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Potentials of associated traditional knowledge on marine resources for economic and general well-being among coastal communities in Terengganu, Malaysia

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ABSTRACT

This study was conducted to explore the potential of associated traditional knowledge on marine resources for the sustainability of economic and general well-being among coastal communities in Terengganu. Using a qualitative study, twenty-six interviews were conducted. The study used convenience and snowball sampling to identify the other potential participants who had knowledge and experience about the topic. The study used thematic analysis to identify the required themes according to the objectives. Drawing upon sustainable livelihood theory for data interpretation, the findings indicate that traditional knowledge of marine resources plays an essential role in achieving economic well-being for the coastal community in Terengganu. This is viewed from the aspect of increased living standards and improved health quality. Although exploration of traditional knowledge on marine resources is limited among the modern generation, the implications of this study highlight that identification of certain marine resources as traditional medicine for health problem solutions, selling fresh marine resources, and production of processed food from marine resources could offer ways to improve the economy of coastal communities. The study was carried out during the Covid-19 pandemic, which had limited the number of participants interviewed. Therefore, the sample size obtained is relatively small to find more significant results. Future studies can be expanded through quantitative approach methods among traditional medicine practitioners and other communities in different regions that use marine resources in their daily life.

1. Introduction

Traditional knowledge refers to the knowledge, innovation, and practice of coastal and local communities around the world, and for the purpose of this study are those relevant for the conservation and sustainable use of marine resources. The use of such resources is respected and subject to the relevant national legislation in the implementation of the Convention of Biological Diversity in 1992, with the full and effective participation of coastal and local communities (UNDB, 2020). According to the WIPO (2020), traditional knowledge is the information, know-how, skills, and practices developed, defended, and passed down from generation to generation in a community, which is often part of its cultural or spiritual identity.

As noted by Raymond-Yakoubian et al. (2017), traditional knowledge is an integral part of the broader knowledge structure of the coastal communities and combines personal experience with oral traditions. Developed from centuries of experience and adapted to the local culture and environment, it has been obtained and used by coastal communities through long-term socio-cultural, spiritual, and environmental engagement. It provides insight related to a variety of human and non-human phenomena. The traditional knowledge in Indonesia was not allowed to leave their place of origin, but in tandem with the recent development, the local communities have begun to pass on their traditional knowledge of natural resources to be

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developed into a national economic resource and increase their income (Aryanto, 2014).

Malaysia is rich with marine resources and traditional knowledge related to the use of marine resources. Marine resources include living organisms found in the oceans which have monetary and health value such as lobsters, fish, crabs, seaweed, and sponges (Nova et al., 2020). Marine resources have great potentials to be used as a source of wealth and are highly valuable to improve general health, which may also enhance the economic well-being among coastal communities if properly developed into products such as traditional medicine, health supplement, and cosmetics. As noted earlier by Cavanagh et al. (2016), the position of marine resources is vital for their contribution to the world communities' health and economic well-being.

Coastal communities are groups of people (fishermen, fishmongers, local people, etc.) who live together to inhabit the coastal areas form and have a distinctive culture associated with its dependence on the utilization of marine resources. The coastal communities are constantly developing and adapting their intangible cultural heritage, including traditional knowledge and practices related to nature as well as social practices, to address basic needs and social issues. Traditional health care practices, local culture, and knowledge delivery systems play important societal roles in achieving social development and general well-being. The global communities have developed diverse knowledge related to health practices, providing effective and affordable therapy, through the use of local natural resources including endemic herbs, spices, and marine resources. Experts have been using these natural resources for public healthcare since a thousand years ago.

Hence, this has led to two research objectives for this study. The first objective is to examine how the coastal communities used their traditional knowledge as a new source of wealth to enhance their economic well-being, and the second objective is to identify the factors leading to the practice of traditional knowledge on marine resources among the coastal communities for their general well-being.

