



## Traditional Knowledge of Marine Resources and Its Impact on the Well-Being of Coastal Communities in Peninsular Malaysia

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### ABSTRACT

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Traditional knowledge (TK) concerning the utilization of marine resources has long been employed by coastal communities for their general well-being and income generation. This study aimed to explore the potential of TK related to marine resources for enhancing the well-being of coastal populations in Peninsular Malaysia. A qualitative approach was adopted, with in-depth interviews conducted among 117 participants in the region. Data collection took place during the Movement Control Order (MCO) imposed in Malaysia due to the COVID-19 pandemic, which restricted the ability to conduct face-to-face interviews. The findings of this investigation revealed that TK associated with marine resources plays a crucial role in promoting health among coastal inhabitants. This was assessed by examining the key resources and purposes for which TK was employed within these communities. The present study has the potential to contribute to the development of new knowledge on TK practices, provide valuable information to assist coastal populations in augmenting their income and health, and serve as a reference for governments, agencies, and relevant stakeholders in recognizing the significance of TK. Future research could extend to the Borneo region of Malaysia to obtain diverse perspectives, and a quantitative approach may be employed to achieve a broader generalizability of findings concerning the relationship between TK based on marine resources and societal well-being.

## 1. INTRODUCTION

Traditional knowledge (TK) encompasses the information, skills, practices, and cultural identity that have been developed and transmitted intergenerationally within a community [1]. TK is widely practiced by earlier generations and contemporary communities, as their daily lives depend heavily on traditional practices for survival and income generation [2]. Furthermore, TK practices have considerable importance as they utilize traditional medicine derived from natural resources to enhance health [3]. Unique cultural values and social practices are embedded in TK, which contributes to the well-being of communities through the long-standing use of marine resources. TK may also be characterized as the innovation and practice of coastal and local communities worldwide, relevant for the sustainable conservation and utilization of marine resources [2, 3]. Under the Convention on Biological Diversity 1992, the use of such resources is acknowledged, subject to relevant national legislation and with the full and effective participation of coastal and local populations [4]. Conservation of marine resources promotes health, food security, employment, economic and social benefits, and environmental sustainability awareness and

knowledge.

Malaysia boasts a wealth of marine resources, and TK relates to the community's utilization of these resources. Marine resources include economically and health-valuable living organisms found in oceans, such as lobsters, fish, crabs, seaweed, and sponges [5]. Rich in vitamins and minerals, marine resources possess potential for medical, industrial, and technological applications crucial for healthcare and food supply. Local communities maintain and practice TK to improve their well-being, conserve marine resources, and protect the environment, aligning with the Blue Economy concept. In coastal countries like Malaysia, marine resources are recognized as drivers of well-being and sustainability. Coastal communities acquire TK through socio-cultural, spiritual, and environmental interactions, providing insights into diverse phenomena involving humans and natural resources. However, modern medicine's increased use has led to diminished reliance on traditional medicine [6].

The fading of TK can be attributed to numerous factors, including a lack of awareness about the importance of marine resource conservation and its traditional medicinal uses for general well-being [3]. Despite their proven effectiveness in past studies, marine-based traditional medicine remains

relatively unknown, particularly among urban communities, and is under-commercialized [7]. This highlights the need for increased awareness and research from a human perspective into marine traditional medicine. Governments should promote marine-based TK to ensure the appreciation and protection of marine resources [8]. Moreover, marine resource knowledge is an essential component of the Sustainable Development Goals (SDGs), contributing to economic resources, particularly for coastal communities. Under the Blue Economy framework, marine resources provide social and economic benefits for current and future generations by contributing to food security, sustainable livelihoods, poverty eradication, and health and well-being [9].

This study aims to identify the types and contributions of TK related to marine resources among selected coastal communities and explore their impact on the communities' lives and sustainability. Additionally, the study seeks to determine the effectiveness and importance of marine resource-based TK for traditional medicine, food, and income generation. The findings may support government efforts to conserve TK and marine natural resources. Thus, this study investigates the potential of TK on marine resources for the general well-being of coastal communities in Peninsular Malaysia.

The results reveal that TK remains relevant and essential in coastal communities' lives. Many coastal communities practice TK using marine resources for medicinal purposes, treating various internal and external ailments. Furthermore, TK has been identified as a means to improve socio-economic conditions. Through intergenerational knowledge transmission, marine resources have become not only the primary food source but also a highly nutritious one, recognized by coastal communities.

## 2. LITERATURE REVIEW

Coastal communities around the world diversify their TK in order to cope with climate and environmental changes, strategies such as maintaining genetic and species diversity in fields and herds provide a response to uncertain weather conditions, while the diversified use of the landscape, mobility, and access to multiple resources increase the capacity to respond to environmental variability and change [10]. Residents in remote villages continue to rely on TK from marine resources to feed their families as their main source of food and solutions for health issues [11]. These are attributed by the fact that residents in remote villages live have less opportunity to improve their living standards, well-being, and livelihood resources as compared to urban communities.

