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Traditional Knowledge on The Animal Utilization by The Hatam Tribe of Manokwari, West Papua Province

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Abstract

Animal utilization in traditional community life is an integral part of traditional knowledge itself. This research aims to reveal the Hatam people's traditional knowledge about the utilization of animals in their lives. The method used is the exploratory survey method. The respondents were determined purposively using the snowball sampling technique. The results showed that there are at least 55 species of animals commonly used by the Hatam people. Based on the forms of utilization, the animals can be divided into six groups: consumption, traditional medicine, specific meanings, traditional technology and arts, significant value, and traditional purposes. Wild animals are most widely used for the living needs of the Hatam people. The traditional hunt that is limited and the communal land ownership system (*ulayat* system) practiced by the Hatam people have indirectly helped preserve and ensure the availability of wildlife for the Hatam people's needs. In addition to being a form of documentation of Hatam people's traditional knowledge, the results of this research also have significance for the development of science especially in the field of ethnozoology. The form of interaction between Hatam people and animals revealed in this research can also serve as a reference for designing development policies related to the presence of Hatam people in the Arfak mountains.

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INTRODUCTION

For some people, the term traditional communities are often associated with underdevelopment, poverty, lack of education, and so forth. The opinion is caused by a gap between traditional communities and the people who call themselves as "modern communities". This outlook is fallacious, because traditional communities are truly genuine research groups that are rich in knowledge. Over the years they have achieved self-sufficiency in meeting their needs and establishing a harmonious relationship with the surrounding environment. Nature is not merely a home for traditional communities (Pierotti & Wildcat, 2000). Realizing the importance, they have protected and managed it wisely for generations to meet their living needs (Nathan *et al.*, 2007). Presently, damage to nature is a serious threat to humans, including knowledge held by traditional communities (Giamet *et al.*, 2010). On the other hand, traditional knowledge plays a significant role in the conservation of natural resources and the development of science (Lepofsky, 2009). Various species of animals and plants have been revealed to be beneficial to humans, and that is a proof of the contribution of traditional knowledge in the development of food, medicine, and other fields (Dweba & Mearns, 2011).

Traditional knowledge is becoming an important cultural asset to the existence of ethnic groups in Papua (included West Papua) which has more than 200 ethnic groups. The location of those ethnic groups spread from the coast, low lands to the mountains. The characters of different neighborhoods are distinguished by the kind of knowledge possessed by each ethnic group. Although, during the development, the ethnic groups experience some changes as a result of technology and information advances, most of them still maintain their traditional patterns and lifestyle. For some ethnic groups, maintaining a traditional lifestyle is not seen as an option only, but more than that. It is preserving the customs and habits that have been passed down by their ancestors for generations.

There are very few researches that reveal animal utilization in indigenous life of West Papua, although in fact the utilization of animals by traditional communities has been going on for thousands of years for various purposes. Knowledge of the use of animals is certainly an integral part of traditional knowledge systems owned by a community group. On the other hand, research on botany has been widely conducted, including in the Arfak mountains. The establishment of the Manokwariense herbarium is a proof of the existence of a large number of botanical studies, including the utilization by researchers in this area.

One of the ethnic groups still closely linked to traditional lifestyle is the Hatam sub-tribe. The Hatam sub-tribe itself is part of a large ethnic group called Arfak that is native to the Arfak Mountains in Manokwari, West Papua Province. In addition to the Hatam, there are three other dominant tribes in the large ethnic group of Arfak, namely Moile, Meyah, and Sough (Salosa *et al.*, 2014). Among the four ethnic groups, the Hatam sub-tribe, which is called the Hatam people in this paper, is the most dominant group in terms of the number and its distribution. Similar to the lives of most ethnic groups in Papua, the Hatam people still rely on the potential of the natural surroundings for a living, especially for those living in the inland areas. Traditional methods are still apparently used by Hatam people in utilizing resources such as plants, animals and other environmental components (Pattiselanno & Lubis, 2014). Traditional lifestyle, along with the knowledge that the Hatam people have, has now started, more or less, to be influenced by a modern lifestyle that develops rapidly. As the effects of the development program, modern lifestyle is feared to have an impact on lowering the quality of the traditional knowledge held by the Hatam people. Therefore, this study was conducted as a form of appreciation to this ethnic group as well as documentation of indigenous knowledge and local wisdom.

