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BORNEO : an Introduction

At almost 750,000 km², Borneo ranks as the world's third largest island. The political division between three nations—Malaysia, Brunei Darussalam and Indonesia—and their contrasting histories, have generated economic and cultural distinctions in human society in different parts of this huge island. Nonetheless, geography, climate, and plant and animal ecology provide a unifying environment to justify the theme of this issue of the Malayan Nature Journal. In these pages, participants from all three nations have presented a remarkable collection of reports on aspects of the natural history of Borneo, or parts of Borneo. Collectively, these papers illustrate the diverse character and fascinating breadth of the subject, and celebrate the endeavours of the community of people and institutions who participate in studies that add to our collective understanding of the diverse and remarkable natural history of Borneo.

The opening contribution draws attention to the Proboscis monkey, the long-nosed colobine endemic to Borneo, frequenting coastal and riparian forest throughout the island. Equally well-known is Borneo's great ape, the Orangutan, whose threatened status has roused international and national support for the rescue and rehabilitation programme at Lamadau, Central Kalimantan. Also generated in Indonesia, in West Kalimantan, the Mastwatch website continues to link observers throughout Borneo in a programme to monitor the phenomenon of mast-flowering and fruiting of dipterocarps, the magnificent giant trees that dominate the lowland and lower montane forest of Borneo. There follows a study of the utilisation of natural resources by an indigenous community of Muslim faith.

Move on to the giant mammals, Asian elephants, at last proven by skilled zooarchaeological detective work to be present in Borneo in the Late Pleistocene era. An archaic group among invertebrates, the Odonata (dragonflies and damselflies) are well represented in Borneo; presented here is an overall review and a linked, first Borneo-wide checklist. The birds of Borneo are perhaps a group more often drawing naturalists to Borneo; several checklists exist and it is more cogent to include, in these pages, an authoritative review of ornithology, an active pursuit throughout the island.

There are two contributions from Brunei based on phototrap images. The first provides previously unknown evidence of colour variation among the Sundaic Horse-tailed squirrel, while the second puts into circulation the first pictures of living Borneo Yellow muntjac, and original evidence of ecological separation of the two species of barking deer in Borneo. On the island Mantanani Besar a study, initiated by the Sabah Society, has investigated the human/bird relationship, and assessed the likelihood of a productive future for the strange, mound-building megapodes. A short essay on the cultural significance of Clouded leopard precedes a careful, well illustrated account of the living legend of Tigers in East and North Kalimantan. In the same area, human ingenuity has invented a mechanical alternative to the blowpipe, the traditional hunting weapon of interior people of Borneo. The second-last features a study of the declining mud crabs in Kuching mangroves, and this issue closes on a report showcasing prey-handling of a venomous Bornean Keeled Pit Viper.

Apologia: lifetime connections with people and places in Borneo

Readers of the Malayan Nature Journal may question my qualification to serve as Guest Editor of this Borneo-themed issue. I hope a few paragraphs can provide satisfactory justification.

Sometimes, in Sarawak, people who half-hear my name, jump to the (wrong) conclusion that I am related to the dynasty of Brooke Rajahs. Dismiss that as the reason why, in March 1956, shortly before graduating at Cambridge, I did not refuse the offer by Tom Harrison, then Curator of the Sarawak Museum, who offered to give me a job, if I came to Kuching. So, in June 1956, I bought a passage on a cargo steamer of the Blue Funnel Line, from Liverpool to Singapore, where I transhipped to S.S. Rajah Brooke -- and finally arrived at Kuching.

The 'job' was termed 'Technical Assistant to the Curator', and had no fixed duties. The Museum was engaged in a programme of amassing bird skins, funded by the eminent businessman and ornithologist Dato Loke Wan Tho. Young men from rural longhouses were given basic training in skinning and specimen preparation, and sent home with a supply of cartridges, museum labels, cotton wool and preservative. At the Museum, I sorted and identified the resulting skins. This task -- a valuable introduction to the avifauna -- was supplemented by proof-reading B. E. Smythies' new checklist of the birds of Borneo (1957). The text went back and forth (seven times, I remember) between Museum and the Government printer, whose staff were seriously challenged by Latin nomenclature and the arcane rules on the use of italics in zoology. In the same year, I was issued a Sarawak international passport, no. 4553, valid in 'The British Commonwealth and all Foreign Countries'. On this document, I travelled the world for ten years until it expired in February 1967.