1.1. Underlying problem

Despite its potential to increase economic resources and general well-being has been acknowledged and the coastal communities have in fact be relying on them, proper documentation on how the traditional knowledge on marine resources may benefit them is still lacking (Fui et al., 2014). This is crucial since traditional knowledge is gradually diminishing in this modern society although many laws have been enacted to show increasing recognition of its importance (Pauchard, 2017). According to Akbar et al. (2016), traditional knowledge is also affected by the increasingly sophisticated technology, globalization of new cultures, and international trade that are collectively contributing to a lack of awareness of the importance of traditional knowledge.

Noting the importance of institutional, socio-cultural, and economic factors in the application of traditional knowledge and management of the natural environment. Sutinen et al. (2000) lamented on the increasingly neglected traditional knowledge, which may otherwise be utilized to improve the economy and general well-being of the local communities. Likewise, although marine resources have been proven to have many benefits and nutrients, the associated traditional knowledge on their use is currently being less applied (Gibson, 2016). Although the local communities strive to defend traditional values or traditions, the challenges of modernization are inevitable. Due to many factors, some traditional knowledge has become extinct or gradually ignored, including the lack of understanding of the value of retaining such traditional knowledge. This was confirmed by Venables (2016), who mentioned that those practicing and maintaining traditional knowledge are mostly the older generations.

As an important foundation for economic development and general well-being, the expansion of marine resource use is growing globally, which, correspondingly, shows an increasing role in the coastal countries' socio-economic development. In Malaysia, marine resources that are nutrient-rich have the potentials to be developed as new sources of wealth among the coastal communities based on the traditional as well as new knowledge they possess (Masnan, 2012). Therefore, it is crucial for Malaysia to capitalize on traditional knowledge on the use of marine resources.

As highlighted by Song et al. (2020), many coastal countries are greatly concerned with their economic development leading to a growing focus on the sustainable use of marine resources. Coastal countries are constantly making decisions and plans for the strategic advancement of their marine resources to achieve their rational use. Thus, Malaysia must also take an active role in ensuring sustainable use of its marine resources contributing towards the livelihood of the coastal communities.

1.2. Traditional knowledge and marine resources

According to Finetti (2011), traditional knowledge embodies the information that embraces the whole culture of a local community based on traditions, which have been transmitted through generations. Traditional knowledge is essential because it helps people to use natural resources without biodiversity degradation, calling for moves to safeguard the traditional knowledge more strictly (Chun, 2014). This is emphasized by the view made by Sangha et al. (2018) that local people practicing traditional knowledge are able to maintain, recollect, or revive the relationship with their lands.

Marine living resources are defined as marine-related organisms (flora and fauna), their behavior, and their interactions with the environment that

may or may not be direct (Luypaert et al., 2020). The conservation of marine resources contributes to food security, job creation, economic and social benefits, cultural exchange programs, as well as awareness and knowledge of environmental sustainability. More than 3 billion people worldwide rely directly on marine resources from the oceans and coastal biodiversity for their livelihoods as their primary source of protein (Chen et al., 2020). The nutrient and compounds found in these marine resources can also be used as supplements and have health properties, such as anti-diabetes and antioxidants.

Coastal areas provide important habitat for large numbers of commercially valuable marine species. However, habitat loss, pollution, and overfishing have reduced the population and diversity of coastal fish and other marine animals. Maintaining healthy coastal ecosystems and biodiversity is crucial for the sustainable development of coastal resources as well as the economic and general well-being of the current and future generations. For decades, the livelihood of the coastal populations and the economy of the country depends on coastal and marine resources based on traditional knowledge practices among coastal communities. Communities are always finding ways to systematize and communicate their knowledge, life skills, and competencies especially those related to the natural and social environment.

Since most traditional knowledge and traditional delivery methods are being actively used among the coastal communities, modern education must not exclude this rich traditional knowledge on the associated use of marine resources, which are closely linked to the cultural identity of the local communities in Malaysia. This intangible cultural heritage should therefore be safeguarded and promoted, through inclusion in the school curriculum among others, to nurture the love for conservation and sustainable use of natural resources.

