

The North Borneo Iranun's community's ethnomedicine knowledge on marsh clam (*Geloina expansa*)

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Abstract. Hamdan DDM, Shah JMD, Gumpulan F, Foo J, Lukman KA. 2020. The North Borneo Iranun's community's ethnomedicine knowledge on marsh clam (*Geloina expansa*). *Asian J Ethnobiol* 3: 30-38. North Borneo is rich with natural resources that have boundless potential for pharmaceutical product discovery, leading to socio-economic development in rural areas as suppliers. Even though rich with cultural heritage and comprises of hundred sub-ethnic groups, detailed documentation of ethnomedicinal knowledge in North Borneo from different ethnic groups is still limited and could disappear in no time. The ethnomedicinal knowledge of marsh clam (*Geloina expansa*) use in the Iranun community (respondents no.=28) living in Kampung Rampayan Ulu, Kota Belud in North Borneo were investigated, and also the concentration of iron, zinc, and copper in different parts of marsh clam tissues were determined. In postnatal care of the Iranun community, many believe that marsh clam soup help boost nursing mother milk supply. Marsh clam is rich in iron micronutrients, followed by zinc and copper. The mantle organ has a higher iron concentration than other tissues. The traditional knowledge to heal blood clotting and bruises are the topical application of marsh clam mantle organs onto the wound areas. Although participants have the ethnomedicinal ability of marsh clam, they have poor knowledge of the nutritional benefits of this clam. Lifelong learning the use of marsh clam is necessary from local health care.

Keywords: Galactagogue, indigenous knowledge, Iranun, maritime community, transdisciplinary

Abbreviations: ICP-OES: Inductively Coupled Plasma Optical Emission Spectroscopy; MFR 1985: Malaysia Food Regulation 1985

INTRODUCTION

In recent years, there has been an increase of awareness on the importance of the preservation of indigenous knowledge, especially for ethnic groups that did not have their development of writing system until other societies who have writing system transferred this writing system to them (Kheng 1996; Embong et al. 2016; Mandal 2016). Some traditional oral stories have also been confirmed as a narrative that helps scientists understand past natural world catastrophic e and history. The history of North Borneo was recorded from outside people who have a relationship with them. The writing system was adopted late on this island, and only aristocrats had early learning access. Indian cultures once heavily influenced the old Malay World culture before Islam establishment in the Nusantara region was once territories of Hindu empires such as the Srivijaya Empire and Majapahit Empire that had brought along the Sanskrit writings with them (Al Qurtuby 2013, Jalil et al. 2019). The Jawi literature development was modified from Arabic letters when some parts of the Malay World community had converted to Islam religion brought by Arab and Indian traders before Roman letters were still used. There is also a suggestion that some groups of people in tropical regions might have written records in the past,

but it was done on perishable items that perished after hundreds of years (Keene 2019). This could be one of the factors why only a few well-preserved records from the old Malay world by locals are available. The political power and religious change throughout the Malay world timeline had caused record preservation to be neglected. However, apart from the writing system, the diverse motif depiction by different ethnic groups in Borneo also has a tale to decipher. The flora and fauna motifs used in the design are usually natural product resources that have the utmost importance in the life of their people and bring many benefits to their users. One of the importance of oral tradition preservations is the traditional ethnomedicine knowledge that can cure illness in the synthesis of medical drug production (Poh et al., 2018).

The technology to extract a substance from natural products is well-refined; specific substances from natural products can be generated from a resource for a clinical study to aid specific ailment (Peng et al. 2017; Hsieh et al. 2018). In contrast, the traditional medicine preparation of natural products will retain all its natural substance composition when the patient is treated. Nowadays, an innovation of pharmaceutical products has been developed that can instantly be used during medical procedures by topical application rather than standard traditional methods

of ingestion such as consumption of snakehead and sea cucumber to enhance wound healing (Poh et al. 2018; Sahid et al. 2018). However, it will take time to test all flora and fauna globally to find the right cure for different disease symptoms. Thus, pharmaceutical drug synthesis literature is based on natural products like common herbs. The uses have been well-recorded from ancient times and are actually traditional medicine (Montaben 2017). In some societies, natural products identified to have medicinal value are from the perception based on taste, smell, and visual (Narchi 2017). The documentation of traditional medicinal natural products is commonly are plant-based (Olawa and Demayo 2015; Rozaimie et al. 2019), whereas there is little documentation on animal use in traditional ethnomedicine knowledge, especially in North Borneo. North Borneo is rich with terrestrial and marine animal diversity that even now, there is often news of recently discovered species. Different ethnic groups in North Borneo could have other traditional ethnomedicine knowledge due to the local natural product resource availability (Rozaimie et al., 2019). Generally, in Borneo, ethnic groups are categorized as either inland people or maritime people.