Plate 1 - Sarawak International Passport

2

DESCRIPTION - SIGNALEMENT

Bearer—Titulaire		Wife—Femme	
Profession Profession	ZOOLOGIST		
Place and date of birth Lieu et date de naissance	LONDON 20-6-1933		
Residence Residence	ENGLAND		
Height Taille	6 ft. 1 in.		
Colour of eyes Couleur des yeux	BLUE		
Colour of hair Couleur des cheveux	FAIR		
Special peculiarities Signes particuliers	1		
CHILDREN - ENFANTS			
Name-Nom	Date of birth-Date de naissance	Sex-Sexe	
Usual Signature of Bearer Signature du Titulaire	Medway		
Usual Signature of Wife			

3

Bearer
(Titulaire)

Wife
(Femme)

(Photo)

In 1958, promoted to Archaeological Assistant, I became responsible for the identification of animal remains excavated at Niah caves, and elsewhere in Sarawak and Sabah. As a personal project, the Curator also encouraged me to study the edible-nest swiftlets -- a group of birds with unique adaptations to life in caves. Two years later, my fieldwork on swiftlets became the foundation of a PhD dissertation at the University of Birmingham, U.K. In 1960-1961, a post-doc fellowship with Yayasan Siswa Lokantara (as ahli burung walet) extended my research to Indonesia; Here I found other managed populations of cave swiftlets, and met other scientists prepared to share their experience in the taxonomy and behaviour of these fascinating birds.

In 1961, appointed to the Zoology Department at the University of Malaya, I was well placed to resume research on the animal remains excavated in Malaysian caves, notably at Niah, Sarawak. Discoveries included the foot bones of Malayan tapir, a large mammal now extinct in Borneo, but I failed to find evidence of the past presence of elephant in any Late Pleistocene context.

Most identifiable animal remains in these cave sites consisted of teeth and bones of mammals, encouraging me to study extant Borneo species. In 1965, a grant from U.S. sources funded a round-the-world air ticket. Starting at the B.P. Bishop Museum, Honolulu, and progressing across mainland USA from San Francisco, via Chicago and Washington, D.C., to the Peabody Museum, Yale, and then to museums in London, Paris and Frankfurt, and finally at the India Museum, Calcutta, I managed to see all historic mammal collections from Borneo. During this circumglobal tour, I discovered two undescribed species of small mammal—not in the upland localities they inhabit, but in the museum cabinets where they lay, overlooked: the Grey-bellied pencil-tailed tree-mouse, in the U.S. National Museum, Washington, D.C., USA, and the Black shrew, in the Museum of Comparative Zoology, Cambridge, Mass., USA. The resulting annotated checklist of mammals of Borneo was published by the Malaysian Branch of the Royal Asiatic Society, first in 1965 and, later, as a revised edition, in 1977.

In the 1990s, invited by the Director of Forests and Wildlife, Sarawak, to review the edible birds'-nest industry. I looked for a student-assistant to cooperate in the research. Luckily, Lim Chan Koon, a graduate student at Universiti Malaysia Sarawak (Unimas) was willing to transfer to the topic. He was awarded a Government scholarship to the University of Kent, U.K., and I became external supervisor for his Ph.D. I remembered my 1957 visit to Salai Cave, in the Middle Baram above Long Laput, site of an accessible colony of White-nest swiftlets. We approached YB Kebing Wan, head of the family of hereditary owners of the cave rights, and were pleased by his generous offer to provide facilities for a year's research on site, alongside his relative Usong Wan, as cave manager. This unprecedented opportunity for a dedicated and assiduous student, and for shared learning by myself as supervisor, resulted in a successful graduation by Dr Lim..