This research aims to reveal the Hatam people's traditional knowledge about the utilization of animals in their lives. In addition to serving as documentation of traditional knowledge for the Hatam people, the results of this study can also provide a basis for the government to determine the development policy in the Arfak Mountains. Incorporating traditional knowledge in the management of natural resources and the environment is a wise step to reduce the current environmental and development problems (Egeru, 2012).

METHODS

Research site

The study was conducted in some sub-villages in Mokwam (01̊ 05̓ 42,8̋ S, 133̊ 55̓ 45,5̋ E), and Ndonbei sub-village (00̊ 58̓ 19.3̋ S, 133̊ 57̓ 14.2̋ E) in Warmare District, Manokwari Regency, West Papua Province. Mokwam has long been known as the habitat of several species of cenderawasih (birds-of-paradise) making it one of the

ecotourism areas officially established by the local government. Part of Ndonbei area is a forest area that is mostly overgrown with lowland forest species such as *Pometia pinnata, P. acuminata, Intsia bijuga, Dracontomelum edule, Celtis latifolia,* and *Ficus* spp. Some types of wild animals that are often found in this area include *Cervus timorensis, Phalanger* spp.*, Morelia viridis,* and *Sus scrofa.*

Research design and Data collection

This study used an explorative survey method that included several variables, among others, enumeration of the scientific names and local names, forms of utilization, and other knowledge relating to the use of animals in everyday life. The data were collected by direct, semi-structural, scheduled interviews, participant observation and by actively participating in the people's daily activities. The respondents were determined purposively (Tongco, 2007) using the snowball sampling technique. The respondents in this study are the Hatam people who have adequate knowledge about animal utilization, and other traditional knowledge relating to animals. A total of 30 respondents were successfully interviewed in relation to animal utilization at the research site.

Data analysis

The data obtained from interviews with respondents, and through direct observation in the field were then analyzed descriptively to describe the traditional knowledge of Hatam people in utilizing animals.

RESULT AND DISCUSSION

Utilization of animals by the Hatam people

There are at least 55 species of animals, divided into 29 families, used by the Hatam people. (Table 1).

Consumption

The results of the observations show that the utilization of animals for food is higher in comparison to other forms of utilization. Most species consumed are wild animals (86.84%), and only the remaining 13.16% are domesticated species namely *C. timorensis, G. gallus domesticus, O. mossambicus, O. niloticus* , and *S. domesticus*. Both wild and domesticated species in Table 1 are the species commonly consumed, and they have not yet included various types of wild birds that are also frequently consumed.

There are several factors that cause the Hatam people to utilize many wild animals as the main solution to address the need for animal protein. Long distance to markets and low purchasing power are the factors that significantly affect the animal consumption by the Hatam people. In addition to these two factors, the lack of knowledge of the Hatam people about good breeding techniques also leads to a high dependency on wildlife.

Animals as traditional medicine

Although the utilization of animals as medicine is not as popular as that of plants, the existence of animals in traditional medicine for the Hatam people is very important. Animals have been used in the medical system of the Hatam people for generations, and a complex system of knowledge has been formed relating to the treat-

Table 1. Species of animals and their forms of utilization by the Hatam people

Family	Species name	Hatam	Forms of utilization					
			1	2	3	4	5	6
Accipitridae	*Accipiter* sp.	Acam	●	●	○	○	○	○
Boidae	*Candoia* sp.	Woundong	○	○	○	○	○	●
Bucerotidae	*Rhyticeros plicatus*	Undoya	●	○	○	○	○	○
Canidae	*Canis* sp.	Mensien	○	○	○	○	○	○
Casuariidae	*Casuarius* sp.	Hanengat	●	○	○	●	○	○
Cervidae	*Cervus timorensis*	-	●	○	●	○	○	○
Cichlidae	*Oreochromis mossambicus*	-	●	○	○	○	○	○
	Oreochromis niloticus	-	●	○	○	○	○	○
Cyprinidae	*Barbonymus gonionotus*	-	●	○	○	○	○	○
	Cyprinus carpio	-	●	○	○	○	○	○
Elapidae	*Micropechis ikaheka*	Wouthiei	○	●	○	○	○	○
Gryllidae	*Gryllus* sp.	Apot	○	○	○	○	○	●

