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Snake as Functional Food by Arfak Tribe Community in Manokwari Regency Papua Barat

(Ular sebagai Bahan Pangan Fungsional bagi Masyarakat Suku Arfak Kabupaten Manokwari Papua Barat)

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ABSTRACT

The Arfak tribe has utilized snakes as functional food for generations. This study aims to describe the pattern of the snake utilization as functional food. This research was conducted using Descriptive Method with semi-structured interview and observation. Data collection was performed in 27 villages in Manokwari Regency. Data analysis was carried out qualitatively and quantitatively. The results showed that the Arfak tribe has utilised five species of snakes as functional food, which are *Leiophython albertisii, Apodora papuana, Morelia amethystine, Morelia viridis*, and *Micropechis ikaheka*. The utilised parts are meat, fat and bile. The health benefits of snakes are grouped into four categories, namely curing diseases of the respiratory tract, skin diseases, chronic diseases and increasing body strength and vitality. Although snakes have been utilized and are believed to have health benefits, issues related to zoonosis and the absence of comprehensive studies showing the effectiveness of snakes as medicine have resulted in the utilization of snakes as functional food has been debatable.

KEYWORDS: Apodora, Ethnozoology, Leiopython, Micropechis, Morelia.

INTISARI

Suku Arfak telah memanfaatkan ular sebagai pangan fungsional secara turun-temurun. Penelitian ini bertujuan untuk mendeskripsikan pola pemanfaatan ular sebagai bahan pangan fungsional. Penelitian ini dilakukan menggunakan metode deskriptif dengan wawancara semi terstruktur dan observasi. Pengambilan data dilakukan di 27 kampung di Kabupaten Manokwari. Analisis data dilakukan secara kualitatif dan kuantitatif. Hasil penelitian menunjukkan bahwa suku Arfak memanfaatkan lima jenis ular sebagai pangan fungsional, yaitu Leiophython albertisii, Apodora papuana, Morelia amethystine, Morelia viridis, dan Micropechis ikaheka. Bagian yang dimanfaatkan adalah daging, lemak dan empedu. Manfaat ular

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bagi kesehatan dikelompokkan menjadi empat kategori, yaitu menyembuhkan penyakit pada saluran pernafasan, penyakit kulit, penyakit kronis serta meningkatkan kekuatan dan vitalitas tubuh. Meskipun ular telah dimanfaatkan dan diyakini memiliki manfaat bagi kesehatan, namun isu terkait zoonosis dan belum adanya penelitian yang komprehensif yang menunjukkan efektivitas ular sebagai obat menyebabkan pemanfaatan ular sebagai pangan fungsional masih diperdebatkan hingga saat ini.

KATA KUNCI: Apodora, Etnozoology, Leiopython, Micropechis, Morelia.

INTRODUCTION

Snakes are widely utilized by people and are included in various cultures around the world. In China, people consume snake meat, ferment snakes to produce energy drinks (snake wine) and medicine (Somaweera & Somaweera, 2010). The research of snake venom as a medicine to cure cancer and various diseases related to skin and nerve cells is also being carried out in various countries (Oliveira et al., 2022). In Central Java, snakes are source of protein and medicine for liver disease, stroke and low blood pressure (Mirdat et al., 2019). The Muyu tribe in Boven Diguel consume snakes for male vitality. However, pregnant women are prohibited from consuming snakes because it is believed that the child will experience a delay in growth (Laksono & Wulandari, 2021).

Snakes, which have long been utilised traditionally, certainly have the potential to be developed into functional food to support food diversification from local resources in complementing nutritional needs by considering health, practicality and availability. In Indonesia, much research is focused on functional food which based on the local wisdom of certain tribes because this has certainly been proven over a long period (Suter, 2013). This is also due to an increasing of public awareness of a healthy lifestyle (Silalahi, 2020). Functional food, which is food that is delicious and can improve body health, is increasingly in demand and various studies have been conducted to develop functional food products (Abbas, 2022).

Snake is widely traded on a local, national and international scale (Janssen & Gomez, 2021). In Manokwari, snakes are traded for IDR 250,000 per individual. In Kalimantan and central Java, snakes are purchased at a price range of IDR 30,000-75,000 per individual. Indonesia is also one of the countries that export snakes to various countries, with around 30-60 tonnes of meat per year and 50-100 thousand snake bile annually (Kurniawan et al., 2018;Qurniawan et al., 2012). Today, snakes are not only traded in conventional ways but have been traded through various e-commerce applications (Mutiaradita et al., 2023).

The Arfak tribe, which is indigenous to the Arfak Mountains in Manokwari Regency, has utilised snakes for generations. Therefore, this study aims to determine the richness of snake species used and discover the pattern of snake utilisation as functional food. The expected benefits of this research are the availability of information in determining local functional food sources that have

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the potential to be developed as superior regional protein sources and the development strategies as well as data collection on the wealth of traditional ecological knowledge of the community.

RESEARCH METHOD

Study site

This research was conducted in nine districts in Manokwari Regency, Papua Barat Province. Data were collected in three villages in each district (Table 1) and the map of the research location can be seen in Figure 1. This research was carried out for seven months, from 1st February 2024 to 30rd September 2024 that consisted collection of the data and writting the report.

