questions that followed were based on the detailed information needed by the researcher to further strengthen the findings of the study. In this study, the qualitative data gathered was analysed using thematic analysis to identify potential themes related to TK practices for livelihood and source of wealth to answer the objectives of this study.

4. RESULTS AND DISCUSSIONS

As presented in the profile of the respondents (Table 1), 117 respondents were chosen from the coastal areas throughout the 11 states in Peninsular Malaysia. The highest number of respondents are from Kedah, with a total of 13 respondents. This is followed Terengganu, Melaka, Johor, and Selangor with 12 respondents each. The group with the lowest number are Kelantan and Negeri Sembilan. The findings indicated that most respondents were male, which is 113 respondents, and 4 were female. This can be explained by the fact that coastal communities that work as fishermen and engage in marine activities such as catching marine resources and using traditional equipment are dominated by males. The Food and Agriculture of the United Nations also stated that more than 80 percent of the male population is involved in the fishing sector and marine activities in the world [29]. It is consistent with the high numbers of male respondents compared to females in this study.

The study is also dominated by 92 respondents (78.6%), who are 50 years and above. This is pertinent because the older generation is deemed to have more TK inherited from their forefathers and use such knowledge for their survival. Out of the 17 respondents, 115 (98.3%) were married. 58 respondents (49.6%) earned between RM1001.00-RM2000.00 for their monthly income. Their livelihood is derived from the capture and sale of seafood, which is then sold directly to the

consumers, or to the middlemen.

Most of the 114 respondents are Malay, while 3 respondents are Chinese, which represents the fact that rural and coastal areas are mostly populated by Malays, who traditionally engage in marine and fishing activities. A total of 103 respondents (88%) had only completed primary and secondary education. This could be because the former generations had low awareness of tertiary education with no financial means to send their children to study.

Table 1. Profile of the respondents (n=117)

Characteristics	Categories	Frequency	Percentage (%)
Gender	Male	113	96.6
	Female	4	3.4
Age	20-29	1	0.9
	30-39	6	5.1
	40-49	18	15.4
	50 & above	92	78.6
Marital status	Married	115	98.3
	Single	1	0.9
	Divorce/Widow/Widower	1	0.9
Income	RM1000 & below	22	18.8
	RM1001 – RM2000	58	49.6
	RM2001 – RM3000	10	8.5
	RM3001 – RM4000	7	6.0
	RM4001 – RM5000	9	7.7
	RM5001 & above	11	9.4
Ethnicity	Malay	114	97.4
	Chinese	3	2.6
Education	Primary school	29	24.8
	Secondary school	74	63.2
	STPM/diploma	11	9.4
Occupation	Bachelor	3	2.6
	Fishermen	100	85.5
	LKIM Officer	9	7.7
	Fishmonger/Trader	5	4.3
	Traditional Medicine Practitioner	3	2.6
Location	Kedah	13	11.1
	Terengganu	12	10.3
	Melaka	12	10.3
	Johor	12	10.3
	Selangor	12	10.3
	Pulau Pinang	11	9.4
	Perak	10	8.5
	Pahang	10	8.5
	Perlis	9	7.7
	Kelantan	8	6.8
	Negeri Sembilan	8	6.8

Based on occupation, most respondents (85.5 percent) work as fishermen and earn a living through marine activities and resources. It is in line with the objective and context of the study. The study population and unit of analysis are coastal

communities, and fishermen are the individuals most involved with marine activities and resources. Furthermore, this study believes that fishermen are the most suitable group to obtain information about TK based on marine resources.

4.1 Potentials of traditional knowledge based on marine resources for the economic well-being of coastal communities

In order to study the potential of TK based on marine resources for the economic well-being of coastal communities in Peninsular Malaysia, the respondents were asked about their awareness of the associated use of TK on marine resources, and their involvement and dependence in the practice. Their perception of TK on marine resources for economic well-being, and knowledge of the types of marine resources caught, were also examined to determine the potential.

Table 2. Traditional medicine based on marine resources for economic well-being (n=117)

Description	Frequency	Percentage (%)
Commercialised, sold to wholesalers and the community	94	80.4
Used as a health product, food supplement	42	35.9
Job opportunities, develop traditional industries	3	2.6
Low capital	3	2.6

Table 2 illustrates the findings on traditional medicine based on marine resources. A total of 94 (80.4%) respondents agreed that traditional medicine derived from marine resources could be commercialised and distributed to wholesalers as well as the local community, who are using them regularly. Indirectly, this has a positive effect on the rate of economic growth through increased sales. Furthermore, 42 respondents (35.9%) said traditional medicine could be used as a health product or as a food supplement. For instance, sea cucumber is used as an ointment to treat wounds and aesthetically as a facial cleanser.