Hylidae	*Litoria* sp.	Sik	●	●	○	○	○	○
	Litoria arfakiana	Knau	●	●	○	○	○	○
	Litoria micromembrana	Siknemun	●	●	○	○	○	○
	Litoria angiana	Nuwemhai	●	●	○	○	○	○
	Nyctimystes pulchra	Bembaume	●	●	○	○	○	○
Lampyridae	-	Amung	○	○	○	○	○	●
Macropodidae	*Dendrolagus* sp.	Senai	●	●	○	○	○	○
	Dorcopsulus leauheuernii	Semai	●	●	○	○	○	○
Megapodidae	*Talegalla* sp.	Sengu	●	○	○	○	○	○
	Aepypodius arfakianus	Semu	●	○	○	○	○	○
Papilionidae	*Ornithoptera goliath*	Atemai	○	○	●	○	○	○
	Ornithoptera paradisea	Atemai	○	○	●	○	○	○
	Ornithoptera priamus	Atemai	○	○	●	○	○	○
	Ornithoptera thitonus	Atemai	○	○	●	○	○	○
	Ornithoptera rothscildi	Atemai	○	○	●	○	○	○
Paradiseaidae	*Astrapia nigra*	Ugmeng	○	○	●	●	○	○
	Cicinnurus magnificus	Kenang	○	○	●	●	○	○
	Epimachus fastuosus	Kembelai	○	○	●	○	○	○
	Parotia sefilata	Kurang	○	○	●	○	○	○
	Lophorina superba	Nyet	○	○	●	○	○	○
Peroryctidae	*Echymipera* sp1.	Incober	●	●	○	○	○	○
	Echymipera sp2.	Waubei	●	●	○	○	○	○
Phalangeridae	*Phalanger orientalis*	Menggrep	●	●	○	●	○	○
	Phalanger permixtio	Menggrep	●	●	○	●	○	○
	Phalanger sp.	Mopam	●	●	○	●	○	○
	Phalanger vestitus	Menggrep	●	●	○	○	○	○
	Spilocuscus maculatus	Mbrab	●	●	○	○	○	○
Phasianidae	*Gallus gallus domesticus*	Saba	●	○	●	○	○	○
Pseudocheridae	*Pseudochirops albertisii*	Ntingoi	●	●	○	○	○	○
	Pseudocheirus sp.	Busi	●	●	○	○	○	○
	Pseudochirops schlegeli	Atiboi	●	●	○	○	○	○
Pteropodidae	*Dobsonia* sp.	Sgom	●	●	○	○	○	○
Ptilonorhynchidae	*Amblyornis inornatus*	Urnyai	○	○	●	○	○	○
Pythonidae	*Leiopython albertisi*	Nebrieb	●	●	○	○	○	○
	Morelia viridis	Woumaingun	●	●	○	○	○	○
Ranidae	*Rana arfaki*	Wuham	●	●	○	○	○	○
	Rana grisea	Uwam	●	●	○	○	○	○
Scolopendridae	*Scolopendra* sp.	Awe	○	○	○	○	○	●
Strigidae	*Ninox connivens*	Suen	●	○	○	○	○	●
Suidae	*Sus scrofa*	Naba	●	●	●	○	○	○
	Sus domesticus	Naba	●	●	●	○	●	○
Tachyglossidae	*Zaglossus bruijni*	Mecum	●	○	○	○	○	○
Varanidae	*Varanus indicus*	Bengrat	●	○	○	○	○	○

Descriptions: 1. consumption; 2. medicine; 3. significant value; 4. traditional technology and arts; 5. traditional purposes; 6. specific meanings. (● used ○ not used).

ment of various diseases. The animals can be utilized as medicine to treat wounds (either caused by a sharp object or venomous animal bites), skin diseases, internal diseases, flatulence, sprains, and medicine for body aches and muscle strength enhancement (Table 2).