Table 1. Villages where the data are collected

Number	District	Villages	Coordinates	
			Longitude	Latitude
1.	Manokwari Timur	Bakaro	134,13402126100	-0,86605557243
		Arowi	134,12640698500	-0,87271806325
		Pasir Putih	134,10213648300	-0,86986271004
2.	Manokwari Barat	Brawijaya	134,08119722600	-0,86462789582
		Fanindi Dalam	134,05978207700	-0,85463415960
		Amban Dowansiba	134,05787850800	-0,83892971697
3.	Manokwari Utara	Asai	133,94271259600	-0,72899861850
		Mubraidiba	133,92663023900	-0,73667821254
		Warbefor	133,85846636300	-0,73587941059
4.	Manokwari selatan	Anday	134,03360800600	-0,92839745077
		Doubut	134,03350219700	-1,00275237831
		Sowi	134,03503568300	-0,89746445770
5.	Warmare	Sotea	133,92938761400	-0,94743313881
		Subsay	133,90083408200	-0,96504115025
		Nimbay	133,88655731600	-0,92792155857
6.	Prafi	Mebiji	133,90606889600	-0,92744566637
		Bedip Matoa	133,90273765100	-0,90365105631
		Umbuy	133,90765123800	-0,93641623436
7.	Masni	Meiforga	133,76572549300	-0,82754096355
		Meyof II	133,72960154500	-0,85013340043
		Ourmios	133,65903420000	-0,79367952442
8.	Sidey	Sidey	133,58658505900	-0,73722564842
		Kaironi	133,57247159000	-0,74851642362
		Meyof I	133,62422097600	-0,79367952442
9.	Tanah Rubuh	Warmawai	134,08500436400	-1,09971864318
		Warkapi	134,11260611200	-1,14635607889
		Warami	134,13878018300	-1,17062658115

Methods

The research was conducted using descriptive method with semi-structured interview and observation techniques. Determination of respondents was performed using snowball sampling technique. The main respondent was the village head and subsequent respondents were obtained based on the recommendation from each respondent interviewed. The collection of data was carried out until the data became saturated. There were 234 respondents in this study. The data collected includes data on the identity of respondents, snake species and their utilization patterns.

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Observation was carried out to see the process of serving snakes into functional food. The main variables in this study are the pattern of the utilisation of snakes as functional food. Data was presented descriptively and displayed in the form of tables and figures. Contextual analyses were also conducted to enrich the discussion.

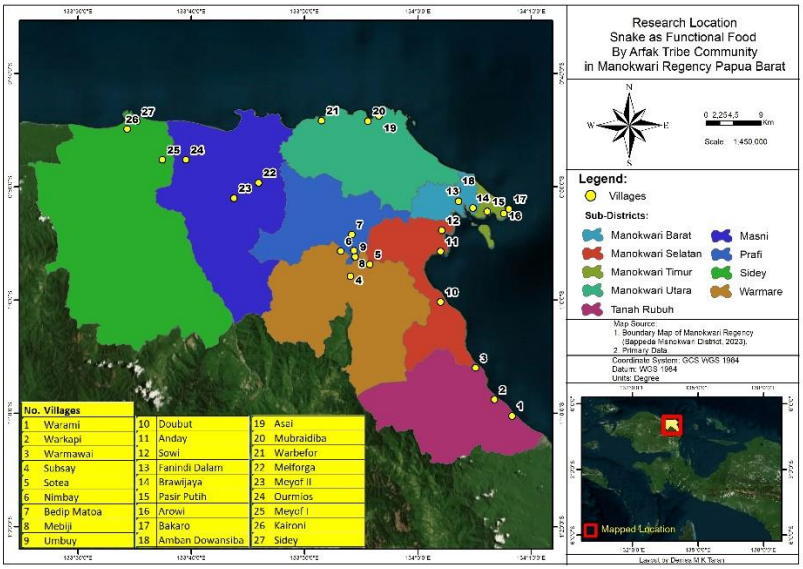

Figure 1. Research Location

RESULT AND DISCUSSION

Respondents Caracterization

There were 234 respondents in this study. They are considered as people who know and understand snake utilisation patterns. Figure 2 shows the composition of respondents by ethnicity and districts. The Arfak tribe respondents came from four sub-tribes, which are Sough, Hatam, Moile and Meyakh. The most respondents are from the Sough sub-tribe and the least from the Hatam sub-tribe. Within the Arfak tribe, the largest sub-tribe is Sough because it has many clans, followed by the Meyakh sub-tribe. Meanwhile, the Moile and Hatam sub-tribes have less clan composition. Data was also taken from other tribes, namely tribes originating from Papua such as Biak, Serui, and Wamesa. However, these respondents are related to the Arfak sub-tribe because they are married to Arfak people and or live close to Arfak families.

Respondents came from nine districts in Manokwari Regency, which are Manokwari Timur, Manokwari Barat, Manokwari Selatan, Manokwari Utara, Tanah Rubuh, Warmare, Prafi, Masni and Sidey districts. The Arfak community live in all these districts. Data were collected from three villages in each district, which were purposively sampled by going directly to villages where people were known to utilize snakes. The percentage of respondents by District can be seen in Figure 2. Respondents from all Districts were evenly represented because the persentage did not differ greatly, ranging from 10%-13%. Data collection was conducted until data saturation, meaning that if there

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was no new information or the information provided was similar, the interview was then stopped for that village.

