

Traditional medicines from marine resources: Understanding the consumer's knowledge and perceptions



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ABSTRACT

Traditional medicine is an alternative medicine adopted by local communities using natural resources from plants and animals. This study aims to explore consumers' knowledge and perceptions of the use of marine resources as traditional medicinal properties. The qualitative method of utilizing an in-depth face-to-face interview was used to gather the data from the respondents. The sample comprises communities from the East Coast of Peninsular Malaysia, including traditional practitioners, fishermen, villagers, and members of the public. Twenty-four marine resources have been identified as being used as traditional medicines, and most of the identified resources are effective in treating illnesses. The highest frequencies mentioned are seahorses that have been used as a traditional medicine to cure asthma. The knowledge and belief in the benefits of using marine resources as traditional medicine have been passed down from generation to generation, especially from older generations and traditional healers. These have contributed to the positive perception towards marine resources as a traditional medicine to cure illnesses, enhancement of sustainable livelihood, good health, and well-being among users. The results of this study are valuable and useful in developing more marine-based alternative medicines by using the scientific investigation to overcome health problems among Malaysians and also expected to help the government in documenting marine resources that can be used to treat illnesses. Since this study is limited only to the coastal areas in the East Coast of Peninsular Malaysia, future research should focus on other coastal areas of Malaysia for the purpose of discovering other potential marine resources being used as Traditional medicines. Furthermore, future research should also expand into quantitative research that might focus on a larger and wider population of traditional medicine users or potential customers.

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1. Introduction

Traditional medicine is commonly used to maintain health and treat illnesses. Traditional medicine commonly dates back many years, and in some cases, millennia. As a substitute for the modern medication in addressing health problems, traditional medicine is referred to as complementary or alternative medicine. It is increasing its popularity

globally (Habtom, 2018), and plays important roles in many countries (Abdullahi, 2011) including Malaysia (Abdullah et al., 2018; Jamshed et al., 2016; Aziz et al., 2015; Kew et al., 2015). Traditional medicine is different from modern medicine because it usually formulated from natural resources, like animals or plants.

Normally, the natural resources used in traditional medicine are from land-based sources. The World Health Organization (WHO) defines traditional medicine as a health practice that uses a variety of approaches, confidence, and knowledge to use natural resources, such as plants, animals, and marine resources, to prevent and treat diseases (WHO, 2013). Traditional medicine also consists of methods for preserving and conserving health that existed before the advent of modern medicine. The

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traditional health medicine approach is based on the knowledge and beliefs that involve drugs derived from animals and plants, and employ a variety of treatment techniques for maintaining health or treating disease (WHO, 2013).

In developing countries, traditional medicine is important for the health care of the society (Islahudin et al., 2017; Kew et al., 2015; WHO, 2013; Mngqundaniso and Peltzer, 2008). For example, in Uganda and Ethiopia, the prevalence of traditional medicine used to complement primary healthcare among the population ranging from 60-90%, as compared to the USA and Australia, which only ranged from 40-50% (Kew et al., 2015). Apart from its health-care benefits, people use traditional medicine because it is affordable and accessible as it is based on natural resources (Hosseinzadeh et al., 2015).

Every society wants to maintain health and treat disease through the use of drugs that are deemed appropriate. Traditional medicines have been used alongside modern medicine as some people continue to rely on it for health care. Lemonnier et al. (2017) reported that even though progress in medicine is based on scientifically-proven evidence contributed by laboratory research or clinical outcomes, a huge world population still relies on the contemporary forms of traditional, complementary, and alternative medicines.

The practice of traditional medicine is different for each geographical area according to the heritage and culture of each country. The practice of traditional medicine is usually based on the use of conventional and personal experiences of an individual or community. Consequently, a variety of traditional medicines have been practiced, such as Ayurveda medicine, herbal medicine, marine resources, and so on. In Malaysia, the use of traditional medicine has long been practiced by the population and is growing rapidly and widely. Various herbal and roots products have, in fact, been commercialized as traditional medicinal.

Nevertheless, traditional medicine based on marine resources is still lacking in user-friendly and less-commercialized sites. Although there have been many past studies claiming that marine products have been consumed for quite some time, there are very little details on the advantages of marine resources that can be applied to the formal healthcare system. Thus, people are generally unaware of marine-based traditional medicines, and studies in terms of human perspective are still underdeveloped.