There are two types of utilization of animals for medicine, namely direct and indirect uses. The direct use means to directly utilize animals without going through a process such as heating or boiling, while the indirect use is the use of animals by going through certain processes such as heating, scraping or crushing, boiling and burning. Apart from the simple processes, another ease in using the animals for treatment is that it is also practiced without any special ritual or rule both for the patients and those who treat them.

Animals that have a high value

Animals with a high value are a group of animals whose existence can provide economic benefits to the Hatam. Animals having the economic value are grouped into two: animals with a direct economic value and animals with an indirect economic value (Figure 1). Animals having a direct economic value are the ones that can be sold for money. These animals are generally hunted animals whose meat is sold to markets. Animals classified as having a direct economic value are among others S. *scrofa, S. domesticus, S. maculatus,* and *Echimipera* spp. In addition to the type of animals whose meat can be sold, there are also various types of birdwing butterflies (*O. priamus, O.rothscildi, O. paradisea, O.tithonus,* and *O.goliath*) which have a direct economic value. Birdwing butterflies are sold at a price that varies among species. The rarer the species are, the higher the price can be. On the other hand, animals with an indirect economic value are animals whose existence in nature can provide benefits in the form of money. Animals in this group are a type of exotic animals that become a tourist attraction like *A.inornatus* (Vogelkoop bowerbird) which is often known as a smart bird, as well as several species of birds of the Paradiseaidae group, namely *P.sefilata, P.carunculata, E.fastuosus, A.nigra, C.magnificus,* and *L. Superba. A.nigra,* and *P.sefilata*are endemic birds found only in the Bird's Head Peninsula of Papua Island (*Vogelkop*). The existence of these exotic animals is an attraction for tourists both domestic and foreign tourists who come to the Arfak mountains. Any tourists or visitors who wish to see or observe the behavior of these exotic animals are usually required to pay a sum of money to the owner of the area (holders of *ulayat* or communal rights).

Missionaries, Non-Governmental Organizations (NGOs), and local governments play a major role in increasing Hatam's understanding of the economic value of goods or objects. It is known that the socio-cultural changes that occur among the Arfak tribes have existed since about 1940 and these include changes in the economic, social, religious, educational, and health sectors (Apomfires & Sapulete, 1994). Knowledge of the utilization of animals is not only derived from "trial and error" experience as it was in the past, but it is also acquired through the adoption of knowledge from outside their group.

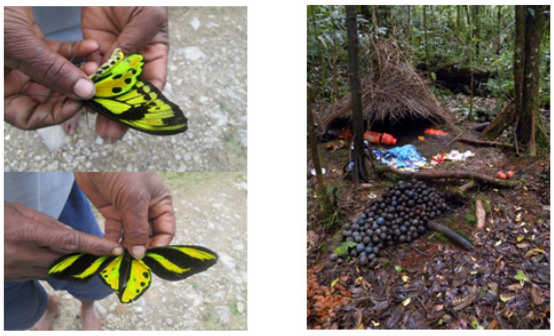

Figure 1. Animals that have a high value. (a) birdwing butterflies (*Ornithoptera* sp.); (b) A bower built by a male smartbird (*A. inornatus*).

Animals for traditional technology and arts

Sharp weapons are the only form of traditional technology created by the Hatam people using the leg bones of *Casuarius* sp. (cassowary). Now it is quite difficult to find these weapons among the Hatam people. The presence of sharp weapons made of metal and the increasing scarcity of cassowaries in their habitat are the reasons why these people no longer use cassowary bones as traditional weapons.