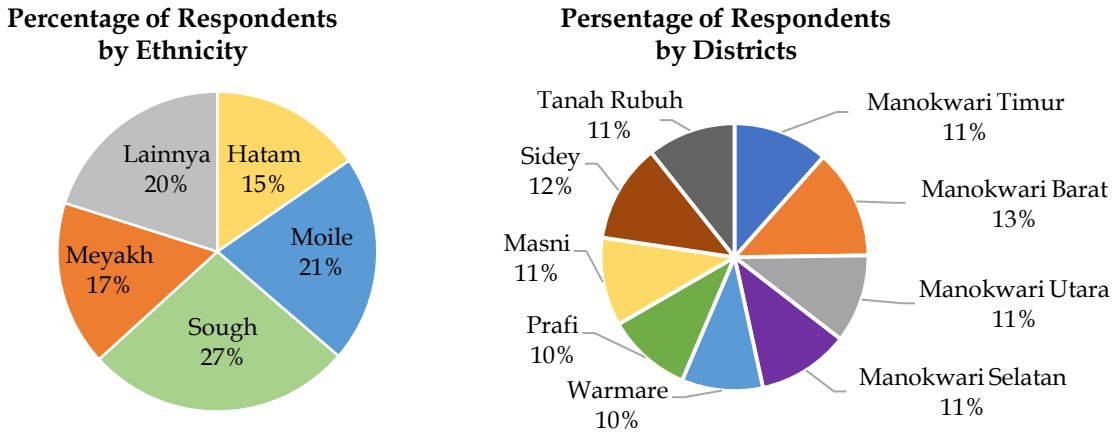

Figure 2. Percentage of respondents by ethnicity and district

Pattern of Snake Utilisation as Functional Food

The information from all the respondents showed that the pattern of snake utilisation among all respondents is identical with an exception in the local name of the snakes utilized. Arfak has four languages, which are Hatam, Sough, Moyle and Meyakh. Moreover, the pattern of utilisation includes the species of utilized snakes and all the prosedures of catching, processing, to the rules to use according to the local knowledge so that the purpose of utilisation both as a source of food and medicine can be obtained optimally.

Utilized snake

The study found that there are five snake species utilised as functional food by the communities of the Arfak tribes. This is only 6% of the 83 snake species reported in Papua (Allison, 2007). The scientific and local names of the five snake species from each Arfak sub-tribes languages displayed in Table 2. Each sub-tribe has a different local name for each snake species. This shows that the community knows their animal resources based on the species of snake owned. The snakes are named based on its morphological appearance. The colour and pattern of scales is one of the specific characteristics used in the key to snake species determination (O'Shea, 1996).

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Table 2. The utilizad snakes

Scientific name	Local name			
	Hatam	**Moile**	**Meyakh**	**Sough**
Leiopython albertisii	Maskuk	Wou munna nangoya	Mansi Marmokos wak	Hinoskeirec
Apodora papuana	Abieb	Wou Imunna	Mansi Kumbutoi	Hinogo
Morelia amethystine	Wou saba	Wou pyeda	Mansi Mansita ejmek	Hinohodera
Morelia viridis	Wou mainguna	Wou mainguna	Mansi Irifewah	Hinosmeimku
Micropechis ikaheka	Wou nimun	Wou tyeia	Mansi Mouwyewsi	Hinokofu

Source: Primary Data

The five species of snakes used are catagorized into two families, the Boidae family (*L. albertisii, A. papuana, M. amethystine* and *M. viridis*) and the Elapidae family (*M. ikaheka*). Snakes that are members of the Boidae family are snakes that have large bodies and are not venomous so they are often used by the community because they will have a lot of protein and are considered safe to be catched and consumed (O'Shea, 1996). Respondents in Warbefor Village stated that the largest *M.amethystine* ever found was about 8.4-metres long and weighed up to 18 kg, which was wrapped around a piglet. The community then killed the snake and consumed it together. Meanwhile, snakes from the Elapidae family, a group of highly venomous snakes, are also utilised by the community (Mattison, 1986). *M.ikaheka* contribute to the high number of deaths in Papua. This shows that the community has traditional knowledge in processing this venemous snake so that it can be consumed safely.

Origin of snakes utilised

There are various species of snakes in the forest and communities have traditional ecological knowledge related to the species and utilisation of each snake. Snake utilisation in Papua is still done traditionally and not yet at the level of cultivation although the frequency of utilisation is quite high. All the utilizad snakes are obtained from the forest. 87% of respondents explained that the snakes utilised were taken from the forest around their place of residence. However, Snake is not a game. Snakes are only be caught when people find them and or caught when there is an urgent need for a particular utilization. The community catches snakes using hand-catching method or snakes caught in snares set by the community to catch wild boar or bandicoot. Meanwhile, 13% of respondents obtained snakes indirectly by purchasing them from relatives who trade snakes to them. Snake, which is categorised as special menu, is always purchased when being traded, although the prices are quite high, ranging from IDR 250,000-500,000 per individual. The price increases according to the size of the snake.

Finding snakes in forest can be challanging according to the size of the population. Respondents explained that observing *A. papuana* is quite difficult nowadays. Several respondents who are actively hunting stated that in the past year they have not even found this species in the forest area of North Manokwari. Meanwhile, the other four snake species are common around settlements and secondary forests. Snakes are nocturnal animals, which are active at night

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(Lutterschmidt et al., 2002). Therefore, respondents stated that it is convenient to find snakes when hunting at night, particullarly in areas that still have forest and oil palm plantation in Manokwari Utara, Warmare, Tanah Rubuh, Prafi, Masni and Sidey Districts. Meanwhile, respondents in Manokwari Timur, Manokwari Barat and Manokwari Selatan claimed that they usually have to purchase and or hunt snakes in Warmare, Prafi or Manokwari utara because snakes are increasingly difficult to find in urban areas or areas that are actively developing.

Rules of utilisation

There are four rules that are addopted by the people of the Arfak tribes in utilising snakes. These requirements have been applied for a long time and passed down through generations to ensure that the snakes will have sufficient nutritional value so that they can be consumed and have maximum health impacts. Firstly, the snakes must be over 1.5 metres in length. This is the minimum size to ensure that there is sufficient muscle to meet household protein requirements, as snakes of this length usually weigh more than 2kg. Secondly, snakes meat can only be consumed a maximum of three times a week. This is to prevent excess protein in the body because excessive consumption will cause pain, generally, the skin will peel and hurt (Widhyari, 2012). However, this is not always the case when consuming a snake. The frequency of consumption also depends on the health condition of each person. Third, the snake obtained must be in a healthy and intact state. The snake should not be injured, deformed or have dull scales. Traditionally, people consider snakes that do not look healthy and intact to be the incarnation of evil spirits that want to harm. Scientifically, snakes that look unhealthy may indeed be unhealthy and carry disease-causing pathogens (Pramatika et al., 2015).