Traditional medicine is a complement to the modern medical and healthcare system, and its use and consumption is widespread and increasing in most countries. Modern medicine has generally been used by the global population to treat illnesses and cure diseases. It is associated with expertise and medical knowledge from the West, utilizing science and technology with countless high-end equipment and drugs capable of treating various diseases. Medications in pills and capsules are administered in

treating illnesses, and they contain drugs or chemicals that can affect the human body and intellect (Ibrahim, 2009). In addition, long-term consumption of modern drugs or prescribed drugs are taken not in accordance with the doctor's prescriptions can cause side effects on the human body.

Some communities, particularly those living in rural areas, consider vaccination as a major cause of autism and brain problems in children (Kew et al., 2015). This perception has led them to refuse vaccination for their children. Thus, consumer perceptions of medicines can affect their consumption, be it modern or traditional medicines (Adjei, 2013).

Ekor (2014) reported that the general perception of traditional medicines is that they are safe and are deemed to have fewer adverse effects. In a study conducted in Nigeria, accessibility, affordability, perceived safety, and therapeutic potentials are the main reasons for using herbal medicine in treating countless illnesses (Osuchukwu et al., 2017). Despite these past reviews on consumers' perception of traditional medicine, consumers' perception of marine-based traditional medicine remains limited. In today's modern world, this left us with the knowledge gap, whether people still believe in traditional medicines based on marine resources in their health care. This had led to two research questions attempted to be answered in this study: Firstly, to identify what type of marine resources that have been used as traditional medicines; and secondly, to explore how the experienced-based knowledge and perception among the society influences the use of marine resources as traditional medicines in treating illnesses and curing diseases. Therefore, the aim of this study is to investigate consumers' knowledge and perceptions towards the use of marine resources for traditional medicinal purposes.

1.1. Perception

In marketing, perceptions are more important than actual behavior in which perceptions will have a positive or negative impact on consumers (Kotler, 2012). Perception is defined as the process by which an individual organizes or interprets their sensory impact on the environment (Robbins and Judge, 2013). Perceptions generally occur in a person's mind that is influenced by the experience, expectation, as well as the psychological state of individuals in decision-making. Yuan et al. (2016) stated that stimuli have tangible features, such as intensity and repetition, which causes perception. When an individual sees and tries to make an interpretation of what is seen, it shows that the individual has been influenced by individual characteristics such as attitudes that influence the interests, needs, knowledge, experiences, personality, and hope. Modern medicines are often associated with drugs and chemicals and consumers often perceive that there are unsafe for consumption

and have side effects. In contrast, in a much earlier study. Gyasi et al. (2015), Aziz et al. (2015), and Ambrosioni et al. (1998) found that consumers believed that traditional medicine is natural, have no side effects and is free from drugs and chemicals. Due to this positive perception on traditional medicines, and consumers feel safe to use traditional medicines to treat various health problems, compared to modern medicine (Haslan et al., 2015). According to Rekha and Gokila (2015), consumers are increasingly aware that various herbal cosmetics are no longer considered luxury items, and they also have the perception that herbal cosmetics have no side effects and no chemicals, and this has resulted in consumers switching to herbal cosmetics. Two other studies on consumers' perception and personal health beliefs regarding motivation for herbal medicines' used were conducted in Ghana (Gyasi et al., 2018) and Nigeria (Nuhu et al., 2018), which also revealed positive perception. A study conducted by Son et al. (2015) was aimed at exploring the perception and experience of chronic patients on Traditional Korean Medicines as well as the factors that encourage them to use it. It had been shown that the underlying reasons for choosing Traditional Korean Medicines were their positive perception of the products coupled with their dissatisfaction and less confidence in modern medicines. Ayurvedic medicine is the oldest traditional medicine in the world, capitalizing on natural resources such as herbs and minerals. Arya et al. (2012) have studied the behavior of consumers in buying or using Ayurvedic medicines. The results showed that consumers had shown positive perceptions of Ayurveda medicines without consulting the doctors. It is also indicated that rural consumers have a positive perception and preference for using Ayurvedic products. These studies collectively showed that consumers have been more confident to consume traditional medicine in treating illness as compared to modern drugs. Nonetheless, there are also consumers who wary about the use of traditional medicine in treating illnesses. In the perception survey conducted by Suleiman (2014), the result revealed consumers' perception that all herbal remedies and health supplements also have side effects and should be used correctly and according to instructions, especially for children, pregnant women, senior citizens, and patients with chronic diseases. This was supported by Awad and Al-Shaye (2014) in their study on the level of awareness, usage pattern and consumer perception towards natural health products, where it was found that despite having positive perception towards the use of herbal products to maintain health as well as to prevent diseases, they also believed that users should seek advice from a doctor before consuming them.