Marine resources can provide adequate food supply and improve the living standards of coastal communities through TK, which includes the processing and treatment methods [3]. Nevertheless, marine-based TK medicines are limited due to lack of exploration of use and knowledge of the process of developing traditional medical solutions for health, especially when it is not part of the formal healthcare framework practiced by many countries [6]. Exploring the potential use of marine resources as traditional medicine and health supplements will support the efforts to promote the use of marine resources as traditional medicine, which is typically used to maintain health and treat diseases. It has been used for many years and serve as an alternative to modern medicine [7].

The use of traditional medicine is generally higher in rural

areas, partly due to limited access to medical facilities accruing from inadequate and costly medical supplies, the lack and low motivation of medical practitioners, as well as the widespread preference of traditional medicines as having comparatively minimal side effects [12]. However, despite having been used by past generations, modern and conventional scientific medical practitioners have been avoiding traditional medicine in treating their patients due to the lack of scientific evidence [13]. It has also been highlighted that traditional medicine faces severe obstacles due to inadequate modern research [14].

This may have led to the inadequate documentation of marine-based TK in Malaysia, more predominantly concerning the advantages of traditional medicine and the related body of knowledge in Malaysia, as mentioned earlier [6, 7]. However, the findings of this study indicate that there is a substantial possibility of documenting the benefits that can be found in marine-based traditional medicine.

The potentials of capitalising this traditional medicine as a superior alternative treatment with high nutritional value has fostered a sense of trust and encouragement for the practice of using traditional medicine among users in the modern day. As highlighted by past study, the belief in traditional medicine among coastal communities on the Peninsular Malaysia East Coast has encouraged its use to enhance their well-being [3].

The recent global movement toward the development of the country's Blue Economy strategy further highlights the increasing focus on coastal resources to address various problems on marine resources and the need to manage sustainable development through local knowledge methods [15]. In Australia, a strong cultural identity promotes well-being and good socio-economic outcomes especially among indigenous people and local communities as they consider these traditions to be valuable and difficult to find in urban areas [16]. Apart from that, the development of traditional medicine is also an innovative way to reduce poverty and improve public health through its human and environmental integration that can be developed by responsible parties [17]. This is similar to a study conducted in Africa that reported the consumption of foods and other goods derived from the sea, as well as the usage of marine-based resources, will inadvertently assist in the improvement of local communities' means of subsistence and available healthcare options [18].

It is crucial to provide recommendations to coastal countries towards the sustainable use, conservation, and preservation of the marine environment fairly and equitably, especially those that depend directly on coastal resources. Good ecosystem services can support ecosystem processes such as food web dynamics that support fish populations to continue to grow and complex human processes such as fishermen using their TK of marine resources to find food supplies [19]. This suggests the relationships that form actions that can provide food and harvest so that humans can benefit from it. In the Eastern region of Thailand, where the coastal communities' resilience is being impacted by climate change due to the lack of conservation of marine resources, it has been suggested that using their TK of marine resources can provide general well-being and benefits to humans with support from the authorities [20]. Likewise, if more evidence can be gathered to support the link between marine resources and human well-being, it will assist the Malaysian government to consider this TK as a basis to further promote the sustainable use and management of marine resource. Therefore, this study will provide an understanding and potentials of TK based on marine resources

for the general well-being of the coastal communities in Peninsular Malaysia.

### 3. METHODOLOGY

In this study, the qualitative approach was employed. An important aspect of qualitative research is the use of methods that centre on the participant to better understand their own experiences, meanings, and perspectives [21]. The responses provided by the participants are unlimited to the options provided in the questionnaire, and this can be expanded through additional experiences, knowledge, and other factors related to the economic well-being of marine resource users. Additionally, this method enables the study to elicit, and to further comprehend the participants' detailed information.

In this study, 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 coastal communities' general well-being. The participants were asked about the associated use of TK related to marine resources that are considered vital for their health and sustainability. The participants' criteria were set according to the objectives, which are to study the potential use of TK related to marine resources and identify the knowledge, experience, and influencing factors in using marine resources as a source of their well-being. These in-depth interviews were used to gain experiences, expertise, opinions, and practices of marine resource utilisation by the coastal communities.

The participants were selected from people who live in coastal areas from the 11 states of Peninsular Malaysia including fishermen, and traditional medicine practitioners. This criterion was established with the understanding that these groups have direct and actual experience with the topic, which is appropriate to form their knowledge and achieve the objectives of this study, particularly in 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 participants were selected through a combination of convenience and purposive sampling. Convenience sampling is used on populations who are accessible by the researcher, and in this instance, the researcher interviewed and the participants provided the information [22]. Further, purposive sampling is known as judgmental, selective, or subjective sampling, which is a form of non-probability sampling where the researchers rely on their judgment when choosing members of the population to participate in the study [23].