A large population of North Borneo lives in the coastal areas. One of the ethnic groups in North Borneo, which is a part of maritime society, is the Iranun ethnic group; which is a great historical enemy of the western countries that were trading in the sea trade route of Southeast Asia region and had branded them in their view as pirates (Warren 2002). There were no local words for what the westerners defined as pirates during that century. The colonial power gave birth to the local term of piracy, '*lanun*,' a fear of Iranun's great maneuvering skill in the sea. The Iranun ethnic group had a close political relationship with the Sultanate of Sulu before the colonial came to the Southeast Asia region. Most of what is recorded in the literature concerning the Iranun ethnic group is about their history in the sea trade and political connections (Sajok 2018).

Furthermore, there is a growing concern about the decline of Iranun native speakers and the possibility of losing some of their cultural heritage in dire need of preservation (Smith 2003; Pugh-Kitingan 2010; Amat and Abd Samad 2019). There are limited documentations of Iranun ethnic group ethnomedicine knowledge in North Borneo. Some Iranun ethnic group villages are near mangrove forests with a wide distribution of natural products such as marsh clam (*Geloina expansa*). Marsh clam is a common food source of coastal people, and we investigate if there are other uses of marsh clam in Iranun's ethnomedicine knowledge.

MATERIALS AND METHODS

Study area

Kota Belud district in Sabah state, Malaysia, is a cultural hub (Amat and Abd Samad 2019) where many different ethnic groups live harmoniously in this district, such as the Dusun-Kadazan Bajau-Sama and Iranun ethnic groups. Iranun ethnic group is one of the minorities in

Sabah that originated from the Southern island of the Philippines. Iranun is generally categorized as maritime communities because of their widespread reputation as a very skillful seafarer during their strong involvement in sea trade in the Southeast Asia region exceptionally (Warren 2002). The Iranun ethnic group settlement in the coastal areas of North Borneo is mainly located in Kota Belud district, Marudu Bay of Kudat district, and Darvel Bay in Lahad Datu district (Sajok 2018). One of the historic settlements of the Iranun ethnic group is located in Kota Belud district, North Borneo. The Iranun ethnic group villages are usually near coastal areas because they were very involved economically and politically in the maritime sea trade (Sajok 2018). One of the Iranun villages in Kota Belud district is Kampung Rampayan Ulu, an area sheltered by mangrove forests (6°31'13" N, 116°31'00" E). It takes about an hour's drive to Kampung Rampayan Ulu from the capital city of Sabah state, Kota Kinabalu.

Perception and knowledge on marsh clam survey

During the first site visit, semi-structured interviews were conducted to gather preliminary data for constructing a structured questionnaire. A questionnaire that was previously used in different locations and ethnic groups (Hamdan et al. 2019) was adapted according to the suitability of the study site with some addition and modification of multiple-choice questions based on preliminary data. The questionnaire language medium was the Sabah state Malay language dialect, but some words were changed to follow the study site-local most common term used with the help of the locals. The questionnaire was divided into different parts. The first part was to record the socio-demographic and socio-economics of the survey participants in Kampung Rampayan Ulu. Then respondents were given choice selection about their perception and knowledge of marsh clam (*Geloina expansa*) use as food and natural pharmaceutical resources. The survey was distributed randomly to villagers when *G. expansa* was collected from Kampung Rampayan Ulu. A local villager assisted researchers as a translator to avoid miscommunication during interviews and survey distribution. The total number of survey participants was 28.

Marsh clam heavy metal analysis

A total of 20 individuals adult *G. expansa* in the same size shell range were collected once a month in November 2016, January 2017, and February 2017. *G. expansa* samples were obtained from the same *G. expansa* cage farmer in Kampung Rampayan Ulu. Samples were brought to the laboratory in a cool box (4° C) and washed clean. The abductor muscle, foot, gill, gonad, and mantle organs were dissected from *G. expansa* tissues and dried at 80° C in the oven. Dried samples were ground into a powder, homogenized with 5 mL 65% nitric acid (HNO₃), and left overnight. The next day 2 mL HNO₃ was added and heated at 80°C for 4 hours until complete digestion. Cooled samples were filtered with 0.45 µm Whatman paper and diluted for heavy metal analysis by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) (Perkin

Elmer Optima 5300DV). Blank solutions were also prepared with the same procedure for control.

RESULTS AND DISCUSSION

Socio-demographic profile

Iranun communities in Southeast Asia have been devoted Muslims for centuries. Some believe this is one of the reasons they had vigorously combated western enterprise during their prosperous sea trade era (Warren 2002). All the survey participants conducted in Kampung Rampayan Ulu, Kota Belud district, belong to the Iranun ethnic group Muslim in faith. The majority of the respondents were female (70.0%), and half were already married (Figure 1). Most of the women who had participated in this survey had at least completed secondary school and are working in the private sector. Only two women were homemakers with no income and no formal education because they were already retirement age. Four women who work in the fisheries sectors participated in this survey, and only one of them earned above the poverty line.