In this utilisation, there is also prohibition (taboo/*pamali*). This banned is enacted because of unpleasant experiences based on stories that have been passed down for generations (Niman, 2019). The Arfak tribal communities are not allowed to consume *M. viridis* when outside their customary territory (Arfak Mountain). This green-tree snake is considered an animal that must be protected because it will display various good and negatif inccidents to the person who finds the snake. For example, if a person wants to hunt and finds a green tree snake which is facing the direction of the home, then the person must immediately return home. The community will try to interpret any signs demontrated by the snake and obey them. The sanction for violating is death. However, if they are in their customary territory in the Arfak Mountain then they are free to utilise this snake. This prohibition only applies when they migrate or outside the customary area.

Processing, Products and Efficacy

Processing method is one of the keys to obtain a delicious dish and effective medicine for human body. The snakes obtained will be processed based on the known utilisation pattern within the tribal group to serve products that can achieve the purpose of the utilisation. However, not all communities that utilise snakes as functional food can process snakes into food that is ready for consumption. Interviews showed that only 32% of respondents were able to process the snakes while

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68% of respondents were unable to process the snakes. This is due to bad experiences with snakes, resulting in trauma/excessive fear of snakes (Ophidiophobia), an aversion to handling snakes and/or abstinence due to certain circumstances (Klieger, 1994; Özel et al., 2009). In general, snakes are feared because of their deadly venom and cold, scaly skin (Rádlová et al., 2020). Whitaker & Shine, (2000) stated that snakes are also still one of the most commonly killed animals when encountered. Nonetheless, snakes are still a source of nutritious food that is gaining popularity (Sikatta & Adisasmito, 2020). Meanwhile, that the processing methods and the efficacy are displayed in Table 3 while several documentations of snake processing and products are shown in Figure 3.

Table 3. Processing methods and efficacy based on the species of snake

Snake	Processing method	Efficacy
L. albertisii	The snake is cleaned and intact (not cut). The snake is cooked for about 3-4 hours. Water will be added gradually (2-3 times) until the meat becomes tender. Spices such as shallots and garlic, galangal, ginger, turmeric, pepper, coriander, candlenut and lemongrass are added when the last addition of water. Several respondents boiled by adding papaya (Carica papaya) to speed up the meat tenderisation process.	Meat is consumed as a medicine for respiratory tract diseases and to make the body strength.
L. albertisii	Snake fat is cooked over medium heat until it releases oil and to use it will be dripped on leaves which are then heated with steam and applied to wounds, swelling and other skin diseases.	Oil is used as a medicine for various skin diseases such as wounds, swelling, scabies, ringworm, rashes and so on.
A. papuana	The snake is cleaned and intact (not cut). The snake is cooked for about 3-4 hours. Water will be added gradually (2-3 times) until the meat becomes tender. Spices such as shallots and garlic, galangal, ginger, turmeric, pepper, coriander, candlenut and lemongrass are added when the last addition of water. Several respondents boiled by adding papaya (*Carica papaya*) to speed up the meat tenderisation process. This snake has rather tough meat so it is usually cooked longer.	The meat of the Papuan water python is useful for increasing strength and vitality of the body.
M. amethystine	Snakes are consumed with the same processing method as other snakes, the snake is cleaned and intact (not cut). The snake is cooked for about 3-4 hours. Water will be added gradually (2-3 times) until the meat becomes tender. Spices such as shallots and garlic, galangal, ginger, turmeric, pepper, coriander, candlenut and lemongrass are added when the last addition of water. Several respondents boiled by adding papaya (Carica papaya) to speed up the meat tenderisation process.	Snake meat is consumed as a skin medicine (makes skin healthier and smoother).
M. viridis	The snake is cleaned and intact (not cut). The snake is cooked for about 3-4 hours. Water will be added gradually (2-3 times) until the meat becomes tender. Spices such as shallots and garlic, galangal, ginger, turmeric, pepper, coriander, candlenut and lemongrass are added when the last addition of water. Several respondents boiled by adding papaya (Carica papaya) to speed up the meat tenderisation process.	Green tree snake meat is useful as a tonic (vitality).
M. ikaheka	Only people who have received the 'gift' can be trusted to process this venomous snake. The way to remove the venom of the white snake is by cutting off the head and tail and removing all the blood in the snake's body. The snake is cooked for about 3-4 hours. Water will be added gradually (2-3 times) until the meat becomes tender. Spices	Consumption of white snake meat as a medicine for respiratory tract diseases that have reached a severe condition such as bronchitis, pneumonia and tuberculosis.

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	such as shallots and garlic, galangal, ginger, turmeric, pepper, coriander, candlenut and lemongrass are added when the last addition of water.	
M. ikaheka	White snake bile is swallowed raw as soon as it is taken from the snake's body and or put into *Papeda* (sago flour mixed with boiled water) and swallowed. It is only consumed once in a lifetime.	Consuming white snake bile is effective in providing immunity to autoimmune sufferers and various chronic diseases.
M. ikaheka	The white snake fat will also be cooked on low heat to produce oil which will be used when needed by applying the oil directly on the affected skin area.	This snake oil can treat various skin diseases and warm the body during cold weather.

Source: Primary Data

The right processing method will ensure the benefits obtained are maximized (Sutrisna, 2016). Boiling snakes is a form of processing that was ecplained by all respondents and is most often performed. Boiling is a method of cooking in moist heat conditions, which has been proven to minimize the formation of advanced glycation end-products (AGEs). They are highly oxidized compounds called glycotoxins, which are the cause of diabetes, long-term damage and dysfunction of several vital organs, such as eyes, kidneys, nerves, heart, and blood vessels, which cause various complications and other chronic diseases (Daulay et al., 2013;Mulyati, 2016). AGEs are formed through a non-enzymatic process of adding sugars to free amino acids from proteins, fats, and nucleic acids (Singh et al., 2001).