The interview was conducted via telephone calls to all participants and the conversation was recorded using a digital audio tape recorder with the consent of the participants. This approach is taken to allow for a more consistent and effective transcription of the interview data. The interview questions 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 participants' feedback. The questions that followed were based on the detailed information needed by the researcher to further strengthen the findings of the study.

The purpose of using semi-structured interviews was to gather information from key informants who had experience, knowledge, beliefs, and personal thoughts relevant to the study. In this study, the interview data were analysed using thematic

analysis to identify potential practices related to TK as livelihood and source of wealth. The purpose of thematic analysis is to identify themes in important or interesting raw data and to use these themes to discuss research or to say something about a problem [24].

#### 3.1 Measurement

The Organisation for Economic Co-operation and Development identifies three pillars to understanding and measuring types of general well-being which are; 1) Quality of life, defined as the group of non-monetary attributes of individuals that shape their life chances and opportunities, and has intrinsic values under different cultures and contexts; 2) Sustainability of socio-economic and natural systems in which people live and work, which is essential for general well-being to survive over time; and 3) Material living conditions, which determine people's consumption possibilities and their command over resources [25].

The World Health Organization describes the quality of life as an individual's understanding of their role in life in the context of the community and value system in which they live and in relation to their objectives, desires, standards, and implications [26]. The culture and high values found in TK can improve the coastal communities' general well-being. The overall well-being of coastal communities; including social, cultural, and health factors, depends on multiple dimensions of access and benefits [27]. The significance of the socio-cultural and health effect on TK stakeholders should be noted as it will bring due recognition to the efforts of TK holders as well as bridge the gap between different stakeholders, highlighting the value of benefit sharing and sustainable use of marine resources.

Sustainability and general well-being depend on community activities that can influence the various types of resources (natural resources, economic, health, and social practice) that underpin well-being. There is no single determinant of individual well-being, but in general, well-being depends on good health, positive social relationships, and availability and access to basic resources [28].

Material living conditions refer to a person's standard of living expressed through three different sub-dimensions: income, consumption, and material needs [29]. The living standards of people measured in both relatives (compared to others) and in absolute circumstances (their satisfaction with the necessities of life) reflect whether people live in poverty [30]. Even for dimensions that exceed the cost of material living, the quality of life of an individual is often limited because material resources can often be transformed into well-being in accordance with the preferences and abilities of each individual.

### 4. RESULTS AND FINDINGS

As presented in the profile of the participants (Table 1), 117 participants were chosen from the coastal areas throughout the 11 states in Peninsular Malaysia. The highest number of participants are from Kedah, with a total of 13 participants. This is followed by Terengganu, Melaka, Johor, and Selangor with 12 participants each. The groups with the lowest number of participants are Kelantan and Negeri Sembilan. The findings indicated that most participants were male at 113 participants, and 4 were female. The study is also dominated

by 92 participants (78.6%), who are 50 years of age and above. This is pertinent to the fact that TK is often inherited from the older generations and passed down to the younger generation. Therefore, the older generation owned more TK inherited from their forefathers and use such knowledge for their survival. Out of the 17 participants, 115 (98.3%) were married.

58 participants (49.65%) 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 participants are Malays, while 3 participants 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 participants (88%) had completed their education at primary and secondary education. This is potentially due to low awareness of tertiary education among former generations with a limited financial source to send their children to study. This explains the number of participants in terms of occupation, where the majority of them (85.5%) worked as fishermen and earned their living through marine activities and resources.

**Table 1.** Profile of the Participants (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
	Married	115	98.3
Marital status	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	11	9.4
	Bachelor	3	2.6
Occupation	Fishermen	100	85.5
	LKIM Officer	9	7.7
	Fishmonger	5	4.3
	Traditional Medicine Practitioner	3	2.6
	Kedah	13	11.1
Location	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	

#### 4.1 Contribution of marine resources on coastal community

**Table 2.** Contribution of marine resources

Description	Frequency	Percentage (%)
Food source	106	91.0
Source of income	99	85.0
Improve health	85	72.7

Malaysia is endowed with a variety of marine resources that are essential for the survival, health, and economy of coastal communities. Table 2 shows that marine resources significantly impact and contribute to the local community's general well-being and health. A total of 106 participants (91 per cent) agreed that marine resources are the main food

source for coastal communities such as crabs, squid, and fish are the staple foods in their diet. These resources are abundant in coastal areas and can be obtained from fishmongers or fishermen.

Subsequently, 99 participants (85 per cent) stated that marine resources are their main source of income and are able to improve the economy of local communities and countries through the sale of marine resources to the public, middlemen and wholesalers. Indirectly, it has resulted in increased profits for fishermen and fishmongers. In Africa, the government strongly emphasizes the concept of the Blue Economy strategy because marine resources are a catalyst in economic growth among communities and countries such as job creation, poverty eradication, improved health, and sustainable use of marine resources controlled by governance [31]. Moreover, 85 participants (72.7 per cent) demonstrated that marine

resources could benefit health, stating that seahorses can be used to treat back pain, shrimp can be used to treat colds, and crabs can be used for skin beauty. As agreed by the participants:

“This marine resource has been the main food source in my family and basic food for a long time. As a fisherman, marine resources are no longer foreign as coastal communities live close to the sea. These marine resources do not need to be purchased from outsiders because we can get the resources ourselves” (P81, P82, P83, P107 - Fishermen).