On the other hand, we only managed to have one male participant working in the fisheries sector and above 60 years old during the survey. The male fisherman’s monthly income was below the poverty line (RM1215) for rural

areas of Sabah. The self-employed three fishermen above 40 years old did not receive any formal education and earned below RM500 monthly income. None of the respondents who participated in this survey were involved in the agriculture industry.

In this modern time, only a few people in Kampung Rampayan Ulu are working at sea as their primary source of income. Moreover, fishers below 40 years old prefer to buy marsh clam as middlemen rather than hunt these natural resources themselves due to the hard work and environmental conditions that had to be endured. In contrast, the older fishermen generation prefers to harvest the marsh clam themselves because they are more accustomed to the mangrove conditions. A similar situation has happened in communities living adjacent to mangrove areas in the Kudat district, North Borneo; many prefer to buy these natural resources rather than venture into the mangrove area (Hamdan et al., 2019). The Rungus community’s perception of the Kudat area on which gender is generally associated with marsh clam foraging in a mangrove in Rungus culture points out that it is a woman’s work. Nevertheless, there has been an increasing number of males who forage marsh clam in some Rungus communities in recent years due to the demand for marsh clam supply. However, all survey participants from Kampung Rampayan Ulu agree that marsh clam foraging does not focus on any gender.

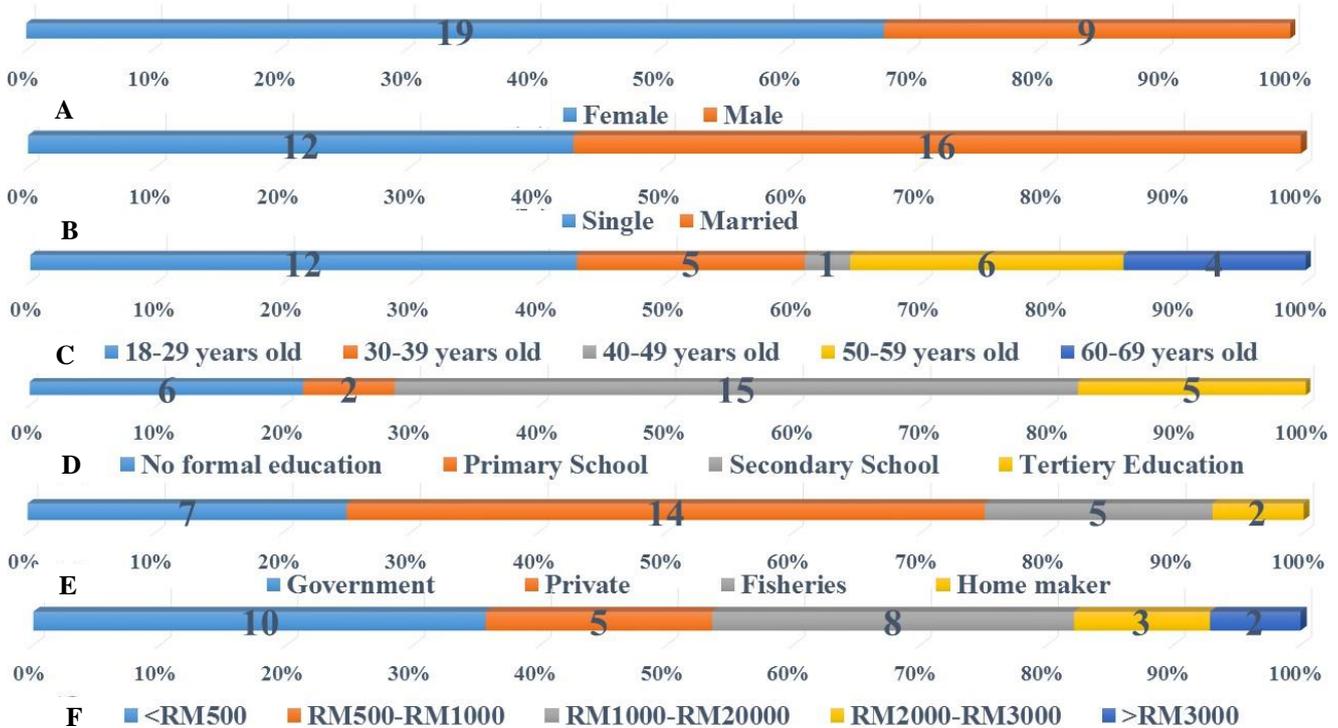


Figure 1. The sociodemographic and socio-economic profile of respondents (n=28) from Kampung Rampayan Ulu, Kota Belud district, North Borneo (n=28) who are Iranun Muslim in percentages of (A) gender, (B) marital status, (C) age, (D) education level (E) working sector, and (F) monthly income