Several respondents developed products from marine resources and partnered with pharmacies and hospitals to sell them on the market and use them to treat patients, contributing to their income generation. This is particularly true when the respondents relate their income to the demand and supply in the Malaysian market. The feedback shows that traditional medicine from marine resources can be an economic catalyst for coastal communities and the country. According to some respondents:

"If traditional medicine is transformed into a product, it can be commercialised and profitably distributed. Until now, many people continue to use traditional medicine for health purposes, which can be sold to both the local community and wholesalers. Additionally, the health product can be used as a nutrient-dense food supplement, such as fish oil." [(R22, R24, R25 - Traditional Medicine Practitioner), (R28, R30, R43 - Fishermen), (R55, R95 - Fishmonger)].

"TK found in coastal communities should be passed down to future generations to ensure the continuation of this tradition. Traditional medicine has the potential to contribute to economic well-being, particularly in coastal communities that rely heavily on marine resources for their livelihood." [(R88, R90, R107, R112 - Fishermen), (R93 - Fishmonger)].

"The sale of traditional medicines as health products or supplements can enhance coastal communities and improve

their economic well-being. For instance, sea cucumbers can be consumed for internal health purposes, not only for treating wounds. Therefore, I believe that traditional medicine based on marine resources is gaining demand both domestically and internationally." [(R22, R24, R25 - Traditional Medicine Practitioner), (R104, R105 - Fishermen)].

Following that, some respondents agreed that traditional medicine based on marine resources can create employment opportunities when the demand is high. Traditional medicine entrepreneurs would require more skilled and unskilled workers to process raw materials, as well as at the management level. For example, in Langkawi, sea cucumber factories have been hiring many workers from the local community to cater to both the domestic and export market. Thus, it can be inferred that the associated use of TK on marine resources can benefit the local community and the economy when the traditional medicine industry prospers and provide economic opportunity to the local communities.

Another economic benefit of marine-based traditional medicine is that it requires low capital while on the other end, it brings the potential for high profits. As quoted from the respondents:

"I have a factory to process raw materials such as sea cucumber into products. So, the factory needs workers for that part, and I will be hiring some workers. This traditional medicine industry can be further developed because there are pharmacies and medical doctors who are interested in taking traditional medicine based on marine resources used on patients" (R22, R24, R25 - Traditional Medicine Practitioner).

"Traditional medicine based on marine resources does not require high capital like modern medicine. As a result, it is easier for the local community to process raw materials into products. Foreigners or tourists are also interested in local products because for them such products are difficult to find." [(R22, R24, R25 - Traditional Medicine Practitioner), (R23, R32 - Fishermen), (R45 - Fishmonger)].

Table 3. Perception towards traditional knowledge on marine resources for economic well-being (n=117)

Description	Frequency	Percentage (%)
Belief		
Generate income and food sources	59	50.4
Used as a health product	51	43.6
High demand, turned into an industry	19	16.2
Disbelief		
Traditional sources are difficult to obtain	5	4.3
No raw material processing skills	3	2.6

As shown in Table 3, 59 respondents (50.4%) believe that TK contributes to economic growth through the utilisation of marine resources. They contend that the associated use of TK on marine resources has the potential to generate income through the sale of traditional medicines and raw materials, as well as serve as a major source of food through the capture of marine resources. For instance, marine resources captured using TK taught by their forefathers, in both fishing methods and post-harvest processes, were turned into medicine or consumed.

Likewise, marine resources are essential to food security, nutrition, and community livelihood in developing coastal countries particularly. As stated by the respondents:

"The TK gained from previous generations has many benefits, among which we are taught about the methods of capturing marine resources, the preparation of traditional medicine, and which sources have the most nutrients to eat. All this acquired knowledge can indirectly generate income and improve the global economy." [(R8, R11, R18, R23, R29 - Fishermen), (R45, R55 - Fishmonger)].

"I also make traditional medicine on a small scale, such as crab, which can be used to treat malaria and is also eaten as soup. There is a community here that is interested in purchasing from me, which has the potential to increase the income of my entire family. This knowledge was passed down to me by my parents, who have been teaching me since I was a child, as well as the appropriate equipment to use." [(R26, R31, R41, R61 - Fishermen), (R93 - Fishmonger)].