1.2. Knowledge

Knowledge is a combination of experience, value, and information required by the user before making

a selection and making a purchase transaction (Khosravi, 2014). Hunt (2003) has defined knowledge as a definite belief concerning what a person knows about something. Maria et al. (2009) suggested that consumers' knowledge is important in influencing functional food intake. The knowledge of durable products with sufficient information will lead to consumers' positive perception and encourage them to use the products.

According to Roy and Cornwell (2004), knowledge affects the user's response. In his study of the impact of consumers' knowledge on sponsorship of events, it was found that consumers' knowledge of sponsorships and brands impacted consumer perception. People in Sabah, Malaysia, are still practicing traditional knowledge in agriculture and eating red rice as a functional food to maintain their general health. However, their experience and knowledge about traditional medicines are disappearing since their ignorance in preserving such knowledge.

The study by Jha et al. (2013), which aimed to examine the knowledge of teachers on medicines in Nepal, had revealed that education is important to increase teachers' knowledge of drugs that would help them choose the right drugs. Furthermore, the majority of the students believed that the knowledge of alternative medicine would be beneficial to their medical practices. Due to the growing use of herbal medicines in Nigeria, Oshikoya et al. (2013) studied the knowledge of pharmacists on the use of herbal medicines where the findings showed that pharmacists' knowledge of the use of herbal medicines was still lacking, leading them to rely on papers on herbal remedies to get relevant information. Fahmy et al. (2010) in their study to identify the perceptions, knowledge, and practices of pharmacists on the use of herbal medicines in Abu Dhabi, United Arab Emirates, found that pharmacists have high knowledge in the efficacy of herbal medicines because they know about the function and benefits of herbal medicines. While the study conducted by Duraz and Khan (2011) and Jamshed et al. (2016) reported that pharmacists have more knowledge of complementary and alternative medicines and believed that herbal medicine products are effective in treating illnesses. Previous studies signified that knowledge is very important, and it has influenced individuals' perceptions in making their decision related to health issues. There have been considerable studies about the knowledge of traditional medicines. However, most results have shown that the knowledge and perception of traditional medicines based on marine resources are still limited. Thus, this study aims to investigate the local knowledge among the coastal communities and their perception towards traditional medicines based on marine resources.

1.3. Conceptual model

This research was developed based on the assumption of attribution theory. This theory

explains that human behavior and reactions towards a particular thing and event are mainly based on two main attributes: Internal and external. Internal factors are those influences that come from an individual themselves, such as their value, personality, and perception. On the other hand, externally attributed factors are those forces that come from their surroundings and environment, such as knowledge and information. The conceptual model of this study is shown in the following diagram (Fig. 1).

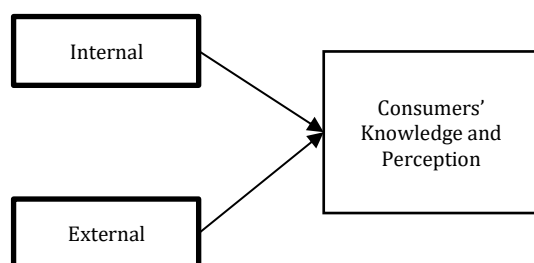


Fig. 1: Conceptual model of the study

2. Research methodology

This study used a qualitative study method. The most practice of traditional medicine is based on personal experience, which explains the need for a qualitative research approach that allows the researchers to explore experiences of the respondents based on their own words rather than pre-determined measures. This may ensure the data gathered for this study could provide more understanding to explain the processes involved in the development of consumers' knowledge and perception about marine-based traditional medicines. Qualitative method is chosen because an in-depth understanding is needed to investigate the marine resources' potentials as a traditional medicine to cure diseases and treat illnesses based on the knowledge that has been passed down from generation to generation. These conditions suggested the use of qualitative research as it serves to achieve a deeper understanding of the research issues by exploring the knowledge, experiences, and perception in a specific context.

A total of 44 in-depth interviews were conducted involving respondents from three states of East Coast Peninsular Malaysia: Terengganu, Kelantan, and Pahang. An interview is an appropriate tool to be used for this study due to its flexibility that allows for unanticipated feedback from respondents before the important cues emerge to explain the consumers' knowledge and perception of traditional medicine. The study was conducted on the East Coast of Peninsular Malaysia because these states have larger coastal areas that have many marine activities and have more potentials to get suitable data. The respondents for this study were randomly selected from the local communities of the coastal areas, including traditional practitioners, fishermen, villagers, and the local people.