“Marine resources are a source of income for the local community if they know how to use them. The resource can be sold and commercialised into a product and can also be raw (per kilogram). Indirectly, the economy of the local community and the economy of the country can also be improved” [(P1, P4 - Fishermen), (P24 - Traditional Medicine Practitioner), (P45, P55 - Fishmonger)].

“I believe marine resources have a huge contribution in terms of health as many local communities here are still practising for health purposes such as crabs to treat dengue and horseshoe crab to treat cancer”. In terms of effectiveness, many of the earlier people were still healthy despite their age

and were able to do heavy work.” [(P11, P17, P18 - Fishermen), (P25 - Traditional Medicine Practitioner)].

#### 4.2 Types of traditional knowledge-based marine resources for traditional medicine

Based on the TK that has been passed down from their older generations, the coastal communities have identified 16 types of marine resources that can be used as a traditional medicine to treat various diseases, as shown in Table 3. Participants have identified the types of marine resources based on their nicknames used by the local community and based on TK acquired from generation to generation. Sea cucumber is the most widely used marine resource by coastal communities to treat various diseases because they believe sea cucumber has many nutrients to improve health and well-being. In China, sea cucumber is regarded as one of the healthiest and most opulent seafood in Asia due to its relatively low fat and high protein content as well as making it a popular choice among seafood lovers [32].

**Table 3.** Traditional knowledge on the type of marine-based traditional medicine

Marine Resources	Illness/Traditional medicine	Frequency	Percentage (%)
Sea Cucumber ( <i>gamat</i> )	Sea cucumber oil, attach the bones, wound healing, maternity wounds, cosmetic product	64	54.7
Crab ( <i>ketam</i> )	Dengue fever, high blood pressure, malaria, chikungunya	57	48.7
Shrimp ( <i>udang</i> )	Asthma, flu, cough	28	23.9
Seahorse ( <i>kuda laut</i> )	Asthma, haemorrhoids, back pain	25	21.4
Horseshoe Crab ( <i>belangkas</i> )	Cancer, muscle endurance, skin beauty, white blood cells, spinal fluid, HIV	25	24.4
Squid ( <i>sotong</i> )	Facial skin beauty, asthma, cough, body swelling	13	11.1
Seaweed ( <i>rumpai laut</i> )	Internal health, beauty products, wound healing, vitamins	12	10.3
Shells ( <i>kerang</i> )	Adding blood	8	6.8
Mudskippers ( <i>ikan belacak</i> )	Vein medicine, strengthen the inner energy of man	7	6.0
Sea potato ( <i>bronok</i> )	Internal energy strength	6	5.1
Flying fish ( <i>ikan terbang</i> )	Asthma	4	3.4
Tembiring fish ( <i>ikan tembiring</i> )	Itching, asthma, skin beauty	3	2.6
Coral reef ( <i>terumbu karang</i> )	Coral disease, abscess/boils	3	2.6
Jellyfish ( <i>obor-obor</i> )	Internal energy strength	2	1.7
Dolphin ( <i>ikan lumba</i> )	Night urine medicine, asthma	1	0.9
Dragon fish ( <i>ikan naga</i> )	Asthma	1	0.9

The nutrients found in sea cucumber can be used as medicinal oil to treat external wounds, maternity wounds, encourage healing and broken bones, while some participants use sea cucumbers in cosmetics. In Langkawi, there are a variety of traditional medicinal products made from sea cucumber, which is one of the more accessible tourist attractions. Additionally, they have grown accustomed to utilising these marine resources because some resources are only accessible from the coast. They inherited this knowledge from past generations, which demonstrated beneficial health effects. Marine resources can be used as a traditional medicine to cure diseases and as a substitute for conventional medicine available in the market, as well as provide benefits for marine resources developed as health solutions in the future [6]. Additionally, past generations used this marine resource as medicine due to its easy preparation, which includes frying, boiling, made into soup, and eaten raw. As stated by participants:

“Sea cucumber has various health benefits, and it can cure

various diseases. Not only can it be used to treat diseases, but it can be used as a beauty product. Sea cucumber is also easily available and is sold among traditional medicine practitioners” [(P5, P6, P16, P31, P61, P73 - Fishermen), (P22, P24, P25 - Traditional Medicine Practitioner), (P67, P71 - LKIM Officer)].

“TK based on marine resources for health gained from previous generations is very beneficial and relevant to use today. We also learned methods to process ingredients into medicines and can be used in many ways such as fried and boiled” [(P39, P40, P45, P53, P67 - Fishermen), (P46, P55 - Fishmonger)].