1.3. Economic and general well-being

Malaysia is considered one of the most prosperous countries in Southeast Asia, partly because of its rich marine resources, which have become an essential source of income for coastal communities and those involved in fisheries, and fishery-related industries. It also allows Malaysia to maintain its position as an outstanding tourist destination contributing towards economic growth, which directly improves the livelihood of the local communities (Masud et al., 2017). Marine biodiversity provides various benefits in terms of fisheries and seafood, ecotourism industry, coastal protection, climate control, and nutrient recycling. CSWE (2016) defined economic well-being as having financial security in the present and the future. Existing financial security includes the ability of individuals, families, and communities to consistently meet their basic needs (including food, housing, healthcare, transportation, and education). It also includes the ability to make economic choices and feel a sense of security, satisfaction, and personal fulfillment with employment pursuits.

The concept of general well-being in this study is based on OECD (2020), which refers to the material living conditions, which determine people's consumption possibilities and their command over resources. According to Qodriyatun (2013), coastal communities have sourced their income from fishing and other marines. To encourage the coastal communities to their traditional knowledge on the associated use of marine living resources to improve their economic and general well-being, education, and training programs should be carried out in cooperation with the local authorities and NGOs to raise awareness especially among young people on the protection of traditional knowledge on marine resources.

Traditional knowledge is used to maintain the community and its culture and to preserve the marine resources required for the continued survival of the community. Within the context of international trade, traditional knowledge and culture present economic opportunities, a particular cultural and social value relevant to local communities (Gibson, 2016). More than three billion people worldwide rely on marine and coastal biodiversity for their livelihoods, which shows that marine living resources have become a vital contributor to sustainable economic growth (Masud et al., 2018). According to Song et al. (2020), the coastal communities have developed a unique system within their culture that encompasses social and economic aspects to establish well-being in life while protecting marine resources and climate change.

2. Research methodology

Most traditional knowledge practices are derived from the older generation that has been passed down, which explains the need for a qualitative research approach that allows researchers to identify the experiences, beliefs, and types of knowledge of participants based on their own words. This can ensure that the data collected for this study can provide more data richness in explaining the processes involved in the development of knowledge and application of traditional knowledge based on marine resources for economic and general well-being among coastal communities.

Qualitative methods are chosen because in-depth understanding is needed to investigate the potential of marine resources as financial resources and general well-being that can increase household income, livelihood, and can improve general health based on the traditional knowledge that has been passed down from generation to generation. This situation shows that the use of qualitative research is suitable to be used to achieve a deeper understanding of research issues by exploring knowledge, experience, perception, and belief among

participants on the use of traditional knowledge on marine resources in the context of this study.

The scope of this study is the coastal areas of Terengganu, on the east coast of Peninsular Malaysia. This study was conducted in Terengganu because the state has large coastal areas with multiple marine activities that have bigger potentials to obtain appropriate data. A total of 26 in-depth interviews with fishermen and fishmongers were conducted involving six coastal villages: Batu Rakit, Tok Jembal, Seberang Takir, Pulau Duyong, Penarik, and Marang. The location was chosen based on several factors namely: coastal areas, distance, the suitability of places to interact, and the barriers of movement and face-to-face encounters due to the Covid-19 pandemic. The participants were selected among coastal communities that live and engage in socio-economic activities related to marine resources.

The participants were also selected from coastal districts with the potential to answer questions. Snowball and convenience sampling methods were also applied in this study, where some participants have recommended friends or those who have knowledge or experience with traditional knowledge as potential participants in this study. The use of snowball approaches would ensure that knowledge is gathered from essential people who are close to the issues being studied.