The data were collected through face-to-face, semi-structured interviews to enable researchers to use both open and close-ended questions, as well as to interact closely with the respondents and to observe respondents' non-verbal responses so that the meaning of responses can be investigated thoroughly. In particular, open-ended questions were applied in this study to explore more information regarding traditional medicine based on the respondents' own experiences, knowledge, and perception. To guide the interview session, questions were developed based on literature reviews and medical experts' opinions.

Each interview session lasted approximately thirty minutes to one hour. The snowball method was applied in this study, where some participants have recommended friends or those who are familiar with traditional medicines as potential respondents in the study. The use of the snowball method will ensure that information is obtained from the key person close to the issues studied.

The interviews were recorded using digital voice recorders to ensure that verbatim recording was recorded for subsequent analysis. Tape recordings of the interviews were transcribed into a Microsoft (MS) Word document. Notes taken during the interviews were also added to the document to gain a whole picture of each interview. Following that, a thematic analysis was employed to identify the data according to the research objectives.

3. Results

The respondents' demographic characteristics are shown in Table 1. The total respondents of this study were 44 individuals selected from coastal settlements in three states on the East Coast of Peninsular Malaysia. The majority of the respondents were male (95.5%). The findings also showed that most of the respondents were aged 51 years and above, and worked as fishermen, traditional practitioners, fishmongers through which they have acquired knowledge about marine resources and their use as traditional medicines. More than half of the respondents (52.3%) have experience of the use of marine resources as traditional medicines in addressing health problems and treating illnesses.

As in Appendix A, Table A1, the respondents revealed that the basis of them using marine-based traditional medicines is their belief in the medicinal properties in marine resources capabilities in preventing and curing many diseases. Although some respondents had never used marine resources for their health problems, they still had confidence in the health benefits of marine resources.

Most respondents said that they were informed by their older generations about the medicinal properties of marine resources. This traditional knowledge and wisdom has been passed down from generation to generation, especially amongst traditional healers, who are well-versed about the

nutrition of traditional medicines and preparation processes.

Table 1: Demographic characteristics of the respondents

Characteristics	Frequency	%
Gender		
Male	42	95.5
Female	2	4.5
Age		
20 to 30	2	4.6
31 to 40	0	0
41 to 50	5	11.3
51 to 60	21	47.7
61 to 70	14	31.8
>70	2	4.6
Occupation		
Fisherman	34	77.3
Traditional practitioner	3	6.8
Fish Seller	5	11.4
Laborer	2	4.5
Experience of using marine resources as traditional medicine		
Yes	23	52.3
No	21	47.7

However, most of this traditional knowledge about marine resources are disappearing. The knowledge and skills of these traditional healers have not been properly documented. Furthermore, failure to pass on the knowledge about marine-based traditional medicines could be caused by traditional healers who strictly guarded their knowledge, which is only shared with their offspring as family heritage. If the traditional healer does not have any next of kin to receive the passed-down knowledge, it will be lost forever. This has inevitably led to the knowledge of traditional medicine among the current generation.

The respondents also viewed that some traditional healers assume that their knowledge is of

high value, which prevents them from sharing with others. The younger generation was also considered as not taking the value of traditional medicines seriously. These are described through the following statements in [Appendix A, Table A2](#).

Most respondents said that they believe in marine resources potentials to cure disease based on their own experience, as well as the experience of their family members having cured of illnesses after consuming marine-based traditional medicines. This is illustrated by the following answer, as shown in [Appendix A, Table A3](#).

In total, the respondents have identified 24 marine species in their respective local names that can be used as traditional medicines based on their traditional knowledge. The respondents also described the usage of marine resources as traditional medicines to cure various illnesses, as shown in [Table 2](#).

Seahorse is the often-most mentioned marine resources being used as a traditional medicine to cure various illnesses such as asthma, heart-related diseases, dysfunction, wounded in body, reduces body temperature, detox, and skin disease problems. Unlike sea cucumbers, the public is generally unaware of the health benefits of seahorses.

The most-mentioned usage of seahorses is to cure asthma. The ways seahorses are processed into medicines are based on traditional knowledge. Some of the methods to make asthma medicine from seahorses are; grilled and pounded into powder, boiled or made into soup, or fried for consumption. Some respondents have recommended several methods, as stated in [Appendix A, Table A4](#).