“The TK gained from the ancestors provides many benefits especially to the coastal community because the nutrients found in the marine resources themselves can provide well-being to us. The knowledge we gain is used as medicine in our daily life and the preparation to make it is also not difficult” [(P78, P86, P88, P107, P112 - Fishermen)].

However, sea cucumbers are now difficult to obtain and becoming extinct, and the number of sea cucumbers is also declining in coastal areas in Malaysia. In addition, this is also due to coastal erosion done by the community which causes a negative impact on marine resources. As stated by the participants:

“Nowadays, sea cucumbers are difficult to obtain because they are becoming extinct, and they need to get the source from other locations such as Thailand. In addition, there is also the exploitation of marine resources which has resulted in a depletion of various resources.” (P21, P26 - Fishermen).

“Coastal erosion that exists today is also a cause of declining marine resources because there are communities that engage in illegal activities such as using equipment to catch the resources that are not allowed by the government.” [(P27, P59, P71 - LKIM Officer), (P67, P77 - Fishermen)].

Consequently, there are marine resources that are found to have similarities in terms of nutrition and disease treatment. These include shrimp, seahorse, squid, flying fish, *tembiring* fish, and dragonfish, all of which have the potential to be used as a treatment for asthma in both adults and children. In the past, people suffering from asthma relied on these marine resources to help them reduce or even cure their symptoms. Marine resources can also be used to treat diabetes through consistent consumption of fish oil which has been proven to lower down the sugar level [33]. These resources are processed into medicine in a variety of ways due to the higher value put on traditional products, which are only derived from natural sources and do not contain chemicals.

Marine resources are not merely used for medicinal purposes but can also be used in cosmetics for skin improvement. In the past, products to enhance skin appearance were scarce, and this led the older generation to concoct their own remedy from marine natural resources. It was first dried thoroughly in the sun and subsequently crushed into powder form before it could be applied to the facial or body skin. This traditional method has been passed down to the present generation and has proven to work well.

Additionally, coastal communities have worked extremely hard to survive. Majority of the people who live in coastal areas are dependent on marine resources for both their means of subsistence and their daily food supply because these resources are readily accessible in coastal areas [2]. This requires them to be highly energetic and in good health to explore and exploit the marine natural resources. According to the participants, they consume seaweed, sea potato, and jellyfish daily as supplement to maintain their energy and good health. These sources contain nutrients that have been used to sustain human nutrition since ancient times. However, the resources are becoming increasingly difficult to obtain in the wild since they are mostly endangered, if not extinct.

#### 4.3 Marine-based traditional medicine and modern medicine for health and medical purpose

Table 4 shows that most participants (53.0 per cent) agreed that traditional medicine based on marine resources is natural, chemical-free, and has fewer side effects than modern medicine. This is because traditional medicine is concocted locally by persons who are familiar with the ingredients and dosage, such as sea cucumber medicinal oil that can be used to treat wounds, and crab soup that can be consumed to treat dengue fever. Moreover, 39 participants (33.3 per cent) agreed that this traditional medicine does not require high costs and is

much cheaper to find and used for medicinal purposes. They can obtain these marine resources for traditional medicine purposes by capturing or purchasing them from fishermen and fishmongers. As stated by the participants:

**Table 4.** Marine-based traditional medicine and modern medicine for health and medical purpose

Description	Frequency	Percentage (%)
<i>Traditional Medicines</i>		
No chemicals, fewer side effects, natural	62	53.0
Low cost	39	33.3
Lack of resources, difficult to get	27	23.1
Not bound by law/policy	4	3.4
<i>Modern Medicines</i>		
Monitored by MOH (KKM) Clinic, Hospital	34	29.1
Suitable for serious illness	13	11.1
There are side effects	9	7.7
High cost	7	6.0

“Traditional medicine among the local community is made from natural ingredients and does not have chemicals. Therefore, traditional medicine has fewer side effects that are detrimental to health. In addition, this traditional medicine also requires low cost only because the source is easily available in coastal areas and purchased from traditional medicine practitioners” [(P1, P4, P8 - Fishermen), (P22, P24 - Traditional Medicine Practitioners), (P14, P94 - Fishmonger)].

“Resources made into traditional medicine can be obtained from fishermen who capture marine resources. In addition, the source can also be purchased from fishmongers on the coast. It is cheap and easily available for health purposes and can be eaten.” [(P45, P55 - Fishmonger), (P72, P87 - Fishermen)].

However, 27 participants (23.1 per cent) asserted that traditional medicine is difficult to obtain in the modern era due to a scarcity of resources, particularly in urban and suburban areas such as jellyfish and seahorses that are becoming extinct. Marine resources are now becoming extinct as there are endangered species and the local community is having a hard time getting them to be used as a source of medicine and food supply [34]. Traditional medicine is only available in a few village areas and coastal areas such as sea cucumber that has been processed into sea cucumber oil and sold to the local community by traditional medicine sellers. Additionally, a small number of 4 participants (3.4 per cent) stated that traditional medicine is not governed by law and can be used anytime and anywhere because it does not require permission from government bodies. As stated by the participant:

“Due to the scarcity of traditional medicine’s resources, it is becoming increasingly difficult to locate. As a result, many people have abandoned traditional medicine in favour of modern medicine. Additionally, modern medicine is not governed by any laws and is not regulated by the government.” [(P5, P109 - Fishermen), (P58 - LKIM Officer)].