Data were collected via face-to-face, semi-structured interviews to enable a researcher to use both open and close-ended questions as well as to communicate closely with participants and also to observe non-verbal responses from participants so that the context of the answer could be thoroughly investigated. Open-ended questions were considered crucial for this study to explore and gather adequate information regarding traditional knowledge based on the experiences and understanding of the participants.

The questions for the interview (Appendix A) session were formulated based on the literature review. Each interview session lasts about twenty to forty minutes. The interviews were recorded using a digital voice recorder and were subsequently transcribed into a Microsoft (MS) Word document. Notes taken during the interview were also added to the document to get an overview of each interview. Subsequently, thematic analysis was used to identify the theme according to the objectives of the study.

3. Results and discussion

The demographic characteristics of the participants are shown in Table 1. The age group aged between 60 and above formed the largest number of participants (42.3%). This group of community gained more knowledge and experience of traditional knowledge on marine resources earlier as compared to the younger generation. While the majority of the participants earn below RM1,000.00 (57.7%), there is 1 participant (3.8%) who earns more than RM5,000.00 by selling fish-related products and operating two sundry shops. In terms of ethnicity, 100% are Malays. 15 participants (57.7%) have secondary education. In terms of employment, 15 participants (57.7%) are fishermen, while 11 participants (42.3%) are fishmongers.

Table 1: Demographic characteristics of the participants

Characteristics	Frequency	Percentage (%)
Gender		
Male	19	73.1
Female	7	26.9
Age		
18 and below	0	0
19-29	0	0
30-39	1	3.8
40-49	6	23.1
50-59	8	30.8
60 and above	11	42.3
Marital Status		
Single	0	0
Married	24	92.3
Divorce/Widow/Widower	2	7.7
Income		
RM1000 and below	15	57.7
RM1001 – RM2000	10	38.5
RM2001 – RM3000	0	0
RM3001 – RM4000	0	0
RM4001 – RM5000	0	0
RM5001 and above	1	3.8
Ethnicity		
Malay	26	100
Education		
Primary school	9	34.6
Secondary school	15	57.7
Certificate/diploma	2	7.7
Employment		
Fishermen	15	57.7
Fishmonger	11	42.3
Location		
Batu Rakit	7	26.9
Tok Jembal	6	23.1
Seberang Takir	5	19.2
Pulau Duyong	2	7.7
Penarik	3	11.5
Marang	3	11.5

Based on Table 2, the coastal communities believe that the traditional knowledge on the associated use of marine resources can become a source of income for coastal communities. This is encapsulated through the following response:

"Marine resources can be used to generate income, especially traditional medicines. Traditional medicines made from marine resources can be sold to the public, such as sea cucumber medicine (ubat gamat), but for the process of making traditional medicine is longer and many ingredients need to be used." (P3, Fishmonger)

Table 2: Traditional knowledge of the marine resources to improve the economic

Description	Frequency	Percentage (%)
Availability of MR as an economic source	21	80.8
Belief in TK can improve economically	20	76.9
MR for earning an income	19	73.1

MR=Marine Resources; TK=Traditional Knowledge

The opportunity to sell marine resources is viewed as part of its potential for economic achievement. This corroborates a previous study that reported that the value of marine resources can be used as a financial source among coastal communities if the traditional knowledge can be truly utilized (Masnan, 2012). 80.8% of the participants stated that accessibility factors to use the marine resources for the purpose of obtaining a fixed source of income and secondary income. 76.9% of participants believe that traditional knowledge on the associated use of marine resources can increase their economy, and 73.1% use traditional knowledge to gain profits such as selling marine resources to the public as traditional medicines.