Table 2: Marine resources and usage

English name	Local name	Usage
Seahorse	Kuda Laut	Asthma, heart disease, sexual dysfunction, reduces body temperature, detox, skin disease, internal injuries
Sea Eel	Belut Laut	Wound, heart diseases, blood melting, skin disease, body itching
Shark (fin)	Jerung (sirip)	Heart diseases, skin diseases
Cuttlefish bone	Tulang sotong	Gallstones, itch
Dolphin (liver)	Ikan Lumba-lumba	Heart diseases
Sea urchin	Landak Laut	Heart diseases, asthma
Flying fish	Ikan belalang	Asthma
Sea cucumber	Gamat	Wounds, internal injury, heart diseases, wounds, skin disease, cosmetic, cancer, diabetes, high blood pressure
Mud Crab	Ketam Nipah	Dengue fever
Root Bahar	Akar Bahar	Wounds, asthma, sinusitis, toothache, fever, gout, reduce blood pressure
Thenus	Udang Ketak	Asthma
Swordfish	Ikan Todak	Asthma
Coral	Batu Karang	Kidney stones
Seaweed	Rumpai Laut /Alga	Supplement, kidney, internal illness, heart disease, reduce body temperature
Horseshoe crab	Belangkas	Heart diseases, leukemia, cancer
Bronze croaker	Ikan gelama selampai	Skin health, internal health
Ketuka fish (Sharpnose Stingray)	Ikan Tuke	Intestinal parasites (Worm disease)
Clams (shell)	Kepah Batu (cengkerang)	External and internal injuries
Mudskipper	Ikan Belacak	Erectile dysfunction
Mantis shrimp	Udang Katok	Asthma, kidney stone
Moss	Lumut	Skin disease
Croaker fish	Ikan Gelama	Gout and skin disease
Starfish	Tapak Sulaiman	Reduce body temperature, detox
Goby fish	Ikan Goby	Waist pain, lumbago

4. Discussion

In the modern world today, traditional medicine is important for its ability to solve many health problems and illnesses with fewer side effects as compared to modern medicine. However, the study of marine-based traditional medicines is still lacking and is not well documented. In Malaysia, medical research focuses more on resources from the land, such as *Orthosiphon aristatus* (Leaf Cat Whiskers), *Eurycoma longifolia* (Tongkat Ali), and *Labisia pumila* (Kacip Fatimah). Studies on the medicinal properties of marine resources, other than sea cucumber (gamat), are still lacking. Thus, the exploration of knowledge and perception among society towards the use of marine resources as traditional medicines is warranted and must be documented for future references.

The exploration on knowledge and perceptions of the use of marine resources as traditional medicine was garnered through three main steps: Firstly, identifying marine resources that have been used as traditional medicines; secondly, exploring the experienced-based knowledge among society towards the use of marine resources as traditional medicines; and finally, discovering on how the marine resources were processed to be consumed as traditional medicine.

As a response to the first research question, the study had unveiled 24 marine resources that can be used as traditional medicines, as perceived by the respondents from Terengganu, Kelantan, and Pahang. The respondents have used different names and terms for the marine resources based on their local names. This is consistent with most studies, which found that traditional medicines are associated with the social and cultural factors of the community (Gyasi et al., 2016; 2018). The majority of the respondents strongly believed that marine resources have high potentials to be explored and developed to treat illnesses and cure diseases as traditional medicine.

The study also reported that seahorses are the highest-mentioned marine resources used to cure illnesses such as asthma, heart-related diseases, dysfunction, wounded in body, reduces body temperature, detox, and skin disease problems. Supported by past research, which demonstrated that seahorses have numerous nutrients for human health with bioactive content that can function as anti-cancer agents, anti-fatigue, anti-aging (Sari et al., 2018) asthma, heart, thyroid, and skin diseases.

The findings also recorded the consensus amongst respondents about the need for the knowledge and information about marine resources as a traditional medicine to be documented for future reference. This has answered the second research question on the importance of experience-based knowledge and perception among society towards the use of marine resources as traditional medicines. This is in line with Dulvy et al. (2003), who stressed the necessity to have more proactive efforts to search for marine resources that could be

utilized as medicine before the species go into extinction.

People choose to consume certain marine resources as a traditional medicine because of their belief that marine resources can solve their health problems. The findings also showed that the respondents' knowledge about traditional medicine has been acquired from their predecessors and passed down from generation to generation. This has influenced their positive perception of the health benefits of marine resources. This is supported by Duraz and Khan (2011), Suleiman (2014), and Jamshed et al. (2016), which stated that knowledge is important for maintaining a medical practice in the community.