Source: Primary Data

Figure 3. *L. albertisii* to be boiled (a); snake cooked with *Ficus copiosa* (b); snake ready to serve (c)

There is also a form of processing that is increasingly rare to be performed. Currently, the number of people who process snakes by cleaning snake scales is decreasing. Snake scales are usually cleaned by burning and then scraping them off and/or removing the scales by peeling the snake and then boiling the snake. Nowadays, cleaning the snake is generally only performed by removing the stomach contents and the fat. Although respondents know this method, they no longer use this method. People prefer a fast-processing procedure. However, this will certainly affect the nutritional value of snake meat because generally parasites such as mites and lice are found in the skin and scales of snakes (Katmono et al., 2019). Furthermore, the cooking method by wrapping the snake in

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bark of *Ficus* spp. and cooking the snake in bamboo and then burning were also mentioned by respondents. However, these two methods are only carried out during special occasion and/or when the respondents held special celebrations.

Respondents argued that snake meat is healthy, therefore, it has excellent health benefits on the body compared to other wild animals. This assumption is based on traditional ecological knowledge that snakes consume only healthy food (prey) since they never consumed carcasses, so that, they have not been contaminated by disease-carrying pathogens which are generally found in carcasses. Moreover, snake meat is a white meat which often said to be healthier than red meat since it contains low saturated fat (cholesterol) (Jacobo, 2024; Khomsam and Anwar, 2008). Snake meat is odorless and has a rather hard texture (Ruitan et al., 2024). Therefore, it takes a long time to tenderize snake meat.

Snakes also provide a variety of flavors based on their species. The interview revealed that *L. albertisii* is the most preferred species for consumption because it has a savory taste after being boiled even without additional spices compared to other species, meanwhile, *M. amesthystine* is a species that is less in demand because it has a bland taste even though it has a large body size. The people of the Arfak tribes explained that they generally cook snakes with *gohi* vegetables (*Ficus copiosa*) and consume them with *kasbi* (*Manihot esculenta*), *betatas* (*Ipomea batatas*), *papeda* (*Metroxylon* spp.) and or rice (*Oryza sativa*). Kathy Ng Yiu-fan, a nutritionist in Hong Kong stated that several species of snakes have bland meat, so to add flavor, snake meat are cooked by combining several species of snakes (2-5 species) and or vegetables (Wai, 2023). This combination can also maximize the efficacy of snakes.

Animal fat has a negative image because it is always associated with obesity, cholesterol, stroke and various other chronic diseases (Khomsan & Anwar, 2008). In reality, the body needs animal fat intake to carry out various body functions (Rarastiti et al., 2023). The term fat refers to the solid form at room temperature while the liquid form of fat is called oil. 58% of respondents admitted that when processing snakes, fat will be taken to produce oil and it has to be removed so that the processed meat is not too oily. Fat can provide a savory taste, add nutritional value to the food, but if there is too much, it will become too oily and cause sore throats and stomachs (Sartika, 2008; Sriyani et al., 2017).

The oil obtained is used for various skin diseases and to warm the body. Until now, studies on the content of snake oil in Papua have not been available. However, in Chinese medicine, snake oil has been used for centuries as an anti-inflammatory to treat arthritis, bursitis, other joint pain and dermatitis (Bausell, 2007;Mukherjee et al., 2017). Currently, snake oil is also traded massively at a price range of IDR 25,000-1.,00,000 conventionally and on well-known e-commerce in Indonesia, such as Tokopedia, Lazada and Blibli. The existence of this trade proves the existence of users who have enjoyed the benefits of snake oil.

Consumption of snake bile is quite popular in several communities around the world, particullarly in Asia (Bergström et al., 1960). Indonesia is one of the countries that trades snake bile

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in significant quantity to various countries. Zulkarnain et al., (2021) discovered that Python's snake bile contains bile acids, bile salts of the Tauropythocholate, Taurocholate and Taurodeoxycholate and other amino acids. Bile acid compounds can provide benefits to human body such as eliminating toxins, increasing metabolism such as absorption of fat-soluble vitamins and cholesterol while bile salts are useful for protecting the small intestine from disease-causing microorganisms. However, high-dose consumption of more than two bile and long-term use is not recommended. Consumption of more than two bile of *Naja naja* which is a snake of the Elapidae family has been reported to cause damage to the liver and kidneys. Although scientific examination of *M. ikaheka* bile has not been carried out, the findings of Zulkarnain et al., (2021)are in line with the results of this study that traditionally the Arfak tribal communities have the knowledge that bile can only be consumed once in a lifetime and is beneficial for increasing immunity, particullarly people with autoimmune diseases and various other chronic diseases.

Social Value of Snake Utilization

In the traditions of the Arfak tribes, snakes are one of the dishes that have social value as a unifier and also a special dish at various events. This is because consuming snakes must be done together. People who process snakes must have their family, relatives, friends and/or neighbors to dine the dish together. Snakes are also not consumed every day so they become one of the dishes that are awaited. In addition, snakes are also seen as animals that bring good and bad to society because they are believed to be the incarnation of ancestors and become intermediaries to inform various events for their descendants and at the same time snakes also bring bad lucks and even death if people do not carry out the given orders properly.

Snake Conservation

World Snake Day is commemorated every year on July 16th as an effort to promote the conservation of snakes which are still one of the wild animals that are often killed (Stevany, 2024). One of the causes of the decline in the snake population is excessive utilization by the community. However, the communities of the Arfak tribes have wisdom in maintaining the snake population so that snakes will sustain for utilization. Interview revealed that every time respondents catch a snake in the forest, they will only catch one individual. This is related to their belief that if they are in the forest and find a snake that can be consumed, they must catch the snake and take it home immediately. If they continue hunting, they will not find other games. Thus, if they have other targets, they must walk away from snake's habitat. In addition, if people deliberately catch snakes, the snakes used must meet the minimum standard size and comply with the established consumption frequency.