Based on Table 3, seven types of marine resources are mostly sold-fish, squids, sea cucumbers, crabs, shrimps, seahorses, and eels. Coastal communities agreed that the fish is their main source of income (100%), followed by squid (84.6%), sea cucumber (80.8%), crabs (73.1%), shrimp (69.2%), seahorses (53.8%), and eels (26.9%), which normally sold fresh from the ocean, processed into seafood processed food or processed into traditional medicine. The highest sale among the fish are; Selayang (sardines), kembung (mackerel), selar scads) and pari (stingrays). As stated by participants:

"Usually, fish are the most frequent marine resources that we cached, and people will buy them fresh. The best-selling fish are Selayang and kembung. The source of these kinds of fish are also easy to get." (P21, Fishermen)

"Fish resources are the easiest to obtain. I am a fisherman and anchovy catcher, a lot of people asks me to get it, and some people pay me to get the source." (P17, Fishermen, and Fishmonger)

All of the respondents (100%) agreed that fish, squids, crabs, and shrimps are their main sources of income, which are normally sold fresh to the coastal community making it a significant valuable marine resource for them. Traditional processed seafood products have their appeal among locals as well as tourists, and this makes the sales of these traditional products that based on marine resources, such as keropok lekor, keropok keping, otak-otak, and satar were also part of the community's source of income (61.5%) that helps increase their wealth. The recipes to produce these traditional foods were passed down from generation to generation. Most of the respondents agreed 100% that fish are the first source of their income. As stated by some participants:

"Fish is the main source of my income because I sell keropok, and keropok is made from fresh fish. If there is no fish then I am not able to process to make keropok lekor and keropok keping and my family also rely entirely on the source of fish." (P15, Fishmonger)

The respondents mentioned that they also earn income from selling seahorses (53.8%) and sea cucumbers (42.3%), which were processed into traditional medicine. Sea cucumbers were cooked and processed into medicine (such as gamat oil) or sold fresh to be used as traditional medicine for good health and to heal internal wounds. Dried seahorses were sold or cooked and processed into oil, which can treat body aches. The participants acknowledge that their traditional knowledge on the associated use of these marine resources as traditional medicines is still prevalent among the local communities. This has shown that traditional knowledge has played a significant contribution towards the coastal communities' economic well-being, as noted earlier by Sudayasa et al. (2016), the development of marine resources deserves to be a mainstay in economic and health sustainability prospects and is also able to improve the livelihood of the coastal communities. As stated by participants:

"Sea cucumber can be eaten raw and processed into medicine such as gamat oil as well because it has nutrients. It is also can be sold fresh and I got some profit from selling them." (P22, Fishermen)

"I normally use a dried seahorse and it is effective in treating body aches. I learn from my late father." (P3, Fishmonger)

"Information obtained from previous generations is still used today. My family still practices this knowledge gained from my mother. For example, sea cucumber oil is used to treat wounds and the sea cucumber decoction can be drunk as well as more effectively." (P16, Fishermen)

Table 3: Marine resources as a source of income

Description	Frequency	Percentage (%)
Types of Marine Resources		
Fish	26	100
Squid	22	84.6
Sea Cucumber	21	80.8
Crab	19	73.1
Shrimp	18	69.2
Seahorse	14	53.8
Eel	7	26.9
Source of Income		
Fresh Fish/Squid/Crab/Shrimp	26	100
Seafood processed product	16	61.5
Seahorse medication	14	53.8
Sea cucumber medication	11	42.3

Table 4 shows that the majority (92.3%) of the participants agreed that the associated use of traditional knowledge on marine resources plays a significant role in their well-being, such as generating income, employment, healthy life, food sources, and necessities. Masud (2019) defined socio-economic and general well-being involves food security, employment opportunities, good health, balanced distribution of benefits, similarity with local culture, and environmental awareness and knowledge.

In terms of the use of traditional knowledge to improve health, 84.6% of the participants believe that traditional knowledge on marine resource benefits can heal certain illnesses. For example, sea cucumber can treat wounds, seahorses to treat fatigue and aches, and squid bones can be used for facial beautification. A total of 73.1% agreed that the availability of marine resources was a factor influencing coastal communities using them for their health.