Furthermore, 51 respondents (43.6%) believe that marine resources contain various multiple health benefits than can be turned into health products, such as seaweed that have countless nutrients and can also be used in beauty products, which are in high demand. Additionally, they believe that marine-based product accruing from TK is highly sought after, which has potentials as a traditional industry with job opportunities for the younger generation. According to some respondents:

"TK based on marine resources can be trusted from its effectiveness. Not only in terms of health but can be used as a source of income in our lives. I still practice it, and its effectiveness has been proven to be effective and can improve my family's economy" (R51, R54, R107, R113 - Fishermen).

"We believe that these marine resources have the potential to be a catalyst for our economy, particularly in terms of job creation. Many coastal communities have lower levels of education and rely heavily on marine resources as a source of income and primary occupation. Additionally, we can establish traditional industries to generate employment opportunities." [(R22, R24, R25 - Traditional Medicine Practitioner), (R71, R77 - Fishermen), (R93 - Fishmonger)].

Nevertheless, a trivial number of respondents do not believe in TK due to the difficulty of obtaining traditional medicines. They are also sceptical of the skills of the coastal communities in processing such raw materials. As several respondents mentioned:

"Coastal communities do not have the right skills to process the raw materials. The TK is used in the village area only and is acceptable. Not suitable in urban areas, the source is difficult to obtain nowadays." [(R62 - LKIM Officer), (R106 - Fishermen)].

"Nowadays, traditional medicine is scarce, as only a few people practice it. Raw resources such as sea cucumber and seahorse are also declining and difficult to process into medicine. Manual processing also takes longer to complete. Also, the local community does not get proper education in the processing skill of this traditional medicine" [(R27, R69 - LKIM Officer), (R66, R75 - Fishermen)].

Most coastal communities survive solely on marine resources. They obtain marine resources both as a source of food and income. Referring to Table 4, there are three types of marine resources that are most widely consumed and benefited by the respondents. 92 respondents (78.6%) catch fish as their primary source of revenue. Most respondents catch fish using fish nets and sold them to fishmongers and middlemen on the coast. Among the most common fish are mackerel and sardines. Apart from that, they also process seafood products such as fish crackers (*keropok lekor* and *keropok keeping*),

which are then sold to supplement their income.

Table 4. Types of marine resources used to generate income (n=117)

Description	Frequency	Percentage (%)
Fish	92	78.6
Crab	71	60.7
Squid	63	53.9
Sea cucumber	38	32.5
Shrimp	34	29.1
Horseshoe Crab	7	6.0
Seaweed	4	3.4

A total of 71 respondents (60.7%) stated that catching crabs are also another source of income. Crabs, boiled or in soup, have numerous benefits including treating dengue fever, high blood pressure, malaria, and chikungunya. Consequently, people are willing to pay fishermen and fishmongers relatively high prices to acquire them. Another 63 respondents (53.9%) catch squid for sale. Popular seafood, squid also contains nutrients that can be used to treat various health issues, including facial skin beauty, asthma, coughing, and body swelling. As stated by the respondents:

"Usually, fish is the marine resource that most fishermen here get, and the local community will buy it raw and fresh. The bestselling fish are mackerel and selayang fish. There is also a community here asking me to get it and paying me to get the source" (R17, R31, R76 - Fishermen).

"Fish is the main source for my family because it is used as a source of food and income. For example, raw fish is processed and made into products such as "keropok lekor" and "keropok keeping" and marketed to the community." [(R9, R93 - Fishmonger), (R102 - Fishermen)].

"Apart from fish, crabs and squid are also in high demand in this community because they contain nutrients that are beneficial to health and require little preparation to cook. Additionally, these resources are readily available in coastal areas and can be sold for a higher price than fish." (R6, R16, R20, R21, R29, R61 - Fishermen).

Nevertheless, there are also marine resources that are less lucrative such as horseshoe crabs and seaweed. Since this seafood is less abundant and low in demand, they are mostly consumed by the fishermen.

The findings of this study revealed that coastal communities in Peninsular Malaysia believe that the potential of TK is based on marine resources to their economic well-being. Based on the experience and knowledge passed down through generations, these coastal communities have the knowledge, experience, and beliefs necessary to apply TK related to traditional medicine. If optimised, marine resources can provide financial security to coastal communities [30]. In order to supplement household income and improve their living standards, the coastal communities in Peninsular Malaysia have turned to the TK they have inherited.