Respondents employed in the government sector have more stability in their monthly earnings. They all have more than RM1000 above monthly income, and all had at least completed secondary school education (Figure 1). Moreover, only two representatives in this survey had revenues of more than RM3000 working in the government sector and are close to the retirement age. Like other parents in the world who want a better future for their child in life by getting a good education, Iranun parents begin to converse less with their children using their native language at home to help their children to grasp the national language that is mainly being used in the primary education (Smith 2003). The younger generation finds it difficult to master their native language because, at school, they need to have a deeper comprehension of the national language of Malaysia and the English language for better opportunities in furthering their study to tertiary education. This has raised concern about the decline of Iranun native speakers, which can cause this language to lose as many languages have been lost in recent years. Initiatives were taken to rectify this situation by providing Iranun language classes to a primary school with many Iranun students in the class. All the respondents living in Kampung Rampayan Ulu under 40 years old had completed their secondary school education except for one participant (Figure 1). The decline of native Iranun speakers is a concern as it can disrupt the oral tradition of passing down indigenous knowledge to the younger generation. Thus, the documentation of traditional indigenous knowledge is essential before it is lost forever.

Rural communities that solely rely on fishing as a source of livelihood face many insecurities and need to find different side income sources. The Sabah state government had developed rubber or oil palm plantation projects in collaboration with locals to alleviate poverty in rural coastal areas (Kodoh et al., 2016). This has shifted some of the main occupations of the locals who participated in this socio-economic development project from the sea to land because the primary source of stable income comes from the rubber or oil plantations. In contrast, a small number of Rungus communities in Marudu Bay have also begun to work more in the sea than land. The Rungus ethnic group has always been associated with the agriculture sector, and very little is known about their history connected to the sea. In recent years, an increasing number of Rungus communities have participated in aquaculture projects (Hamdan et al., 2019). Socio-economic has been one of the key drivers that change the dynamics of community development in this modern world (Mansur and Idris 2016). There is a lack of socio-demographic and socio-economic data for the Iranun community in North Borneo. Most of the literature emphasizes the cultural elements of this community (Amat and Abdul Samad 2019; Mulia 2010). Therefore it isn't easy to gauge how long this marine community has gradually shifted to more land orientated in their current lifestyle. This study can provide data for future studies on the Iranun community in North Borneo.

Mud clam locality as a food resource

Most of the survey participants are seafood lovers, and no one has any allergies to seafood consumption (Table 1). Only two respondents did not enjoy seafood and preferred to eat meat than seafood. Marsh clam is not a staple food in this maritime society. However, they prepare marsh clam as the main dish and consume them once or twice per month (Figure 2). Moderate clam consumption is recommended as bivalves are filter feeders which absorb nutrients from their habitats that can cause toxicity risk if the environment is contaminated with an excessive amount of minerals from the upstream activity caused by agriculture management and industrialization (Hamdan et al. 2016). Moreover, respondents do not have any tips to reduce toxicity risk from marsh clam consumption (Table 1). Marsh clam boil together with blood cockle perhaps can reduce contaminant risk were tips given by only two respondents.

The Iranun community in Kampung Rampayan Ulu is not a heavy marsh clam consumers. All respondents did not consume more than 10 clams per meal, making it at most 20 clams per month per person (Figure 2). On the other hand, the Rungus ethnic group, which is not known as a maritime society in the Kudat district, North Borneo, eats marsh clam more frequently and consumes more than the Iranun community in Kampung Rampayan Ulu (Hamdan et al. 2019). Marsh clam is becoming a popular cheap seafood snack by the roadside in North Borneo, especially in Salut, the outskirts of the capital city of Sabah state, Malaysia (Hamdan et al. 2016). These eateries offered grilled marsh clam where the entrepreneur grilled the marsh clam with charcoal on top of straight zinc slate and sometimes added some herbs on top of the clam flesh. Thus, grilling has increasingly become a popular cooking method for marsh clam in the Iranun community in Kampung Rampayan Ulu compared to the traditional way of preparing marsh clam by marinating. The locals describe it as '*hempap*' (Figure 2). Marsh clam can also be eaten as raw meat (Table 1), and this is also had been observed in other cultures such as the Rungus people of Kudat district, Malaysia (Hamdan et al. 2019).

Table 1. Survey participant (n=28) perceptions on the marine resources as a food source and their life experience with marsh clam as a food source

| | Yes | No |
|--|----------|-----------|
| Seafood lover | 26 (93%) | 2 (7%) |
| Prefer to eat seafood rather than poultry meat | 26 (93%) | 2 (7%) |
| Allergic to seafood. | 0 (0%) | 28 (100%) |
| Like to eat marsh clam. | 26 (93%) | 2 (7%) |
| Eat more marsh clam than fish. | 0 (0%) | 28 (100%) |
| Enjoy marsh clam as the main dish | 20 (71%) | 8 (8%) |
| Raw Marsh Clam ingest experience | 16 (57%) | 12 (43%) |
| Know any tips to reduce contaminant risk | 2 (7%) | 26 (93%) |