However, only 53.8% of the participants still use marine resources for health purposes. The plausible reason is perhaps due to the accessibility of modern medicine. 46.2% of the participants however said that traditional knowledge on marine resources is better than modern knowledge in terms of health. Traditional knowledge related to marine resources affects the well-being and health of coastal communities. For instance, several participants spoke:

"I believe the traditional knowledge gained from previous generations is useful and has certain benefits. Traditional knowledge related to marine resources can provide general well-being to coastal communities. For instance, marine resources such as crabs can treat internal diseases and these resources are also used to support daily needs such as basic food resources." (P4, Fishermen)

"Marine resources such as seahorses and pufferfish can treat body aches internally. It is good for health and prefers to use traditional knowledge from generation to generation. Such resources can also give us well-being such as selling them and using them in necessities." (P10, Fishermen)

Table 4: Associated traditional knowledge on marine resources for wellbeing and health

Description	Frequency	Percentage (%)
Contributing to well-being	24	92.3
Can improve health	22	84.6
Availability of marine resources for health	19	73.1
Never used marine resources for health	14	53.8
Marine resources as traditional medicine	12	46.2

This study has provided valuable data on the consent process for the associated use of traditional knowledge on marine resources. With regards to research objective one, which is to examine how the coastal communities used their traditional knowledge as new sources of wealth to enhance their economic well-being, the majority of the coastal communities interviewed used traditional knowledge associated with marine resources for income generation to support life. These coastal communities also prefer using traditional knowledge to develop local economic resources in their communities. This is agreed by the participants:

"I have been practicing traditional knowledge since I was a teenager and still use it until today. For example, what is the appropriate way to catch marine resources and when is a suitable time. I can make a profit by using this technique to support my daily life. Unfortunately, this knowledge is no longer practiced by the new generation." (P26, Fishermen)

"I believe the traditional knowledge of marine resources can be applied and relevant to the present. I used this knowledge and inherited from my mother, and I was able to earn a good income through the method of processing and selling the resources." (P7, Fishmonger)

The traditional knowledge on the associated use of marine resources can be an essential source of economy and help bring sustainable income to the coastal communities. Cultural heritage such as traditional knowledge could be a driving force behind economic growth contributing specifically to strengthening the local economy. Supported by Sudayasa et al. (2016), they noted that diversity of marine resources provides opportunities and potential for various marine-based economic activities, as well as in developing a healthy society. Desmond and Taisin (2018) found that the Kadazan-Dusun community in Sabah are practicing the use of traditional knowledge on natural resources in their daily activities that have been inherited from their predecessors for their economic and general well-being.

As for research objective two, which is to identify factors that lead to the practice of traditional knowledge on marine resources among the coastal communities for their general well-being, the results show that majority of the coastal communities interviewed practice traditional knowledge, warranting for its promotion and protection so that the new generation does not marginalize this practice. Some coastal communities believe that traditional medicine from marine resources has nutrients and benefits for treating illness. There was agreement among participants that the most effective use of marine resources is for the treatment of diseases. This is described through the following responses:

"I use sea cucumber to treat small wounds and can also be used for the internal body such as people who have given birth. Sea cucumber decoction will make the wound heal quickly." (P20, Fishmonger)

"I believe the marine resources such as seahorses have certain nutrients. Seahorses can be used as medicine and can be used to treat diarrhea. Additionally, sharks can also be used as medicine and are able to treat children who are slow in speech and be able to smooth their speech." (P21, Fishermen)

However, some coastal communities seem to have more trust in modern medicines. As stated by some participants:

"Traditional medicine can only treat small wounds and is not suitable for other serious illnesses. In terms of health, modern medicine is more effective and secured because it administered by a medical practitioner (doctor)." (P25, Fishermen)

Nevertheless, traditional medicines must also be promoted because traditional knowledge has certain benefits that have proven to be effective over the year. As noted by Alonso (2015), the knowledge gained in traditional food systems and traditional medicines can contribute to improved food safety and nutrition, and public health as well. This point can be further emphasized by the findings made by Aryanto (2014), where the local communities in Indonesia have been using traditional knowledge on the associated use of marine resources to improve their living standards. For example, corals that are believed to have certain nutrients and health values and are in abundance in the Indonesian waters, have been the target of coastal communities who poached them to be traded for money.