4.2 Preference for traditional medicines over modern medicines among coastal communities

After the potential of TK based on marine resources for the economic well-being of coastal communities in Peninsular Malaysia has been determined, it is also necessary to know the coastal community's preference between traditional medicines over modern medicines, in terms of effectiveness and contribution to their economic well-being. This is pertinent

because the potential can only be optimized if the coastal communities perceive TK's capability to improve their livelihood, and whether or not they have a preference and faith in marine-based traditional medicines.

Table 5. Economic well-being improvement with traditional knowledge (n=117)

Description	Frequency	Percentage (%)
Traditional Knowledge	74	63.2
Modern Knowledge	30	25.7
Traditional and Modern Knowledge	13	11.1

According to Table 5, a total of 74 respondents (63.2%) voted and argued that TK has the potential to strengthen the economy through the use of marine resources. This is because the methods of capturing and identifying marine resources for their medicinal properties, as well as the processing method, are all highly valuable and difficult to obtain. Most coastal communities have their own TK or practice that has been passed down from generation to generation. The fact that TK does not require as much capital as modern knowledge demonstrates that coastal communities prefer TK when it comes to expanding their income. As quoted from the respondents:

"This TK has helped me a lot to improve the economy, not only for my income but can also benefits others because they can use the marine resources as a result of catching and processing made by us. Fishermen also capture marine resources based on traditional methods that are still used today" [(R24, R25 - Traditional Medicine Practitioner), (R97, R103, R104, R107, R112 - Fishermen)].

"Because the information passed down to us has been used since time immemorial among previous generations who are capable of being a source of food as well as a source of income, I believe that TK is the best method for improving the economy. It is also unnecessary to spend a lot of money on modern medicine because TK based on marine resources has a significant positive impact on our well-being to us." [(R72, R76, R108, R112 - Fishermen), (R93 - Fishmonger)].

On the other hand, 30 respondents (25.7%) believe that modern knowledge is more beneficial than TK in terms of economic growth, owing to the increasing sophistication of technological equipment. Additionally, this modern knowledge will save time and may allow for a reduction in the workforce. Respondents expressed the following opinions:

"Modern knowledge, in my opinion, is superior because it is consistent with the passage of time. Today's equipment is more sophisticated, which enables time savings and manpower reductions" [(R7, R10, R32 - Fishermen), (R71 - LKIM Officer)].

"As a developing country, we should make more use of modern knowledge in terms of employment, education, and health to move towards a developed country. Modern equipment can make a greater contribution in terms of revenue such as making sales online and for the purpose of promoting products." [(R58, R68, R70 - LKIM Officer), (R78 - Fishermen)].

13 respondents (11.1%) however stated that both traditional and modern knowledge are beneficial to the economy, depending on the situation. For instance, the method of making sea cucumber oil is based on TK and is better suited to treating minor wounds without the need to visit a clinic. On the other hand, modern knowledge is also crucial because if someone

has a severe health problem, they should consult a medical doctor for treatment. As stated by the respondent:

"Both traditional and modern knowledge have their own distinct advantages that can stimulate economic growth. It depends on the present situation such as TK can improve the economy in terms of traditional medicine that can treat external wounds and modern knowledge such as clinics." (R11, R26, R60, R76, R77 - Fishermen).

It must be noted that apart from understanding the perception of the contribution of marine-based traditional knowledge to the economic well-being of the coastal communities, traditional medicine has been found as the preferred method of improving health and supplying energy in their daily lives. While some people still consider traditional medicine to be an alternative and informal treatment because it has yet to be integrated into the formal health care system, the demand for traditional medicine is increasing as the local community responds to it more enthusiastically and positively [5].

4.3 Impact of availability of marine resources on coastal communities

As previously stated, marine resources have the potential to benefit the local economies. Another important factor is to determine the availability of marine resources. This is because the fact whether the marine resources are readily available or otherwise is influencing the coastal communities to rely on them as their source of income.