In 2001, a grant from Flora and Fauna International helped Dr Lim and myself, with friends from the community of Sarawak birds'-nest cave owners, including George Nawan, to undertake an investigation of birds'-nest operators and island sites in North Kalimantan, and the extensive complex of caves occupied by Black-nest swiftlets in the upper Kayan river, East Kalimantan, managed by a local cooperative. In 2002, our experiences were recounted in a jointly authored book: *Swiftlets of Borneo: builders of edible nests*, produced in a lavishly illustrated edition by Natural History Publications (Borneo) and reissued with revisions in 2014.

In 2009, I was appointed a member of Yayasan Ulin, an Indonesian foundation dedicated to conservation of natural habitat and wildlife in areas unprotected by legislation. I traversed the southern breadth of Borneo by mixed transport modes from Pontianak to Pangkalan Bun, West Kalimantan, across Central Kalimantan, to Banjarmasin and Martapura, South Kalimantan, and later, from Balikpapan to Samarinda and Tenggarong, East Kalimantan, and—later still—from Bandarbaru on the great Mahakam river, by speed boat up the tributary, Sg Belayan, to the oil palm plantations operated by REA Kaltim. The director and staff of REAKon, the conservation arm of this British-owned company, provided valuable insights of the potential for good environmental management on a large commercial plantation.

In 2014, I was invited to participate in the Heart of Borneo initiative, as operated in Brunei Darussalam under Royal patronage and ministerial support. Recipient of a

Merdeka Award in the same year, among other projects, I was able to fund a Sabah graduate of the University of Malaya, for his M Sc research into the Philippine megapodes of the Mantanani archipelago, Kota Belud District, Sabah. In the following years, until the Covid-19 Pandemic closed international travel, I have made at least one visit to a destination in Borneo, and thereby renewed or extended my personal contacts among colleagues who share enthusiasm for all aspects of natural history.

Through the Pandemic years 2020 and 2021, and into 2022, contact has been limited to digital exchanges. As Guest Editor of this Borneo-themed issue of the Malayan Nature Journal, I am supremely grateful to all contributors -- and especially those whom I invited to submit their own stories and discoveries. The subject matter is unlimited. The combination of submissions in this issue indicates the wealth and variety of topics available for research. The published articles demonstrate, emphatically, the assiduity and scrupulous ardour of the diverse community of people whose lives and careers have led them into these fields of research. There is still much more to be discovered. I sincerely hope that this themed issue of MNJ will stimulate further research into the diverse aspects of the natural history of Borneo.

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The utilisation, perceptions and awareness of Melanau communities on wildlife in Rajang area, Sarawak, Malaysia

NUR SHAHNAZ SAHMAT & JAYASILAN MOHD-AZLAN*

Abstract : Different cultures and regions utilise wildlife for various purposes in their livelihood that influence their social systems, beliefs, customs, and arts. The indigenous peoples of Sarawak in this biodiversity-rich region—are deeply engaged with their surrounding nature and have been incorporating wildlife into their traditional lifestyles. The study aims to explore the utilisation, perceptions, and conservation of wildlife among the Melanau community near Batang Rajang of Sarawak. A total of 121 respondents were interviewed from the local communities to elicit essential information on wildlife utilisation. Most of the respondents are found to be dependent on wildlife for food (44%), medicine (8%), and kept wildlife as pets (13%). Some perceive wildlife as taboo (28%) and consider them as pests (40%). The local communities from this area from this study were also not aware of the protection status for the many wildlife species under the Sarawak Wild Life Protection Ordinance (SWLPO) 1998 and its conservation needs. The information of the Melanau community and its wildlife utilisation presented in this study is to provide greater insights for conservation efforts in enriching its socio-cultural aspects, particularly in this largest territorial state of Malaysia in Borneo.

Keywords: Ethnozoology, wildlife, traditional knowledge, Melanau, indigenous people

INTRODUCTION

Tropical rainforests are rich in biodiversity where the use of natural resources is integral in its local communities' lifestyles. The indigenous peoples of Borneo are the long-standing users of the forest resources for many purposes, from land clearance within their housing space compound, agricultural activity, water catchment area, timber, food, and medicines; and for religious and cultural use (Nelson *et al.* 2015; Sait *et al.* 2018). Despite its practical utilisation, forest products are also known to have intangible values concerning cultural and spiritual function usefulness in human society (Ritter and Dauksta 2013; Meijaard *et al.* 2013).