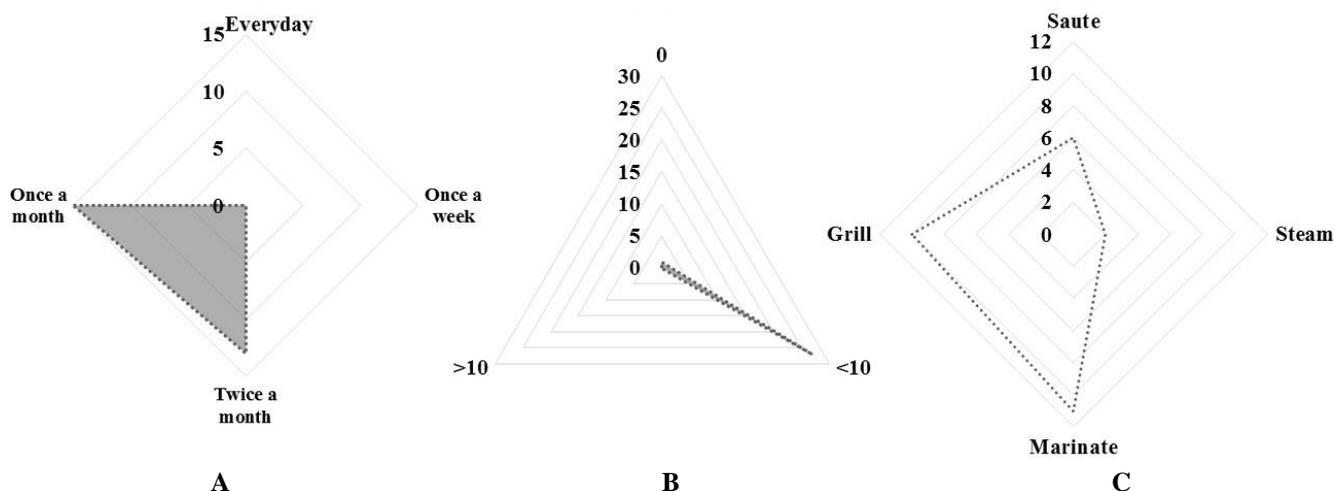


Figure 2. A. Frequency of how often do respondents have marsh clam for a meal. B. The no. of marsh clam that usually respondent eats per meal. C. The common way to prepare marsh clam as a dish that was chosen by the respondents (n=28)

A galactagogue to aid nursing mother

Bivalve is a natural food product rich in micronutrients like iron and zinc, essential for the human body system to function correctly. Iron is necessary for the early baby's development in a mother's womb. Thus, this increases expectant mothers' iron needs in their diet. Local food like marsh clam is a cheap protein source and contains many essential minerals good for health (Hsieh et al., 2018). *G. expansa* harvested in Kampung Rampayan Ulu contains a high concentration of iron followed by zinc and copper (Figure 3). The iron, zinc, and copper concentration in total tissues studied did not exceed the permissible limit of the Malaysia Food Regulation 1985 (MFR 1985). Thus marsh clam collected from Kampung Rampayan Ulu is safe to consume. Marsh clam is widely available for the locals to hunt in the mangrove forest anytime they want. All the respondents have informed that there is no specific season to harvest marsh clam in the mangrove forest and marsh clam is available all year round to catch.

Marsh clam can help supplement pregnant and breastfeeding mothers' diets who earn income below the poverty line than the over-reliance on conventional pharmaceutical supplements. Iron deficiency can cause anemia, and local people can avoid anemia by occasionally consuming clams in their diet. However, all respondents have poor knowledge of the nutritional value of marsh clam that can benefit them (Figure 4. A). Local health care needs to promote indigenous functioning food like marsh clams to the locals as part of their diet as this natural food resource is more fresh, attainable, and cheaper. This can also help promote the local's socio-economic development by eating locally-produced.

Furthermore, not many respondents thought that marsh clam was harvested near their village can pose any health risk (Figure 4. B). By ensuring that marsh clams do not pose any health risk, the fisheries department can regularly monitor the seafood products and inform locals of a red tide occurrence. The local Iranun community knows the impact of red tide on food safety.

Nowadays, all healthcare worldwide strongly encourages mothers to breastfeed their babies as soon as birth because the early nutrient content in breastmilk is beneficial to newborn babies. Borneo people are very supportive towards nursing mothers; At an early stage, family members will support finding ingredients of food resources that can boost milk supply, especially during the post-Partum period (Chang et al. 2015). The Rungus ethnic people in North Borneo are very family-oriented, and some still live in longhouses with extended families. For example, the family elders of the Rungus help prepare a soup of marsh clam boil with papaya to help increase breastmilk supply for nursing mothers (Hamdan et al. 2019). Iranun community also uses marsh clam to improve breast milk supply, but many are unsure of its effectiveness due to poor knowledge of the nutritional value of marsh clam (Figure 4). However, this ethnomedicine knowledge is not widely known in North Borneo. For instance, a field study conducted at Kampung Sebayon, Marudu Bay in North Borneo found that the maritime community of the Bajau-Sama ethnic group does not possess any traditional ethnomedicine knowledge on the use of marsh clam.