Table 6. Availability of marine resources as a source of economic well-being (n=117)

Description	Frequency	Percentage (%)
Influence	113	96.6
Does not influence	4	3.4

As demonstrated in Table 6, a total of 113 respondents (96.6%) mentioned that the availability of marine resources is influencing the coastal communities to make them their economic resource. Readily available sources such as fish and crabs have been their source of income. Additionally, sea cucumbers can be commercialised as traditional medicine, such as a facial soap that can be sold in markets to attract foreign tourists. The availability of marine resources as health products correlates positively with consumer use. Apart from that, they stated that many in their communities had lost jobs due to the MCO and had to rely on fishing to survive. Depending on the seasons, it is difficult for them to obtain marine resources in monsoon to survive. The respondents expressed the following statement:

"The availability of marine resources is essential in improving the economy of the coastal community because it is our source of income. If there is no such source, then we also do not make a profit. When the Covid-19 pandemic occurred, we were badly affected because we could not go to sea, and resources were also dwindling." [(R1, R4, R37, R45, R77 - Fishermen), (R14, R45, R55 - Fishmonger), (R24 - Traditional Medicine Practitioner)].

"My parents and grandmother used to rely on this marine resource as their primary source of income and employment in the past as well. They are entirely reliant on marine resources for their subsistence, and during a monsoon season, it is extremely difficult for them to obtain resources, which has an indirect impact on their economic well-being and survival."

(R2, R5, R6, R19, R61, R79 - Fishermen), (R22, R24, R25 - Traditional Medicine Practitioner)].

However, some respondents who are not dependent on fishing as their source, stated that the availability of marine resources does not influence their consumption where they can still purchase seafood from supermarkets. As stated by some respondents:

“The availability of these marine resources in the ocean does not affect me in consuming them because I am not directly involved with marine resources. In my opinion, such resources can be found in the nearest supermarkets.” (R7, R27, R69 - LKIM Officer).

Therefore, it can be surmised that the availability of marine resources is essential for coastal communities to grow economically. When a resource is abundant and in great demand, it is harvested and marketed.

The diversity of marine resources enables employment opportunities and the potential for various economic activities based on marine resources, as well as the promotion of a healthy society [16]. In Sabah, Malaysia, the Kadazan-Dusun community practices and employs TK on natural resources in their daily activities with the goal of improving their livelihood and living standards [31]. Likewise, the above findings in this study have also demonstrated that the use of TK is still relevant and valuable as a source of wealth that can be used as a platform to develop a sustainable economy among the coastal communities in Peninsular Malaysia.

This study shows a great potential of TK and can make a great contribution to economic well-being. Several practices of coastal communities have been proven to enhance and promote the utilisation of TK on marine resources at the local level and improve maintaining a healthy ecosystem. The local community's contribution to the conservation and sustainable use of biological diversity is also an essential component in maintaining natural resources and well-being. Their practices, skills, and techniques provide valuable information for policy formulation and economic growth. Furthermore, as a coastal community who relied heavily on marine activities, the local knowledge and creativity can be presented to the local authorities or government in order to receive due attention and necessary support to increase awareness on the importance of TK based on marine resources for economic well-being and sustainability.

As part of the cultural tradition, community involvement plays a crucial role in influencing the sustainability of nature and TK. The involvement of members in the society can increase the awareness of coastal communities on the importance of conserving TK of marine resources. This can begin with an individual who is a member within the community, which in turn inspires other members to get to know about their TK and eventually practices the knowledge in their daily life. In addition, it will indirectly educate all communities on the significance of marine resources for economic growth and their households. Coastal communities take steps to protect and preserve marine resources for the benefit of future generations. Factors such as conservation and preservation, participation in community activities, and government involvement will form in determining awareness for economic well-being, especially in coastal areas.

5. CONCLUSIONS

Looking at the potential of TK based on marine resources perceived by the community demonstrates the opportunity for

this knowledge to be a valuable economic resource, allowing coastal communities to generate a sustainable source of income. Culture and practices such as the processing of traditional medicines, which are inherited from their forefathers and deep-rooted in their lives, can be catalysts for economic growth that contribute specifically to the strengthening of local economies.

On the basis of theoretical considerations, this study has the potential to contribute new knowledge on the associated use of TK on marine resources by coastal communities for the purpose of improving their economic sustainability, particularly among the younger generation who are supposed to carry on the tradition. From a practical point of view, this study provides essential information to assist coastal communities in improving their livelihood through the use of marine resources derived from TK in the processing methods, as well as in the production of traditional medicines. In terms of management implications, this study can be a source of reference for governments, agencies, and relevant stakeholders in determining the importance of TK to continue to be preserved and protected based on studies and findings conducted.