In Borneo, wildlife serves the domestic and traditional needs of the local people. It also acts as a prominent feature in their traditional aspects (Bennett and Robinson 2000; Meijaard *et al.* 2013). In Sarawak, for instance, wildlife is fundamental to its indigenous culture; it is deeply rooted in their cultural or traditional belief systems (Bennett and Robinson 2000; Meijaard *et al.* 2013). Many indigenous communities in Sarawak are dependent highly on wildlife for subsistence, and its wildlife meat is one of the main protein sources for the rural peoples (Bennett *et al.* 2000; Kirupaliny and Mohd-Azlan 2012). This dependency has led to hunting in fulfilling their daily needs. Hunting is common among those who live in the rural parts of Sarawak where access to domestic meat is scant (Kirupaliny and Mohd-Azlan 2012; Yi and Mohd-Azlan 2018).

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Nevertheless, religious and cultural traditions affect the sustainability of such resources by controlling which species are available to be hunted (Bennett *et al.* 2000; Ngoufo *et al.* 2014). Some cultures have special taboos that prohibits or indirectly provide another, safeguard against the over-harvesting of certain species (Bennet and Robinson 2000; Horowitz 1998; Ngoufo *et al.* 2014). The contravention of this prohibition in consuming these wildlife may result in undesirable circumstances such as illness, death, or even the birth of a handicapped child (Horowitz 1998). For instance, Ibans in parts of Sarawak will not hunt the Orangutan (*Pongo pygmaeus*) meanwhile, Muruts in Sabah will not hunt hornbills (Bennett *et al.* 1997; Bennet *et al.* 2000).

The other major religion's restriction on the killing and eating of wildlife, particularly in Islam, Buddhism, and Hinduism contribute to higher populations count of many species, especially in Muslim-dominated areas in Northern Borneo. Meanwhile in India, this tolerance act against the hunting of wildlife has resulted in the flourishes of the populations for many species of large animals (Bennett and Robinson 2000). Therefore, the perceptions of people towards wildlife are necessary for any successful implementation of wildlife management, conservation policies, and regulations in the future (Alves 2012; Meijaard *et al.* 2013; Nguofo *et al.* 2014).

Additionally, indigenous communities have much essential knowledge in managing forests resources sustainably. The knowledge of indigenous people is imparted into their rituals, ceremonies, and mystical practices thus underlining how their social and cultural beliefs cannot often be separated from their understanding of the natural world (Nicolas and Lasimbang 2004). For instance, the use of natural resources for medicinal purposes is commonly widespread among the indigenous communities in Sarawak (Halim *et al.* 2013; Ismail *et al.* 2015; Ripen and Noweg 2017; Hidayati *et al.* 2017). On top of that, the traditional livelihood which centred towards forest foraging and subsistence farming had kept the native communities attached to their skills and knowledge, understanding as a gift from nature (Ripen and Noweg 2017). This traditional knowledge is interlinked with natural resource management which is part of indigenous peoples' lifestyles, while it is important to document such valuable and time-tested ethnozoological knowledge before these culturally enriched people and natural resources disappear (Nicholas and Lasimbang 2004). Additionally, this knowledge is also imperative for biodiversity conservation from the outset of protected areas (Mathai *et al.* 2016).

In Sarawak, the Melanau community is viewed among the earliest settlers and is the fourth predominant ethnic, after Malay, Iban, and Bidayuh. There are approximately 123,400 Melanau people living in Sarawak which make up about 5% of the Sarawak population (Department of Statistics Malaysia 2018). The Melanau people live along the lower reaches of the Rajang River and spread along the coast, from the mouth of the Rajang Northeast to Bintulu, and predominantly at the coast of Kanowit. Locally, they call themselves the *a-likow*, meaning 'people of the river' (Bahauddin *et al.* 2018).