One of the five species of snakes utilized, *M. viridis*, is a protected snake based on the Regulation of the Minister of Environment and Forestry No. P.106/MENLHK/SETJEN/KUM.1/12/2018 of 2018 concerning the Second Amendment to the Regulation of the Minister of Environment and Forestry Number

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P.20/MENLHK/SETJEN/KUM.1/6/2018 concerning Protected Plant and Animal Species. However, people do not consume this snake if they are outside their customary territory. Therefore, the pressure on its population is reduced. These four practices can be categorized as traditional snake conservation efforts that are obtained unintentionally as a result of the regulations that apply in the community.

Inheritance of Snake Utilization Knowledge

Respondents from the Arfak tribe obtained this snake utilization knowledge in the family which was directly from children's daily observations of their parents' activities. This utilization was then absorbed into their culture over time. Knowledge of the utilization of natural resources can be obtained from various sources, namely knowledge obtained from parents which is passed down to their children, from personal experience and/or as a result of interactions with other people or other tribes in their environment or even from other regions (Helida, 2021). Moreover, the knowledge of snake utilization held by the people of the Arfak tribes is similar. They can easily describe about snake utilization patterns. For example, 100% of respondents can explain in detail about the rules for utilizing snakes and the prohibition (taboo/*pamali*) of consuming green tree snakes when outside their territory. This shows that there is an exchange of knowledge in society. In reverse, respondents from other tribes, namely the Biak, Serui and Wamesa who also consume snakes, stated that consuming snakes is not part of their tribal customs. However, they consume them because of invitations from their families, friends and neighbors from the Arfak tribe and or Meyakh tribe who also known as snake eater tribe in Papua. One of the reasons for this difference is also geographical factors, the Biak, Serui and Wamesa tribes have more convenient access to marine products because they live in coastal areas compared to hunting which is certainly very tiring but easier for the Arfak tribe who are the inhabitants of the Mountain region.

The Similarity of Knowledge among respondents

The knowledge of snake utilization held by the people of the Arfak tribes is identical eventhough there are four sub-tribes. Similarities in ecological knowledge of forest resource utilisation between tribes or sub-tribes living in close proximity are common throughout Papua and even around the world. There are several reasons that effect this similarity. The first, the people of Arfak have neighbouring customary territories so that interactions among families in their communities still run well and frequent for various purposes, such as friendship, sharing information, trade and even marriage. The data also shows that in one village not all of them come from the similar Arfak's sub-tribes so that information exchange can still be carried out. In addition, this condition is also thought to be related to the way of life of these tribes which generally one house will be occupied by several heads of families (around 3-4) along with all their family members until they are adults and then have their own place to live or remain stayed together. With all these conditions, the transfer of ecological knowledge will be easier to performed because parents transfer

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the knowledge verbally by involving children in the activity and/or by children observing the activities of their parents until they can do it themselves.

Controversy over Snake Utilization

The utilization of snakes by communities around the forest, particularly by the community from the Arfak tribes, has been throughout the history of the tribal group. As a tribe that inhabits the Arfak mountain, collecting forest products in the form of game for daily needs has become a routine and absorbed into the community's culture. However, the consumption of snakes as functional food is still widely debated (Chawthorn and Hoffman, 2016). Various reasons for approval and rejection have continued to be reported since this utilization be performed.

Snakes are useful as functional food have been recognized by various tribes in numerous countries (Aust et al., 2017). In addition to the delicious meat taste, various parts of the snake's body have also been known to be utilized, and even snake venom has been examined as medicine (Oliveira et al., 2022). Not only that, currently, several countries have stated that snakes are a more effective, efficient and sustainable alternative source of protein to address environmental and food security issues than other livestock today (Macquarie University, 2024). This is due to several factors, including snakes reproduce quickly in which one year can produce 50-100 eggs, snakes do not need to consume food every day but this fact do not reduce their body weight, breeding snakes will require less labor, this animal is also wild animals that can survive in difficult environmental conditions (Natusch et al., 2024;Lyons & Natusch, 2011). Respondents considered the taste of snake meat similar to chicken meat. Therefore, snakes will be a more stable and sustainable source of functional food so that they can answer the challenges of food security.

However, many people also reject the use of snakes as a source of functional food. The main reason for this refusal is the risk factor of zoonosis. Zoonosis is a disease that can be transmitted from wildlife to humans or vice versa (Bidaisee & Macpherson, 2014). Zoonosis is caused by parasitic microorganisms that can be bacteria, viruses, fungi, and parasites such as protozoa and worms. World Health Organization claimed that 75% of current diseases come from wildlife (Naipospos, 2014). Snakes, which are one of the wild animals that live in forests and move by crawling, are considered to have many disease-carrying agents so they are not safe for consumption. There are various reports of snake consumption cases which then lead to trachinosis, pentastomiasis, gnathostomiacis and sparganosis infections (Ayinmode, 2010;Magnino et al., 2009; Nawa & Nakamura-Uchiyama, 2004 and Wiwanitkit, 2005).

The absence of comprehensive research showing the effectiveness of snake consumption in maintaining health is also a factor in the rejection of the use of snakes as a source of protein and medicine. The use of snakes and the health benefits they provide are still the result of the community's ecological knowledge. Research on animals as medicine has not been widely carried out as in plants because of the long process (Afriyansyah et al., 2016). Research on snakes and their health effects is still in the laboratory testing stage so that people still doubt the efficacy. However,

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other also claim that modern medicine today also starts from traditional ecological knowledge owned by the community so that snakes can still be considered as animals of hope for functional food purposes.