Based on the policy perspective, the findings can be a reference for the government to improve existing policies and stakeholders to foster traditional knowledge related to marine resources in order to preserve them. In line with the National Biodiversity Policy (NPBD) 2016-2025, the contribution of local communities, civil society, and the private sector to the conservation and sustainable use of biodiversity has increased significantly [32]. This matter needs to be taken seriously so that the action planning and biodiversity strategy from the government remains relevant and does not disappear among today's modern generation.

The government also needs to focus on awareness of the importance of intellectual property (trademarks, patents, designs, and copyrights) in traditional knowledge, especially among coastal communities. This is to prevent third parties from plagiarizing the traditional knowledge, materials used, and methods of using marine resources in traditional medicine. Copyright and patent are important because of their role to protect the owner's innovation while monitoring and allowing third parties to gain access legally. It is crucial to ensure that owners receive appropriate rights for their ideas and creativity and to promote traditional knowledge by protecting it.

Since this study employed a qualitative approach and was conducted in Peninsular Malaysia, which consists of 11 states, it is recommended that future studies should be conducted in the states of Sabah and Sarawak on Borneo Island because of their biological and cultural diversity. Moreover, Sabah and Sarawak are predominantly larger in terms of land and marine space as compared to Peninsular Malaysia. The findings of the study will most likely be more interesting from that point and there will be diverse understanding and knowledge from the diverse ethnicities. Correspondingly, future study may also employ a quantitative approach to gain more perspectives from larger samples throughout Malaysia.

From the above findings and discussions, it is recommended that the coastal communities to fully utilise such the associated TK on marine resources to improve their livelihood. These TK in the fishing method, post-harvest processing methods, as well as in the production of traditional medicines, can benefit them in the long run. It is also recommended that since the younger generation have bigger opportunity to explore their community's types of TK, experiences, and perspectives on

marine resources as a source of wealth for their economic well-being, they should consider exploring adopting this traditional practice as a source of income. It is further recommended that the findings of this study to be used by the policy makers in the Malaysia to sustainably manage the coastal and marine environment through better protection and conservation mechanism, which have huge economic potentials to the coastal communities livelihood.

Among the limitations of this study is that the interview process is unable to be conducted face-to-face due to the Movement Control Order (MCO) of COVID-19 by the government of Malaysia. It is highly possible that the findings of this study will produce more significant data if it is carried out in a face-to-face interview setting. In addition, this study was not conducted in all states in Malaysia where the Borneo area of Malaysia was not included in this study and it is possible that these findings do not represent all groups of society in Malaysia.

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APPENDIX

Interview Questions

Part 1	Perceptions of Traditional Knowledge
1.	Do you know what traditional knowledge is?
2.	Can you differentiate between traditional knowledge and modern knowledge?
3.	What is the type of traditional knowledge do you know/learn/practice?
4.	Do you believe in the benefits of traditional knowledge?
5.	What motivates you to believe/disbelieve in the benefits of traditional knowledge?
6.	What motivates you to practice/not practice that traditional knowledge?
Part 2	Traditional Knowledge on Marine Resources
1.	Do you know what marine resources is?
2.	Do you possess traditional knowledge of marine resources? If yes, what kind of knowledge is that?
3.	Do you use traditional knowledge of marine resources for medical purposes? If yes/no, why?
4.	Do you apply traditional knowledge related to marine resources in daily life?
5.	Are marine resources easy to obtain?
6.	Where can these marine resources be obtained?
7.	How are the marine resources obtained?
8.	For what purpose are these marine resources often used?
Part 3	Traditional Knowledge related to Marine Resources for Well-being
1.	Do marine resources contribute to your well-being? How is it?
2.	Have you ever used marine resources for health purposes?
3.	Do you believe that traditional knowledge related to the use of marine resources can improve health? If yes/no, why?
4.	Do marine resource availability factors influence you to use marine resources as a source of health (medicines/supplements)?
5.	Would you choose traditional or modern knowledge to improve your health? Why?
6.	Is traditional knowledge better than modern knowledge regarding health purposes?
7.	How do you see the effectiveness of the application of traditional marine resource-based knowledge in your life?
Part 4	Traditional Knowledge related to Marine Resources to Improve the Economy
1.	Do you believe that traditional knowledge based on the use of marine resources can improve the economy? If yes/no, why?
2.	Have you ever used marine resources for earning and income purposes?

3. What types of marine resources can generate income?
 4. How do you make these marine resources a source of income?
 5. If you choose, will you use traditional or modern knowledge to improve your income?
 6. Does the marine resource availability factor influence you to use the marine resource as an economical source (income/side)?
 7. Have you ever used marine resources for other purposes?
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