The Melanau people inhabits within the northwest coastal region of Sarawak from the Rajang delta to Bintulu and Miri (Appleton 2012). Though increasing numbers have migrated to the larger towns and cities over the last fifty years, about eighty percent of the total Melanau populations are found to live in rural areas along the main waterways of the region, where fishing and sago-related activities continue to provide a subsistence income for many households (Appleton 2012). The Melanau people previously lived in tall houses but recently they have adopted a Malay lifestyle, living in kampong-type settlements. They are reputed as one of the finest boat-builders and craftsmen (Langgat *et al.* 2011 and Bahauddin *et al.* 2018) although each community has its own ascribed dialect, they all share an equally cultural and lingual background.

Many studies have investigated the wildlife's utilisation and hunting patterns among these local communities in Sarawak (Bennett et al. 2000; Yi and Mohd-Azlan 2018; Yi and Mohd-Azlan 2020). However, there have been only a few studies embarking on wildlife utilisation and its significance among the Melanau community (Mohd-Azlan and Fauzi 2006; Kassim *et al.* 2016). In viewing this aspect, it is necessary to record, preserve, and document the information on the diversified utilization of various animal species. Moreover, as the utilisation of ethnobotanical resources, this study within the Melanau community should be recognised to have many significant benefits (Ripen and Noweg 2017), the role of wildlife is yet to be addressed as an essential step towards biodiversity and biocultural conservation (Alves 2012).

Hence, this study aims to explore the Melanau communities in Sarawak about 1) perceptions of local community near coastal areas between Belawai and Rajang River towards wildlife and their relationship in their daily livelihood, 2) record the utilisation of wildlife by the local community for medicinal purposes, as a food source, aesthetics values and 3) to investigate the awareness of these community on the protection status of wildlife species under the Sarawak Wild Life Protection Ordinance (SWLPO) 1998.

MATERIALS & METHODS

121 residents were interviewed from three Melanau villages. Interview sessions were carried out among the respondents by randomly obtaining relevant information solely on their utilisations and perceptions of wildlife within their foraging area. The Open Data Kit (ODK) software was used for the data collection process. All data were analysed using R-software 3.5.2 (R Core Team 2018) to compute analytical numbers and percentages are presented in the results section.

Study Location

This study was conducted at three Melanau villages in 1) Rajang, 2) Belawai, and 3) Jerijeh of Tanjung Manis district on the west coast of Sarawak (Figure 1). The Belawai and Rajang are located near the coastlines while the Jerijeh village is located about 5 km from Belawai through road access. The Melanau communities in Rajang, Belawai, and Jerijeh are of the same groups of Melanau and distinct from those in Mukah, Matu-Daro, and Bintulu in terms of language, practices, and cultural systems (Bahauddin *et al.* 2018). Most of the local people harvest sea products and practice small-scale agriculture such as vegetables and mostly coconut as their livelihood.

Tanjung Manis district is a delta that is accessible through road from the nearest Sibu and Sarikei towns. The alternative access is through the main Batang Rajang waterway connecting the capital city of Kuching and Sarikei township by express boat. The new township of Tanjung Manis was established recently and where new shophouses and houses lots were developed to enhance the socio-economic background of the local people. The main vegetation covering the area is the Mangrove forests dominated by *Bruguiera* spp. and *Rhizophora* spp. (Ahmad 2006), which are home to the endemic species of Proboscis Monkey (*Nasalis larvatus*). Other species frequently observed in the study areas include Otters (Family Lutrinae), Silver Leaf monkey (*Trachypithecus cristatus*), and Irrawaddy Dolphin (*Orchaella brevirostris*).

Data Collection and Analyses

The questionnaires consist of 7 parts 1) social background 2) perceptions towards wildlife 3) hunting 4) wildlife trade 5) ornamental use of wildlife 6) wildlife use in traditional medicine and, 7) awareness of Sarawak Wild Life Protection Ordinance 1997. In this study, both qualitative and quantitative approaches were used to meet the aims of this study.