5. Conclusion

The results of the study have shown that the communities from the East Coast of Peninsular Malaysia believe that marine resources have many health benefits and can be used as alternative medicine. People have the knowledge and confidence in the use of marine resources as traditional medicine due to the experience and knowledge that was passed from older generations.

In terms of practical implications, the knowledge held by the public could lead to in-depth research concerning the benefits of marine resources as an option for health problems that cannot be solved using modern medicine. Although traditional medicine is not included in the formal health-care system, identification of specific marine resources as a source to treat illnesses can lead to various investigations to prove their effectiveness based on scientific evidence, which in turn will facilitate the commercialization marketing strategy.

As for the management implications, the findings can assist relevant parties, such as the government, to encourage documentation of traditional medicine skills and establish a repository of this traditional knowledge, as well as to reform existing policies on traditional medicine. The existing Traditional and Complementary Medicine Act, 2016, which is mainly to govern service providers of traditional and complementary medicine, should be revised to include a schedule containing the types of traditional medicine, their health benefits, and their active ingredients and composition. Manufacturers of traditional medicine products may also develop marketing strategies in line with the perception of the public towards the use of marine-based traditional medicines.

There are some limitations that must be highlighted in this study. Since the qualitative approach was employed to investigate in-depth on the types of marine-based resources used as traditional medicine, future research can be expanded into quantitative research that might focus on a larger and wider population of traditional medicine users or potential consumers. Furthermore, since the study is limited to only three states in the East Coast of Peninsular Malaysia, the

results may not represent the whole population of Malaysia. Future research should, therefore, focus on other coastal areas in Malaysia as the marine resources found there could distinct from the ones discovered in this study.

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Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

Appendix A. Respondents responses to their knowledge and perception of marine resources as traditional medicine

Table A1: Responses about the benefits of marine resources as traditional medicine

Statements	Respondents
"There are many resources that can be used as a source of drugs compared to the resources of the land, and they are better for solving health problems. Many people do not realize the benefits of marine resources as they are difficult to obtain."	R6, Traditional Practitioner
"Actually, many marine resources are useful in curing diseases because they have a variety of good compounds in them. However, these marine resources are hard to find."	R11, Traditional Practitioner
"There are plentiful marine resources that can be used as a medicine, but it is illegal as most are endangered marine life."	R42, Fisherman
"Actually, marine resources are ten times more beneficial than the sources from land, such as roots and herbs. However, no one has been able to develop marine products widely."	R8, Fisherman
"Many marine resources can be used as a drug, but some of them are difficult to find, which limits people's knowledge concerning their benefits. For example, bahar root is hard to obtain, but it possesses compounds that can treat diseases, such as asthma and sinusitis."	R26, Fisherman
"Various types of sea resources can be used as medicine. One of the most popular is the sea cucumber, which has been commercialized as a medicine. This is because it is able to resolve any problems arising from certain diseases."	R41, Fisherman

Table A2: Responses based on generational differences

Statements	Respondents
"Marine resources have many benefits for good health, but young people have no interest in learning about them, which makes it difficult to find people who really know about traditional medicine from marine resources nowadays."	R14, Fisherman
"Old Folks knew about the efficacy of marine resources, which can be used as medicine such as sea cucumbers and sea horses, but the younger generation does not take cognizance of the benefits of the sea as a source of medicines and how it is processed."	R21, Fisherman

Table A3: Responses about the experience of using marine-based traditional medicines to cure illnesses

Statements	Respondents
"Marine resources are really good for curing disease. My son, who suffered from heart disease, was cured after drinking the water of the sea cucumber."	R16, Fisherman
"Marine resources are very good for health. I had to undergo surgery. After surgery, I drink cucumber water, and my wounds healed faster."	R23, Fisherman
"Marine resources are very good indeed to treat disease. My daughter has asthma, and it's getting better after eating lobster."	R26, Fisherman

Table A4: Responses on the process of transforming seahorses as traditional medicine

Statements	Respondents
"Seahorses can be processed in several ways as medicine to cure asthma. One of them is by burning the seahorses until it's crispy and darker in color, and then they are pounded into powder. The powder should be mixed with water before drinking it by those who have asthma."	R31, Fishermen
"To make seahorses as medicine, seahorses can be cooked as a soup to be eaten by the patient. If the patient continuously consumes it, asthma suffered by the patient will decrease and heal."	R23, Fishermen
"Seahorses have to be washed thoroughly after obtained it from the sea and then fried them before giving to the patient to consume."	R28, Fisherman

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