Besides, 34 participants (29.1 per cent) believe that modern medicine is superior because it is regulated by government agencies such as the Malaysian Ministry of Health. Some professional doctors will confirm the diagnosis and prescribe the necessary medications. Modern medical facilities are also available at nearby clinics and hospitals. Moreover, 13 participants (11.1 per cent) said that modern medicine is more suitable for serious diseases such as cancer and heart disease than traditional medicine is more suitable for treating mild

pain only. Furthermore, nine participants (7.7 per cent) agreed that modern medicine has side effects because there are chemicals that may be harmful to health if taken over a long period. Seven participants (6.0 per cent) also reported that modern medicine requires higher costs than traditional medicine. Since the coastal communities frequently lack the financial ability to purchase modern medicine, they are likely to prefer traditional medicine over modern medicine.

#### 4.4 Participants' perceptions of traditional knowledge-based marine resources for medical purposes

As illustrated in Table 5, the findings demonstrate the belief in the benefits of TK based on marine resources. A total of 95 participants (81.2 per cent) believe that TK derived from marine resources can enhance internal health such as sea potatoes that can replenish and supply internal energy to do daily tasks and external body health such as seahorses that can treat back pain. This is because marine resources are natural and do not contain any chemicals that could be harmful. Additionally, past generations have demonstrated that marine resources such as sea cucumbers, crabs, and seahorses contain nutrients that are probably not available in modern medicine. On the other hand, they believe in TK because it has been passed down through generations and has developed into a tradition. Coastal communities prefer this traditional way of life because it is viewed as a very complex process, which suggests that TK is a crucial source of information in policy-making [35]. Some participants said:

“We need to believe that the TK acquired from generation to generation (ancestors) has its benefits and can be used for health because the past people have used it and it is effective. Marine resources are also good because they are the main resources among coastal communities” (P12, P18, P56 - Fishermen).

“Marine resources that are obtained and processed are safer and more natural because they do not contain any potentially harmful chemicals. Additionally, we are more confident in its use and believe it can be used in the long-term and can treat internal pain as well as external pain” (P101, P104, P107, P108, P112 - Fishermen).

“Marine resources such as sea potatoes and jellyfish can provide external and internal health because they can boost energy for us to be healthier. When the body is healthy, we can also do daily work more easily and its effectiveness should also not be doubted because past generations have practised it and it is effective among our local communities” [(P12, P55 - Fishmonger), (P88, P98, P99 - Fishermen)].

However, some participants do not believe in TK, and they assumed that TK on the benefits of marine resources in healing illnesses is less effective than modern medicine, which is more advanced and faster in terms of healing and improving general health and well-being. As stated by the participants:

“I do not believe in TK because in this modern age we have to follow the passage of time and not many people still practice TK” (P10, P58, LKIM Officer).

“The TK acquired by the coastal community should be applied to more sophisticated technology, as it saves time and eliminates the need to process raw materials manually. Additionally, modern technology is more convincing in terms of health because it is monitored by government agencies” [(P62, P63, P70 - LKIM Officer), (P106, P113 - Fishermen)].

Apart from that, a small number of participants (1.7 per cent) lack of information about TK related to marine resources

because they were not exposed to and did not participate in traditional ways among coastal communities. Furthermore, they are less interested in traditional methods because they are more confident in modern knowledge that follows the passage of time. As quoted from the participants:

“I do not have a lot of information about TK because I was raised in a household where traditional methods were not practised very often. Additionally, traditional methods have piqued my interest less because I believe modern knowledge has numerous benefits that can be applied to human life.” (P68, P71 - LKIM Officer).

**Table 5.** Perception towards traditional knowledge on the benefits of Marine Resources as Traditional Medicine

Description	Frequency	Percentage (%)
<i>Belief</i>		
Body health	95	81.2
Heredity/traditional practices	76	65.0
<i>Disbelieve</i>		
Less effective	5	4.8
Lack of knowledge	2	1.7

#### 4.5 Reason to practice the traditional medicine based on traditional knowledge

**Table 6.** Reasons to practice the traditional knowledge as traditional medicine

Description	Frequency	Percentage (%)
<i>Practice</i>		
Used for health	90	76.9
Source income	39	33.3
Heredity	33	28.2
Low cost	7	6.0
Low education	6	5.1
Traditional medicine practitioner	3	2.6
Resources are readily available	2	1.7
<i>Not Practice</i>		
Hard to find / no resources	7	6.0
Technology is getting more sophisticated	3	2.6