CONCLUSION

There are four snake species utilised as functional food sources by the four Arfak sub-tribes. They are *Leiopython albertisii, Apodora papuana, Morelia amethytine, Morelia viridis* and *Micropechis ikaheka*. The snake body parts utilised are the whole snake body (meat), oil obtained from fat and bile. The pattern of snake utilisation by the four Arfak sub-tribes is similar, from the catching process, the rules of utilisation and management also the believed efficacy (health effects). Fidelity level values show the importance ranking of utilisation based on snake species as a source of protein, medicine and utilisation of each body part where each snake species and body part has an irreplaceable function. Communities of the four Arfak sub-tribes have uniform information on snake utilisation, indicated by ICF values in the four Arfak sub-tribes that are close to 1. From the research results obtained, the suggestion is that further research needs to be carried out to examine the nutritional value, types of amino acids, vitamins and minerals contained in snake meat, oil and bile. In addition, it is also necessary to conduct population assessment on the snakes used, particularly *L. albertisii* which is claimed to be the most preferred snake and most often consumed by the communities and *M. viridis* which is a protected animal based on the regulations of the Government of the Republic of Indonesia.

REFERENCE

Abbas, A. (2022). Potensi Pangan Fungsional Dan Perannya Dalam Meningkatkan Kesehatan Manusia Yang Semakin Rentan—Mini Review. *Teknosains: Media Informasi Sains Dan Teknologi*, *14*(2), 176–186.

Afriyansyah, B., Hidayati, N. A., & Aprizan, H. (2016). Pemanfaatan hewan sebagai obat tradisional oleh Etnik Lom di Bangka. *Jurnal Penelitian Sains*, *18*(2), 66–74.

Allison, A. (2007). *Herpetofauna of Papua. Dalam The Ecology of Papua*.

Aust, P. W., Van Tri, N., Natusch, D. J. D., & Alexander, G. J. (2017). Asian snake farms: conservation curse or sustainable enterprise? *Oryx*, *51*(3), 498–505.

Bausell, R. B. (2007). *Snake oil Science: The Truth About Complementary And Alternative Medicine*. Oxford University PressNew York, NY.

Bergström, S., Danielsson, H., & Kazuno, T. (1960). Bile Acids and Steroids. *Journal of Biological Chemistry*, *235*(4), 983–988.

Bidaisee, S., & Macpherson, C. N. L. (2014). Zoonoses and One Health: A Review of the Literature. *Journal of Parasitology Research*, *2014*, 1–8.

Daulay, D. Y., As'ad, S., Mappahya, A. A., & Wijaya, A. (2013). Concentration of Endogenous

e-ISSN : 2746 – 7155
p-ISSN : 1978 – 4996

Secretory Receptor for Advanced Glycation End Products and Matrix Gla Protein in Controlled and Uncontrolled Type 2 Diabetes Mellitus Patients. *The Indonesian Biomedical Journal*, *5*(1), 31.

Jacobo, U. (2024). *Python farming could offer one of the most sustainable sources of meat in the world, according to a new study*. ABC News. https://abcnews.go.com/International/python-farming-offer-sustainable-sources-meat-world-new/story?id=108084507

Janssen, J., & Gomez, L. (2021). An examination of the import of live reptiles from Indonesia by the United States from 2000 to 2015. *Journal for Nature Conservation*, *59*, 125949.

Katmono, W. D., Prayoga, S. F., Oktaviana, V., & Fikri, F. (2019). Laporan Kasus: Amblyomma sp. pada Ular Sanca Kembang (Python reticulatus) di Banyuwangi Reptile Community. *Jurnal Medik Veteriner*, *2*(2), 140.

Khomsan, I. A., & Anwar, I. F. (2008). Sehat itu mudah. *Hikmah; Jakarta Selatan*.

Klieger, D. M. (1994). A new approach to the measurement of ophidiophobia. *Personality and Individual Differences*, *16*(3), 505–508.

Kurniawan, N., Nugraha, F. A., Maulidi, A., Kadafi, A. M., & Kurnianto, A. S. (2018). Snapshot of an On-Going Trade in Reptile Wholesaler, Kebumen, Central Java: Preparation, Trading, and Conservation Implications. *Jurnal Pembangunan Dan Alam Lestari*, *9*(1), 9–14.

Laksono, A. D., & Wulandari, R. D. (2021). Pantangan Makanan pada Suku Muyu di Papua. *Amerta Nutrition*, *5*(3), 251.

Lutterschmidt, D. I., Lutterschmidt, W. I., Ford, N. B., & Hutchison, V. H. (2002). Behavioral Thermoregulation and the Role of Melatonin in a Nocturnal Snake. *Hormones and Behavior*, *41*(1), 41–50.

Lyons, J. A., & Natusch, D. J. D. (2011). Wildlife laundering through breeding farms: Illegal harvest, population declines and a means of regulating the trade of green pythons (Morelia viridis) from Indonesia. *Biological Conservation*, *144*(12), 3073–3081.

Magnino, S., Colin, P., Dei-Cas, E., Madsen, M., McLauchlin, J., Nöckler, K., Prieto Maradona, M., Tsigarida, E., Vanopdenbosch, E., & Van Peteghem, C. (2009). Biological risks associated with consumption of reptile products. *International Journal of Food Microbiology*, *134*(3), 163–175.

Mattison, C. (1986). Snake of the world. *Octopus Publishing Group Ltd; London*.

Mirdat, I., Kartikawati, S. M., & Siahaan, S. (2019). Jenis satwa liar yang diperdagangkan sebagai bahan pangan di Kota Pontianak. *JURNAL HUTAN LESTARI*, *7*(1).

Mukherjee, S., Gomes, A., & Chandra Dasgupta, S. (2017). Zoo Therapeutic uses of Snake Body Parts in Folk and Traditional Medicine. *Journal of Zoological Research*, *1*(1), 1–9.

Mulyati, S. (2016). Peranan Advanced Glycation End-products Pada Diabetes. *Cermin Dunia Kedokteran*, *43*(6), 422–426.

Mutiaradita, N. A., Kusrini, M. D., & Mardiastuti, A. (2023). Herpetofauna trade via e-commerce in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1220*(1), 012006.

Naipospos, T. (2014). Penyakit Hewan: Dampak Bagi Kesehatan Masyarakat, Kemiskinan dan Lingkungan. In *CIVAS*.