A qualitative method was used to approach the informants to provide insights into the phenomenon aspects from their views such as the description of taboos and beliefs, their preparation of traditional medicines, and local perceptions towards wildlife. Whereby the quantitative approach was used in gathering information via closed-ended questions; the species of wildlife involved, wildlife trade, and the socio-demographic background.

The medium of the interview survey was carried out in both Melanau and Malay languages. Interviews were conducted in group discussions and/or individuals. Prior to the survey, an official letter was presented to the village heads for permission and informing the details of the study. Additionally, we obtained approval to conduct the study through STH3013 by Animal Resource Science and Management, Universiti Malaysia Sarawak. Prior to the oral interview begin, we asked for consent from each respondent of their participation. Illustrations from relevant books such as *The Mammals of Borneo* (Phillipps and Phillipps 2016) and *The Birds of Borneo* (Phillipps and Phillipps 2014) were used as accompanying visual aids for species identification.

The data collected from the interview survey in the form of ODK files were exported into the Microsoft Excel database, before proceeding for analysis using R software 3.5.2. All quantitative data (closed-ended questions) were assessed using R software while the qualitative data such as the detail of taboos and modes of preparation for medicinal purposes were written down and summarised in the table forms.

RESULTS

There were significant findings in the four main components describing the relationships between the local people and wildlife, especially in Rajang, Belawai, and Jerijeh areas. The first is 1) association of wildlife within the culture's taboos, 2) wildlife roles in traditional medicines, 3) human-wildlife conflicts, and lastly, 4) the consumption and aesthetic values of wildlife within the local culture (Figure 1).

Most of the respondents' ages are within the range of 36 to 55 years old (42%) meanwhile, the least informant, age ranges from 15 to 25 years old (11%). All respondents are Muslims, and most of them are unemployed (41%) as simplified in Table 1. The study found that the majority were fishermen and harvesting sea products, mainly in fishes, clams, and crabs as their primary living source.

From the survey, there are 17 species of wildlife listed consisting of 11 mammals' species, three reptiles' species, and one bird's species (Table 2). All these animals are the common wildlife species found within the areas as claimed by most respondents.

Wildlife in Local Culture Taboos

In terms of cultural beliefs, the Melanau people of Rajang, Belawai, and Jerijeh have their own set of wildlife-related taboos still in practice or obeyed. From this survey, 34 respondents (28%) claimed that there are wildlife-related taboos already existed within the communities. Table 3 shows the types of wildlife associated with the cultural taboos of the Melanau people in the study areas. There are eight species of wildlife that are highly revered comprising of three mammals, three reptiles, and two fish species. Consumption of these animals is prohibited among them to avoid unwanted circumstances such as sudden death, miscarriage among pregnant women, and illnesses (Table 3).

The local taboos reported by 34 respondents included the Sambar deer (*Rusa unicolor*) (47%), followed by the Saltwater Crocodile and False Gharial (*Crocodylus porosus* and *Tomistoma schlegelii*) (20%) while Python (*Python reticulatus*), Irrawaddy Dolphin (*Orcaella brevirostris*), and Stingray (Family Myliobatiformes) are 8%, respectively. However, only a

few respondents reported some taboos related to the Archer fish (Family Toxotidae), Monitor Lizard (*Varanus salvator*) and Silvered Langur (*Trachypithecus cristatus*) (3% respectively). The locals claimed their apprehension in going against these taboos to avoid any unforeseen circumstances (Table 3).

Wildlife in Traditional Medicines

Only eight out of 121 respondents (7%) utilised wildlife for medicinal purposes at least once in their lifetime (Table 4). Of these, six of eight respondents (75%) chose to use traditional medicines known to be effective, while the remaining two respondents (25%) used traditional medicines during their childhood as a customary practice by the elders (parents and grandparents). In addition, it was reported that five of eight respondents (63%) inherited the traditional medication knowledge from their family members, two of eight respondents (25%) obtained the knowledge from the local community, while only one respondent (13%) gained it through life-experiences. Consumption of wildlife was to cure different diseases and ailments, such as Crocodiles' meat to cure asthma and breathing problems, and Sun bear's bile to cure body and joint aches (Table 4). The most common wildlife used for medicinal purposes is the Crocodiles (*C. porosus* and *T. schlegelii*) (63%), followed by Sun Bear (*Helarctos malayanus*) (24%) and solely one respondent (13%) who utilised the Sambar Deer (*R. unicolor*). The meat is the most consumed by comparison to other body parts of the wildlife, with the exemption of the bile and penis.