According to Table 6, this study reveals the factors that influence the use of traditional medicine based on TK on the coastal communities in their daily lives. 90 participants (76.9 per cent) indicated that they applied TK on the benefits of marine resources for health and well-being purposes in their lives. It is possible to produce healthy products from marine resources by utilising TK. In Spain, traditional medical knowledge becomes a primary choice in the health system because its potential is enormous if these traditional traditions are protected [36]. Additionally, traditional medicine is still in demand among coastal communities for treating diseases such as “coral” disease, which can be treated by using. Apart from that, 39 (33.3 per cent) participants use TK for income and subsistence purposes through the sale of marine resources sold along the coast and at fishermen markets. Therefore, some statements from participants are required:

“My family and I rely on marine resources for our health and well-being. Almost all of these marine resources are natural, and they contain a variety of nutrients that we can utilise for the human body. This practice should be passed

down to future generations so that they are aware of the benefits of marine resources.” [(P8, P11, P31, P38 - Fishermen), (P25 - Traditional Medicine Practitioner)].

“Marine resources can be consumed in a variety of ways, including fried and boiled, but they can also be used as a food product or food supplement. I believe that coastal communities are capable of processing such raw materials because of the TK that they have accumulated over time.” [(P22, P24, P25 - Traditional Medicine Practitioner), (P26, P33 - Fishermen), (P45 - Fishmonger)].

“Traditional medicine that is based on TK is still relevant and in demand in our society today. It has the potential to be used as a health product before being sold for a profit. In most cases, these products or raw materials are sold on beaches and markets” [(P76, P79, P90, P110 - Fishermen), (P93 - Fishmonger)].

Furthermore, 33 participants (28.2 per cent) continue to practise TK learned orally and practically from their ancestors to help strengthen their immune system. Additionally, seven participants (6.0 per cent) stated that TK does not require as much cost and effort to acquire as modern knowledge does, it can be discovered and acquired by members of the local community. Some participants said:

“Today, TK passed down from ancestors about the benefits of traditional medicine is still practised because marine resources contain certain nutrients that can help to boost the immune system of the human body. We do not have to rely solely on modern medicine to maintain our health.” [(P22, P24, P25 - Traditional Medicine Practitioner), (P88, P107 - Fishermen)].

“TK is not expensive to acquire, as most coastal communities in this region have their knowledge of traditional medicines. We can only learn from past generations for free, in contrast to modern knowledge and modern medicines, which are expensive and high costs.” (P1, P4, P6, P11, P13, P15, P29 - Fishermen).

Aside from that, there are 3 participants (2.6 per cent) who are still practising TK because they are practitioners of traditional medicine. They have a sea cucumber processing plant on the Langkawi Island. According to them, sea cucumbers are in high demand both domestically and internationally. This can be supported with an earlier view who noted that TK presents commercial potential locally and internationally and specific cultural and social values to local communities that contribute to the general well-being [37]. As stated by the participants:

“TK based on marine resources should also be practised among the younger generation. Various nutrients and benefits can be obtained. This TK is not only good for health but can also be the main focus in business and generate income due to high demand in the market” (P22, P25 - Traditional Medicine Practitioner).

However, a minority of participants do not practise TK due to a lack of resources to obtain traditional medicines in the modern era. According to participants, modern knowledge/medicine is more accessible nowadays, such as through clinics and doctors. Furthermore, TK is less helpful today due to the sophistication of modern technology in medicine, such as machines created and enhanced with the expertise of physicians. Thus, society nowadays no longer needs to rely on traditional medication or traditional methods to treat diseases. As quoted from the participants:

“Traditional medicine is becoming increasingly difficult to obtain due to dwindling resources, and only a small number of

people continue to practise it. Perhaps, only a few people continue to use it solely through the purchase method. Many people are already turning to modern medicine because of its more readily available resources.” [(P57, P59, P66 - Fishermen), (P70 - LKIM Officer)].

“TK is already less relevant to use because nowadays there is much-sophisticated equipment that is capable of treating various diseases and more convincingly. Modern medicine is also readily available such as clinics and hospitals.” [(P27, P58 - LKIM Officer), (P55 - Fishmonger), (P104, P116 - Fishermen)].

#### 4.6 Sources of information on traditional knowledge for medicinal purposes

According to Table 7, a total of 66 participants (56.4 per cent) inherited their TK in traditional medicinal process and fishing methods from their predecessors. The coastal communities continue to adopt TK as their primary source of information. The significance of TK can be explained by the need for a more critical understanding, particularly in contemporary society, and the restoration of the value of TK passed down from past generations in order to create more sustainable living conditions [38]. Their TK was gained verbally and through practice where they were taught from young about the benefits found in marine resources. They were also taught about methods of processing marine resources to traditional medicine that have health properties, such as shells as blood enrichment and mudskippers as male aphrodisiac.

In addition, a small number of participants obtained information on TK from medical doctors. Medical professionals educate them about the benefits of TK and how it can be used to benefit the human body without being abused. They also gain TK information through seminars and courses conducted by the Malaysian Fisheries Development Authority on the capture of marine resources and improving their family economy.