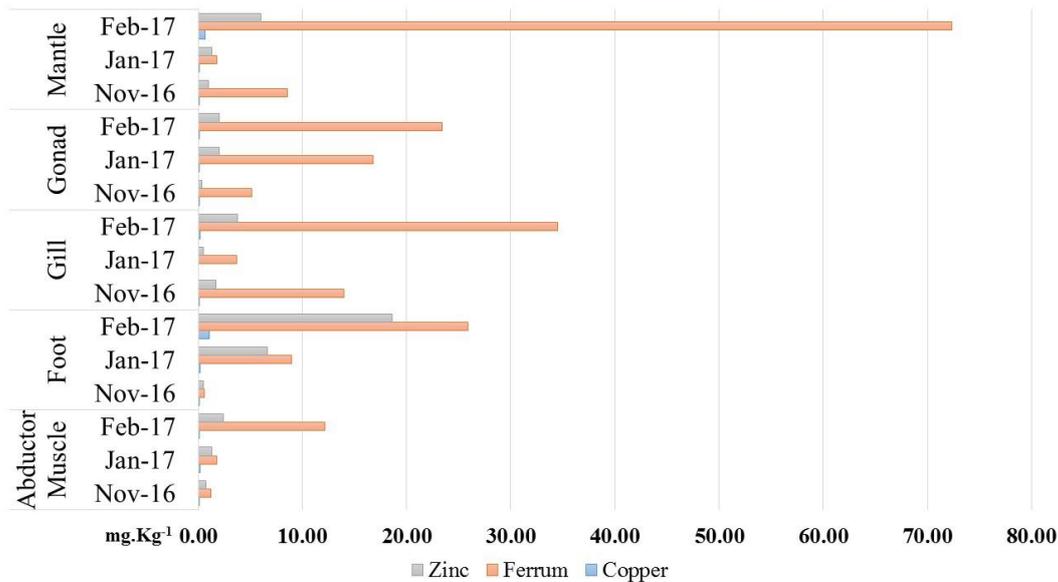


Figure 3 Distribution of zinc, Ferrum, and copper mean concentration (mg.kg⁻¹) in different organs of an individual adult *G. expansa* collected from Kampung Ulu Rampayan in other months.

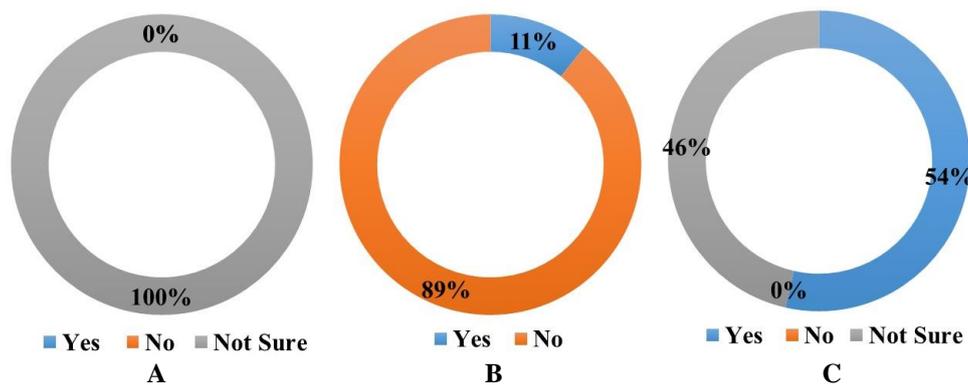


Figure 4. A. Percentages of respondents (n=28) know the benefit of the nutritional value of marsh clam (*Geloina expansa*). B. Respondent thinks that marsh clam can pose a risk. C. Respondents who hold beliefs that marsh clam boost nursing mother breastmilk supply

The importance of postpartum care for mothers who had just given birth to a newborn is common because people in the Southeast Asia region with different cultures and ethnic backgrounds hold the same belief. Traditional medicine during postpartum care is one of the indigenous knowledge that is best preserved among other traditional medicine (Olowa and Demayo 2015). Many different natural product sources are utilized for various needs in postpartum care (Rozaimie et al., 2019). Traditional knowledge of post-natal care is also essential in ensuring that nursing mothers have enough breastfeeding for newborn babies (Montaben 2017). Food resources that can increase breast milk supply for nursing mothers are also called galactagogue. Many traditional galactagogues used in Asia have been recorded, but most are from plant-based

resources. There are limited documentations of animal-based galactagogue (Montaben 2017). The human body more readily absorbs substance extract from animals than plant-based. Like plants, Zinc requirements for early seedling growth development are also essential in the early baby’s development and growth. Recently Zinc content in mother breastmilk is not sufficient for baby needs as mothers themselves need this mineral for their body function (Aumeistere et al. 2018). Thus, this causes little allocation left of Zinc to breast milk. The type of food in the mother’s diet is essential to ensure that Zinc content in breast milk is sufficient, especially for baby growth. Marsh is rich in iron and one functional food rich with zinc micronutrients (Figure 2). A clinical study is recommended to ascertain the merits of marsh clam as nutraceutical food.