Natusch, D., Aust, P. W., Caraguel, C., Taggart, P. L., Ngo, V. T., Alexander, G. J., Shine, R., &

e-ISSN : 2746 – 7155
p-ISSN : 1978 – 4996

Coulson, T. (2024). Python farming as a flexible and efficient form of agricultural food security. *Scientific Reports*, *14*(1), 5419.

Nawa, Y., & Nakamura-Uchiyama, F. (2004). An overview of gnathostomiasis in the world. *Southeast Asian Journal of Tropical Medicine and Public Health*, *35*.

Niman, E. M. (2019). Kearifan lokal dan upaya pelestarian lingkungan alam. *Jurnal Pendidikan Dan Kebudayaan Missio*, *11*(1), 91–106.

O'Shea, M. (1996). *A Guide to the Snakes of Papua New Guinea: The first comprehensive guide to the snake fauna of Papua New Guinea*.

Oliveira, A. L., Viegas, M. F., da Silva, S. L., Soares, A. M., Ramos, M. J., & Fernandes, P. A. (2022). The chemistry of snake venom and its medicinal potential. *Nature Reviews Chemistry*, *6*(7), 451–469.

Özel, M., Prokop, P., & Uşak, M. (2009). Cross-Cultural Comparison of Student Attitudes toward Snakes. *Society & Animals*, *17*(3), 224–240.

Qurniawan, T. F., Arisuryanti, T., & Nur Handayani, N. S. (2012). Analisis Kariotipe Ular Trawang (Coelognathus Radiatus, (Boie 1827)). *Indonesian Journal of Biology*, *8*(2).

Rádlová, S., Polák, J., Janovcová, M., Sedláčková, K., Peléšková, Š., Landová, E., & Frynta, D. (2020). Emotional Reaction to Fear- and Disgust-Evoking Snakes: Sensitivity and Propensity in Snake-Fearful Respondents. *Frontiers in Psychology*, *11*.

Rarastiti, C. N., Hidayat, U., Sundari, S., Sudrajat, A., & Mukti, A. R. (2023). Edukasi Pencegahan Stunting dengan Ragam Protein Hewani. *Manggali*, *3*(1), 225.

Ruitan, N. B., Kiroh, H. J., Rimbing, S. C., Assa, G. S. V., Montong, P. R. R. I., & Ratulangi, F. S. (2024). Inventarisasi satwa liar dan satwa endemik yang beredar di pasar tradisional di Wilayah Minahasa Utara. *Zootec*, *44*(1), 50–58.

Sartika, R. A. D. (2008). Pengaruh Asam Lemak Jenuh, Tidak Jenuh dan Asam Lemak Trans terhadap Kesehatan. *Kesmas: National Public Health Journal*, *2*(4), 154.

Sikatta, F. O. A., & Adisasmito, W. B. B. (2020). Resiko Perilaku Konsumsi Satwa Liar Terhadap Kejadian Penyakit Infeksi Emerging (Pie): Tinjauan Literatur. *IAKMI Jurnal Kesehatan Masyarakat Indonesia*, *1*(3), 143–150.

Silalahi, M. (2020). Pemanfaatan Citrus aurantifolia (Christm. et Panz.) sebagai Bahan Pangan dan Obat serta Bioaktivitas. *Sainmatika: Jurnal Ilmiah Matematika Dan Ilmu Pengetahuan Alam*, *17*(1), 80.

Singh, R., Barden, A., Mori, T., & Beilin, L. (2001). Advanced glycation end-products: a review. *Diabetologia*, *44*(2), 129–146.

Somaweera, R., & Somaweera, N. (2010). Serpents in jars: the snake wine industry in Vietnam. *Journal of Threatened Taxa*, *2*(11), 1251–1260.

Sriyani, N. L. P., Rasna, M. A., Ariana, I. N. A., & Puger, A. W. (2017). Profil Asam Lemak Daging Babi Bali Asli Dan Babi Landrace. *Majalah Ilmiah Peternakan*, *20*(1), 12.

Stevany, R. (2024). *Hari Ular Sedunia diperingati Setiap 16 Juli*. Radio Republik Indonesia. https://www.rri.co.id/lain-lain/830346/hari-ular-sedunia-diperingati-setiap-16-juli

Suter, I. K. (2013). Pangan fungsional dan prospek pengembangannya. Teknologi Pangan. *Seminar Sehari Dengan Tema" Seminar Sehari Dengan Tema" Pentingnya Makanan Alamiah (Natural Food)*

e-ISSN : 2746 – 7155
p-ISSN : 1978 – 4996

Untuk Kesehatan Jangka Panjang, 1–17.

Sutrisna, E. M. (2016). Herbal medicine: suatu tujuan farmakologis. *Muhammadiyah University Press*.

Wai, D. (2023). *Snake soup you can trust: hearty and healthy Cantonese dish rich in protein, amino acids, collagen*. Young Post. https://www.scmp.com/yp/discover/lifestyle/article/3219399/snake-soup-you-can-trust-hearty-and-healthy-cantonese-dish-rich-protein-amino-acids-collagen

Whitaker, P. B., & Shine, R. (2000). Sources of Mortality of Large Elapid Snakes in an Agricultural Landscape. *Journal of Herpetology*, *34*(1), 121.

Widhyari, S. D. (2012). Peran dan dampak defisiensi zinc (Zn) terhadap sistem tanggap kebal. *Wartazoa*, *22*(3), 141–148.

Wiwanitkit, V. (2005). A review of human sparganosis in Thailand. *International Journal of Infectious Diseases*, *9*(6), 312–316. https://doi.org/10.1016/j.ijid.2004.08.003

Zulkarnain, Z., Sholikhah, I. Y. M., & Dewi, T. F. (2021). Efficacy and safety in consuming python bile: a literature study. *IOP Conference Series: Earth and Environmental Science*, *637*(1), 012019.

e-ISSN : 2746 – 7155
p-ISSN : 1978 – 4996