**Table 7.** Sources of information on traditional knowledge for medicinal purposes

Description	Frequency	Percentage (%)
Parents, family, grandparents	66	56.4
Villagers, friends, local community	35	29.9
Social media, newspaper	15	12.8
Own experience	10	8.5
Medical doctor	2	1.7
Courses, Seminars	2	1.7

As discussed earlier in this study, all the above is the main findings for this objective to investigate the potential of TK on marine resources for general well-being among coastal communities.

## 5. CONCLUSIONS

According to the findings, there is high possibility of using TK as primary general well-being either as traditional medicine or supplement. This may broaden opportunities for their coastal communities to improve their health while increasing their access to a natural and sustainable food supply. It is possible that these applied practices and socio-cultural

values ingrained in their lives, such as the traditional medicine process, can be a catalyst to their general well-being and survival. The coastal communities may use this marine-based TK to increase their income.

In this era of globalisation and modernisation, the coastal communities should not be left out in health care such as taking modern medicines and getting treatment in clinics and hospitals. However, this study has proven that the majority of these communities choose to treat their illnesses and maintain their health using traditional medicine. The wealth of marine resources in Peninsular Malaysia has produced a variety of traditional medicines that can treat diseases in the community. The ability of this traditional medicine to be utilised as a high-quality alternative treatment with high nutritional value has fostered a sense of trust and encouragement for the practice of using traditional medicine.

The findings of this study provide further explanation that the belief component is not the only reason that drives this practice, but also indicates that the behaviour, experience, and intention factors are collectively drivers for TK practices. In general, these traditional medicine practitioners search for medicinal resources on the coasts, which is not far from home and are easy to access due to the abundance of these resources. Following that, one of the things that contributed to the continuation of this practice is the use of TK, which is the knowledge that is affordable and simpler to acquire in comparison to both modern components and imported products.

Looking at this development, it is worth noting that the market for traditional medicines can be sustained because the community has begun to prefer natural products, especially products based on marine resources, over modern medicines that may contain harmful chemicals. It has generally been accepted the consumption risk of traditional medicine is low because they have been used and practiced by the community for generations for personal care and health practices.

In terms of theoretical implications, this study has the potential to contribute to new knowledge development on the use of TK on marine resources by coastal communities for their general wellbeing. Since TK based on marine resources are less documented, it necessitates the effort to conduct more studies related to TK from many parts of the world, including Malaysia. The current study adds to the literature pool on the potential use of TK for improving health. From a practical point of view, this study provides important information to encourage the coastal communities to use marine-based TK for their subsistence. In addition, the knowledge of the potential use of TK may also increase awareness among the younger generation to embrace this tradition and expand its potential. In terms of management implications, this study can be a source of reference to governments, agencies and relevant stakeholders in determining the importance of TK to continue to be preserved and protected.

Given that this study used a qualitative approach and was conducted in Peninsular Malaysia, which consists of 11 states, it is recommended that future studies may consider the states of Sabah and Sarawak due to their more diverse biological resources and culture. Moreover, Sabah and Sarawak are mostly larger in terms of land and marine space than Peninsular Malaysia. The findings of the study obtained will most likely be more interesting where a diverse understanding and knowledge of different ethnicities and cultures can be developed. In line with that, future studies could also use a

quantitative approach to gain more perspectives from a larger sample across Malaysia.

Practically, the current findings recommended for the coastal communities to make full use of TK related to marine resources to improve their health and living standards. TK of fishing methods, 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 has a greater opportunity to explore the types of TK, experiences, and community perspectives on marine resources for their general well-being, they should consider exploring and practising this TK. It is further recommended that the findings can be used as the basis by the Government to sustainably manage the coastal and marine environment through better protection and conservation mechanisms.

In terms of managerial implications, the strategies that can be improved such as communication between two parties involving the government and the community. This is due to the fact that many communities are still unaware of the significance of conserving biodiversity and TK, which must be sustainably protected. Additionally, it would also encourage consumers to practise traditional medicine for their health and wellbeing. The government should also assist those who continue to carry out this knowledge in employing marketing strategies. Consumers will be provided with information and understanding about traditional medicine through marketing, and this will allow the tradition that has been practiced up until now to continue. Marketing strategies are essential to significantly impact all communities. This marketing strategy of TK based on marine resources would also be able to increase the Growth of Domestic Product (GDP) and eradicate poverty. When consumers become more aware of the benefits of marine-based traditional medicine, it will consequently increase the practice, which will motivate the community to improve their economy.

Furthermore, the findings can be a source of reference for the Government to improve existing policies and for stakeholders to preserve TK related to marine resources. It requires serious consideration to ensure that the TK and the natural resources are sustainably managed. The local communities will be more inclined to practise TK based on marine resources if they are more aware of the benefits of traditional medicine. Similarly, the Government must also boost promotion on the marine-based traditional medicines by highlighting on the health properties and high national values.

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