Traditional medicinal knowledge of marsh clam topical application

Anticoagulants such as heparin and warfarin are medications that decrease the blood's ability to clot. However, caution must be taken to control the use of anticoagulants to minimize the risk of hemorrhagic complications. Heparin and other anti-coagulants substance compounds can also be extracted from natural products from marine animals like the bivalve (Ahmad et al. 2018). In these past decades, an increasing number of findings of different bivalve species have been identified as a beneficial functional food for wound healing and anti-coagulation (Cesaretti et al. 2004; Mirshahi et al. 2009). Extracting compounds from bivalve tissues administrated in clinical studies as a supplement had shown quicker recovery of wound areas than the sole reliance on conventional modern medical practice (Peng et al., 2017). Many different substances can be extracted from clam tissues, providing many pharmaceutical properties in treating various ailments. The survival rate of specimens with Alzheimer's disease and cardiovascular disease had increased when *Geloina eros* was included in its diet regime (Hsieh et al., 2018). Organic practice in the poultry industry is without administrating livestock with antibiotics. Bacterial diseases can spread very fast between animals in dense conditions. This is one of the main challenges that organic farmers with limited rearing space currently face. Other alternatives than antibiotics, animals can be given feed products based on supplemented organic materials as marsh clam that contain nutritional value and medicinal value content (Saili et al. 2019). Marsh clam can have a broader scope of the function in the future, not as a food resource but as natural pharmaceutical products that are useful for human medicine and the livestock industry. The diversification of marsh clam functions can also help increase the livelihood of coastal people who hunt this wild food and help sustain community-based-management *Geloina* sp. aquaculture development (Hamdan et al. 2019).

The Iranun community in Sabah is related to the Maranao communities living in the Illana Bay off the southwestern coast of the Mindanao islands, the Philippines, where they were come from (Amat and Abd Samad 2019). Ethnobotanical documentation on Maranao communities in Iranun people's original homeland had been published. This publication reported that one of the most common uses of this natural product is to heal cuts and wounds (Olawa and Demayo 2015). Due to their socioeconomic circumstances, many Maranao people still rely on this natural pharmaceutical product than modern medicine. This shows that indigenous knowledge provides the basis for grassroots decision-making (Senanayake 2006) for healthcare in their household. However, only plant-based natural products were listed in the publication. In traditional medicine, plant-based products could be used for healing wounds, but there are animals like molluscs to

which marsh clam belongs, which are believed to have properties that can heal wounds recorded in other cultures (Ahmad et al. 2018).

Nevertheless, the ethnomedicine marsh clam usage for external application to heal blood clotting and the wound was not documented in the literature. Iranun villagers that live in Kota Belud mangrove areas have shared one of the medicinal uses that some still practice today to get rid of blood clotting or bruise on the body are by topical application of raw marsh clam (figure 5. A). The part used for the traditional treatment to heal blood clotting and the wound uses the mantle organ in marsh clam that looks like a layer usually covering other soft tissues in marsh clam. The mantle organ is usually closest to the clam inner hard shell side (Figure 5. B). Other organs are dissected, and only the mantle organ that looks like a thin layer is applied onto the injured areas.

Interestingly, the mantle had a higher concentration of iron (Fe) compared to other organs (Figure 3). Iron is a mineral essential for maintaining a normal process in the blood system. A clinical study will be needed to elucidate how effective this traditional medical treatment is for wound healing is to bridge science and traditional knowledge together as an alternative for cheaper treatment for rural communities whose income is generally below the poverty line. Moreover, indigenous traditional knowledge and basic science need to be promoted so that this valuable information from oral tradition won't be lost in the future.

Another aquatic living use for traditional medicine that has many believers in its effectiveness to heal wounds from surgery is the snakehead (*Channa striatus*) fish. The snakehead fish is locally known as *ikan haruan* and is especially sought out for mothers who had just delivered a newborn baby that had to undergo a cesarean section to assist in a fast recovery. Products from snakehead fish compounds have been innovated for external application and clinical use, which have been proved practical rather than the traditional method by ingestion (Sahid et al. 2018). Sea cucumber (*Stichopus horrens*) is a marine animal for traditional medicine use of people in the Southeast Asian region because it is widely known for its wound healing properties. Not just snakehead but sea cucumber products are also being rapidly developed for external application in clinical use (Poh et al., 2018). The prospect of pharmaceutical products innovation from marsh clam extracts for convenient topical application will increase the demand for this natural product and prompt the fisheries department to support the development of sustainable community-based marsh clam aquafarming that can help alleviate poverty in rural areas (Hamdan et al., 2019). In addition, these pharmaceutical products are also a part of a product that has similar concepts with cosmetic products objective which one of them is to diminish scar visibility.