Accessories are another form of artistic expression of the Hatam people. The presence of synthetic materials does not necessarily eliminate the habit of using natural materials as accessories. Accessories are usually used as a dancing gear or used in major ceremonies both related to traditions and religions. *Abihim* is the name for the Hatam typical dance performed by children and adults. The headdress that is called *tebi* in the language of the Hatam is used while dancing (Figure 2). *Tebi* is made of a series of cassowary (*Casuarius s*p.)'s feathers, and *A.nigra*'s feathers. The bird feathers are arranged in a wicker made of strings of beads (derived from the fruit of *Coix lacryma*.). Besides *tebi*, the dried *C. magnificus*is also

Table 2. Types of diseases and the treatments used by the Hatam people

Type of disease/ injuries	Animal utilized	Part of the body used	How to use
Wounds	*Accipiter* sp.	Feathers	The feathers are burned to ashes. Once cool, the ashes are spread on open wounds.
Wounds caused by venomous animal bites	*M. ikaheka*	Bile	Bile (in a fresh state) is dropped onto the wounds caused by venomous animal bites.
	R. arfaki	Bones	The foot bones are dried and then scraped off with a knife. The powder is then sprinkled on the wound caused by centipede bites.
Internal diseases	*Dobsonia* sp.,	Bile	The fresh bile is swallowed.
Flatulence	*S.domesticus; S.scrofa*	Fat	The fat is placed in a sealed container (a glass bottle). Then, the fat is heated until it is melted by placing the container close to the fireplace. After it is cool enough, it is rubbed on the abdomen having flatulence.
Skin diseases	*Echymipera* sp1. ; *Echymipera* sp2.; *Phalanger sp.; P.orientalis;; P.vestitus; P.albertisi; Pseudocheirus* sp.; *P. permixtio; P.schlegeli*	Fur	The fur is burned to ashes. Once cool, the ashes are mixed with soot from the fireplace (the stove), and then the mixture is rubbed on the skin to cure the skin with problems.
	Litoria sp.; *L.angiana*; *L.arfakiana; L.micromembrana* ;N.*pulchra; R.grisea*	All parts	All parts are boiled (the number of the animals is not specified; it can be more than 10). The warm water from the boiling process is then used for bathing.
	M.viridis	Skin	The snake's skin (living snake) is rubbed on the skin with problems.
	S.domesticus; S.scrofa	Fat	The fat is placed in a sealed container (a glass bottle). Then, the fat is heated until it is melted by placing the container close to the fireplace. After it is cool, it is rubbed on the affected part.
Sprain	*M.ikaheka*	Tail	The snake's tail is cut off and then dried in the sun. After it is dry, it is soaked with oil (could be coconut oil or other types of topical oil). It is then put in a sealed container and used to rub the skin or used as massage oil.
Stiff/sore muscles	*M.ikaheka*	Fat	The fat taken from the animal abdomen is put in a bottle, and then placed around a fireplace (heated) until it is melted. Then, it is cooled down and used as massage/topical oil to relieve aches and pains.
Decrease in stamina and immune system	*L.albertisi*	Meat	By consuming the meat of this animal.

often used as a headdress**.**

Figure 2. A Hatam child wearing *tebi*

Animals for traditional purposes

The Hatam people are a group that still upholds its tradition. An animal that has been utilized since a long time ago for generations in the tradition of the Hatam people is *Z.domesticus* (pigs). In the traditional order of the Hatam people, this animal has its own place, and its existence can hardly be replaced by other types of animals. Weddings, payment of customary fines and big religious ceremonies are some of the events that always involve and use this animal as an absolute requirement. In the traditional order of the Hatam people, someone who has a lot of pigs is considered to have a better social status. Good social status is one of the requirements to become a leader (*pejointi*) in their group, although in the current development this condition is no longer seen as a standard to appoint a leader. Today, competency is a key requirement a person can be appointed as a leader for the Hatam people.

Animals that carry specific meanings

The existence of some kinds of animals for the Hatam people is believed to carry specific meanings. Table 3 shows the types of animals that have specific meanings for the Hatam people.