4. Conclusion

The findings have shown that the coastal communities in Terengganu, Malaysia, believe that traditional knowledge on the associated use of marine resources has many benefits for the economic and general well-being. These coastal communities have knowledge, experience, and belief in the use of the associated traditional knowledge because of the experience and knowledge passed down from their older generation. The traditional knowledge held by the coastal communities from previous generations on the variety of benefits of marine resources has in fact been used as an alternative household income as well as to maintain their health and general well-being.

From a theoretical perspective, this study has the potential to provide new knowledge and understanding relevant to the use of traditional knowledge on marine resources by coastal communities for the purpose of enhancing their economic sustainability as well as improving their health. From a practical perspective, this study provides valuable information to help local communities increase their economic status through the use of marine resources derived from traditional knowledge. In terms of managerial implications, this study is able to be a source of reference to the relevant agencies in determining the importance of traditional knowledge being preserved and protected based on the studies conducted.

Apart from that, the findings could facilitate the government to encourage documentation and create a dedicated repository of traditional knowledge, as well as to reform existing policies on the use of marine resources. Entrepreneurs and practitioners of traditional medicine can also develop marketing strategies in accordance with the communities' use of traditional medicine from marine resources to improve health and as a source of wealth among coastal communities.

Some limitations have been encountered during this study. The study was carried out during the Covid-19 global pandemic. Therefore, it was quite challenging to conduct face-to-face interviews with participants due to restrictions of movement imposed by the Government of Malaysia. This resulted in some participants declining to be interviewed. Inevitably, this study has a relatively small sample size to discover considerable results to explain the relationships and contributions from the data. Despite the limitations, however, this study was still able to investigate the factors and how coastal communities practice the use of traditional knowledge based on marine resources for their economic and general well-being.

This study has employed a qualitative approach to explore the utilization of traditional knowledge on marine resources by the coastal communities. Therefore, it is recommended that future studies can be expanded into quantitative research by focusing on different community or traditional medicine practitioners' populations. Furthermore, since this study was only focused on the state of Terengganu, the results may not represent the entire population of Malaysia. Future studies should also focus on other coastal areas in Malaysia because the variability of marine resources may slightly differ from those found in this study.

Appendix A. Questions for the interview

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 that 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?

Part 2: Traditional Knowledge on Marine Resources

1. Do you know what marine resources are?
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 and Health

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: Marine Resources as Traditional Medicine

1. What do you think about the use of traditional medicines based on marine resources versus modern medicines?
2. What factors influence your choice of using traditional marine-based medicine?
3. Is traditional medicine from marine resources more accessible compared to modern medicine?
4. What types of marine resources are used in traditional medicine to improve health?
5. Does this traditional marine-based medicine help in improving your economy/income? How?
6. Between traditional medicine and modern medicine, which one is your choice?

Part 5: 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?

Part 6: Demographic Characteristics

1. Gender: Male/ Female
2. Age: Below18/ 18-29/ 30-39/ 40-49/ 50-59/ 60 and above
3. Marital status: Single/ Married/ Divorced
4. Total Household Income: RM 1000 and below/RM 1001-RM 2000/ RM 2001-RM 3000/RM 3001-RM 4000/RM 4001-RM 5000/RM 5001 and above
5. Highest Education: Primary School/ Secondary School/ Diploma/ Bachelor's degree/ Master/PhD/ Others _____
6. Employment: _____
7. Race: Malay/ Chinese/ Indian/ Others _____
8. State: _____
9. Location: _____

End of the questions.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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