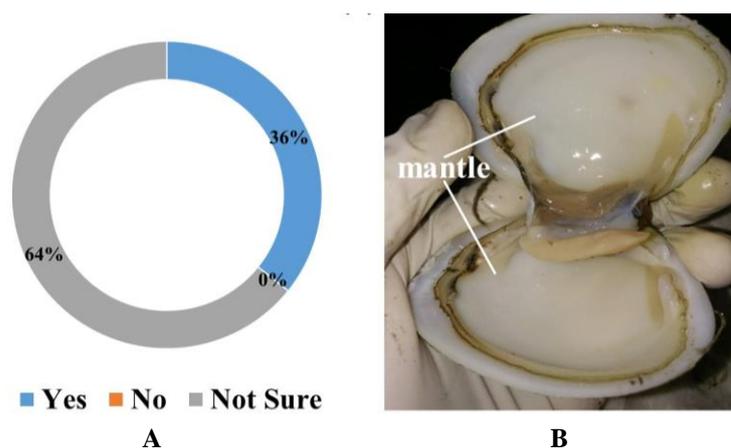


Figure 5. A. Percentages of respondents (n=28) who have heard about the traditional knowledge of *Geloina expansa* heal blood clotting or bruises and hold this belief. B. The anatomy of *G. expansa* mantle tissues after other organ tissues had been dissected out from the shell

Historically, Iranun ethnic groups are also land people. They also do subsistence farming and are known as people of the lake where they originated from near Lake Lanao in the Philippines. But due to catastrophic natural disasters and different political views, a few seafarer Iranun ethnic groups open up settlements and government in some coastal areas in North Borneo to strengthen their political power in the profitable sea trade route of the Southeast Asia region (Warren 2002). Western countries were prompted to be involved in local politics in this region as Iranun marine military force is a force to be reckoned with, and sometimes war would ensue at sea. Some casualties are common during war times. Therefore there will be a need for medicinal resources at hand to treat injuries. Unfortunately, there were very few records from the Southeast Asia region side apart from Western views during that time. It is left to the imagination of how the Iranun army treats these casualties. During that period, the production of synthetic medicine of these days is not available yet. Hence, it will surely be from natural resources at hand. The uniqueness of marsh clam compared to other marine life is that marsh clam can live several days without water, making it easy to transport anywhere because of the clam keeps water in its shell. Moreover, marsh clam has antibacterial properties (Argent and Ilano 2015). The marsh clam is widely distributed in the mangrove forests of North Borneo and will later be discovered by new settlers when they assimilate with the new environment.

Marsh clam (*Geloina* sp.) in North Borneo is locally known as 'lokan.' The Rungus ethnic group has their word for 'lokan,' or 'Tagum' in the native Rungus language. Interestingly, during the survey was conducted in Kampung Rampayan Ulu, an inquiry of other local names for 'lokan' in the Iranun community resulted in all the respondents saying they used the term 'lokan' to refer to marsh clam. Nowadays, not only spoken language that was not successfully transferred to the younger generation orally (Smith 2003) also the skill or knowledge of minority ethnic groups is also rapidly disappearing. One fine example is the

disappearance of gong-making in the Iranun community in the Kota Belud district, Sabah, Malaysia (Pugh-Kitingan 2010). They are once acclaimed as the local gong maker that helps provide gong to this region. The gong is an important musical instrument used in many traditional ceremonies of different ethnic groups, such as the Dusun-Kadazan and Bajau ethnic groups. The skill of gong-making ended in the Iranun community in the Kota Belud when the last gong-making practitioners died of old age without any preservation of gong-making production. Nowadays, the famous locally made gong in North Borneo is only available in the Kampung Sumangkap in the Kudat district, part of the eco-tourism initiative. However, the material used for gong making these days is not the same as previous use in the older version due to the production cost.

Some civilizations have written records of the traditional medicinal value of their fauna and flora in the region they live in, which could be passed on to generations (Ahmad et al., 2018). However, many ethnic groups in the Borneoic islands do not have written records. This information is passed down orally to the younger generation interested in preserving their cultural heritage. Preservation of oral tradition is important before the knowledge is lost. It allows future science research to integrate with indigenous knowledge for the benefit of all during this globalization. Marsh clam is one example of marine animal use in Iranun community traditional ethnomedicine knowledge at the moment that has high potential as pharmaceutical resources. North Borneo is one of the world's regions renowned for its rich marine life diversity. More investigations are required to document detailed other marine animal use in traditional ethnomedicine of the Iranun community in North Borneo for the benefit of all, especially to the next generation. Understanding the worth of this marine animal to humans, not just for food resources, can facilitate socio-economic development and alleviate poverty in rural coastal areas when the demand for this natural product increases.

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