Nowadays, the belief in the meaning carried by every type of animal described in Table 3 is still found. Based on the information gathered from the respondents, the presence of these animals in a particular place is always associated with the phenomena and events they encounter or experience. As a carrier of meaning, it is even prohibited to kill certain types of animals such as *Candoia* sp. This animal is considered to bring bad luck because its presence bodes ill for family members or relatives. For the Hatam people, killing *Candoia* sp. is an action that is not justified because it is believed to bring misfortune.

Among the Hatam people, the intergenerational knowledge transfer process is done through the involvement of their children in the practices of utilization and management of surrounding natural resources including animal utilization. This condition also occurs among the Arfak tribes in general. As stated by Matualage (Matualage, 2011) the transfer of knowledge is done by parents to their children when the children are directly involved in the activities carried out by their parents. In addition to being directly involved in the practice of animal utilization, knowledge transfer also indirectly occurs when a child sees or observes ancestral heritage objects such as accessories used for dancing, sharp weapons made of cassowary bones, and also through songs or folklores. Although these objects have important significance relating to the history of Hatam people, today, these objects are rarely seen. The widespread use of metal-made articles, plastics,

Table 3. The type of animal and its meaning for the Hatam people

Scientific name	Meanings for the Hatam people
N. connivens	Its sounds indicate the appearance of *suanggi* (a person who practice black magic) entering the village, and also at the same time, it is a sign that a person (relative) may die.
Candoia sp.	If a person encounters this animal, it is a sign that someone from his family may have bad luck. If a person intentionally kills this animal, it is believed that someone from his family may die.
Fam. Lampyridae	If this animal enters the house, it is a sign that a family member might have just died.
Scolopendra sp.	If a person dies and a centipede (*Scolopendra* sp.) is found in the house, it is a sign that it may have been an unnatural death (the person might have been killed/murdered), and the person involving in the murder will possibly come to mourn.
Gryllus sp.	If there are a lot of sounds (more than usual) of this animal, it is a sign that a person (relative) may die.

and other synthetic materials has led to the diminishing use of natural materials that Hatam people have been practicing to actualize their traditional knowledge.

How Hatam people obtain the animal

There are two types of hunting methods often used by the Hatam people, namely active and passive hunting. Active hunting is a hunting technique using hunting dogs (Salosa *et al.*, 2014), and traditional weapon such as bow and arrow. Meanwhile, passive hunting is a hunting technique using traps or snares to catch the prey (Pattiselanno *et al.*, 2015). Of the two ways of hunting, active hunting using traditional guns is the type most commonly practiced. For men of the Hatam, the number of *S. scrofa* that can be killed during the hunt is a symbol of prowess, and it also serves as a practice to improve their confidence. The more animals that they manage to hunt the more confidence they will feel about their ability and strength.

The Wisdom of the Hatam people in the utilization of animals

From the observations, no over-harvesting or over-hunting was found to be done by the Hatam people. Animal hunts either for consumption or other purposes is done as necessary using simple techniques and traditional hunting equipment. The use of traditional hunting techniques plays an indirect role in preventing over-hunting of a particular resource, and therefore the resource sustainability can be maintained.

Another form of local wisdom that contributes to the preservation of the types of animals in this area is the existence of the ownership system called the *ulayat* system (communal system). The *ulayat* system or also known as the *ulayat* right is a form of ownership of land (area) based on kinship (lineage). The Hatam people do not recognize individual land ownership. With this ownership system, the utilization of wild animals is only practiced by the holder of *ulayat* rights. This is certainly a positive thing for the existence of wildlife in the region. The *ulayat* territorial boundaries are strongly taken into consideration by Hatam people during the hunt. A hunter is not allowed to hunt outside the boundaries of the territory that he deserves. Anyone known to violate the boundaries of ownership of the area will be subject to customary fines based on the agreement with the owner of the violated area (Hastanti & Yeny, 2009).

CONCLUSION

The Hatam people's lives are a reflection of traditional communities that still rely on the availability of natural resources to meet their needs. Although there are types of domesticated animals, but the number is far fewer than that of the types of wild animals utilized. The utilization of animals for consumption occupies a larger portion compared with the other forms of utilization.

The traditional knowledge of animals utilization possessed by the Hatam people today is a combination of knowledge passed down by their previous generations and the adoption of knowledge that comes from outside of their group. In the younger generation, knowledge transfer occurs when they are directly involved in the management and utilization of resources performed by their parents. In addition, cultural materials such as accessories, traditional weapons, folklores and songs are the knowledge-transfer media possessed by the Hatam people. Through animal utilization, and the mechanism of knowledge transfer between generations, the Hatam people have unintentionally sought to maintain their traditional knowledge so as to maintain its sustainability.

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REFERENCES

Apomfires, F., & Sapulete, K. (1994). Masyarakat Arfak di Anggi, Kabupaten Manokwari. In Koentjaraningrat (Ed.), *Irian Jaya, Membangun Masyarakat Majemuk* (pp. 139–155). Jakarta: Djambatan.

Dweba, T. P., & Mearns, M. A. (2011). Conserving indigenous knowledge as the key to the current and future use of traditional vegetables. *International Journal of Information Management*, *31*(6), 564–571.

Egeru, A. (2012). Role of indigenous knowledge in climate change adaptation: A case study of the Teso sub-region, Eastern Uganda. *Indian Journal of Traditional Knowledge*, *11*(2), 217–224.

Giam, X., Bradshaw, C. J. A., Tan, H. T. W., & Sodhi, N. S. (2010). Future habitat loss and the conser-

vation of plant biodiversity. *Biological Conservation,* 143(7), 1594-1602.

Hastanti, B. W., & Yeny, I. (2009). Strategi Pengelolaan Cagar Alam Pegunungan Arfak menurut Kearifan Lokal Masyarakat Arfak di Manokwari Papua Barat (Management Strategy of Nature Reserve of Arfak Mountains Area According to Traditional Wisdom of Arfak People at Manokwari, West Papua), 19–36.

Lepofsky, D. (2009). The Past, Present, and Future of Traditional Resource and Environmental Management. *Source: Journal of Ethnobiology*, *29*(2), 161–166.

Matualage, A. (2011). Keefektifan pembelajaran sosial kearifan lokal budidaya ubi jalar di kalangan suku Arfak kabupaten Manokwari. *Kawistara*, *1*(1), 68–78.

Nathan, I., Lund, S., & Theilade, I. (2007). The Importance of Local Knowledge and Interdisciplinary Research People, Trees and Agriculture in Africa: Constraints and Options for Improved Management of Trees in Tanzania and Burkina Faso. *The Journal of Transdisciplinary Environmental Studies*, *6*(1), 1602–2297.

Pattiselanno, F., & Lubis, M. I. (2014). Hunting at the Abun Regional Marine Protected Areas: A Link Between Wildmeat and Food Security. *HAYATI Journal of Biosciences*, *21*(4),

Pattiselanno, F., Manusawai, J., & Arobaya, A. Y. (2015). Review Pengelolaan dan Konservasi Satwa Berbasis Kearifan Tradisional di Papua (Wildlife Management and Conservation Based on Traditional Wisdom in Papua). *Jurnal Manusia Dan Lingkungan*, *22*(1), 106–112.

Pierotti, R., & Wildcat, D. (2000). Traditional ecological knowledge: the third alternative (commentary). Ecological applications, 10(5), 1333-1340.

Salosa, S. T., Awang, S. A., Suryanto, P., Purwanto, H., Yogyakarta, B., Kehutanan, F., & Mada, U. G. (2014). Hutan Dalam Kehidupan Masyarakat Hatam di Lingkungan Cagar Alam Pegunungan Arfak (Forest in Hatam Community Live on Arfak Mountains Natural Reserve Environment) Program Doktoral Program Studi Ilmu Kehutanan, Universitas Gadjah Mada, *21*(3), 349–355.

Tongco, M. D. C. (2007). Purposive sampling as a tool for informant selection. *Ethnobotany Research and Applications*, *5*, 147–158.