Human-Wildlife Conflicts

Human-wildlife conflicts were also reported to have been occurring in the study areas (Table 5). Forty-eight respondents (40%, 48 out of 121 respondents) claimed that wildlife causes nuisances in their livelihood. Thirty-three out of 48 (69%) respondents reported wildlife has caused disturbances by invading into the people's houses, stealing foods, being aggressive, and preying on livestock, destroying crops, and newly planted trees (23%, 11 respondents), and four respondents (8%) claimed that wildlife has threatened the safety of local people. From this study, five wildlife comprising two mammals and two reptiles were involved in the human-wildlife conflict incidents.

Of these species involved, the Silvered Langur (*T. cristatus*) was mostly the major cause of many disturbances (claimed by 56%, 27 out of 48 respondents), followed by Bearded Pig (*Sus barbatus*) (29%, 14 of the 48 respondents), the Saltwater Crocodile and False Gharial (*C. porosus* and *T. schlegelii*) (15%, 7 out of 48 respondents). Some of these respondents also listed more than one animal that has caused disturbances in their neighborhood, these included Reticulated python (*P. reticulatus*) and Monitor Lizard (*V. salvator*). Besides, two out of 48 respondents reported that their fishing nets and crab traps were destroyed and damaged by the Crocodiles (*C. porosus* and *T. schlegelii*). Likewise, the Silvered langur (*T. cristatus*) and Bearded Pig (*S. barbatus*), are considered pests in the study areas, as they are known to be frequently destroying fruit trees and crops.

The respondents revealed that they resorted to different ways to overcome this problem (Table 5). Most of the respondents (50%, 24 out of 48) chose to chase away the wildlife Silvered Langur (*T. cristatus*) and Bearded Pig (*S. barbatus*), while 29% of respondents preferred to kill by using the shotgun, and even the means of using food poison. Ten respondents (20%) chose to avoid these nuisances by setting up cage traps to catch these animal pests and later releasing them into the nearby forest. The Muslim communities do not consume this species but rather trapped and kill the animals, or be given them to the nearest Iban community. There were a small number of respondents (1%) who considered no further action taken but were aware of the looming threat from Saltwater Crocodile and False Gharial (*C. porosus* and *T. schlegelii*), Reticulated python (*Python reticulatus*), and even some cases of Monitor Lizard (*V. salvator*).

Wildlife Trade and its Aesthetic Values

From this study, 53 out of 121 respondents (44%) reported having bought wildlife meat at least once in their lifetime for personal consumption. Overall, the Sambar deer (*R. unicolor*) was the highly consumed wildlife in these communities (44%, 53 respondents). Nevertheless, only two out of 121 respondents (about 2%) had consumed Irrawaddy Dolphin meat (*O. brevirostris*) which their consumption is merely by chance; if it is found entangled and dead in their fishing net. About 16 out of 121 respondents (13%) kept wildlife parts for different purposes (decorative=44% (7 respondents), gift from people=56% (9 respondents). Of these, the Sambar deer's (*R. unicolor*) antlers are the most prized and kept (13 out of 16 respondents) as home decorations or accessories, while the other two respondents (2 out of 16 respondents) use Muntjacs' (*Muntiacus* spp.) antlers for these same purposes and only one respondent used the skin of Monitor Lizard (*V. salvator*).

It was recorded that the price of Sambar Deer meat ranged from RM25 – RM30 per kilogram, while the bone parts were generally sold for RM20 per kg, and the thigh parts price ranged from RM10 – RM15 per kg. Also, one respondent reported a Monitor lizard (*V. salvator*) is sold for RM180 per individual. About 16 out of 121 respondents (13%) kept wildlife as pets and some of the respondents have kept more than one type of wildlife as pets. Most kept wildlife is the Spotted Dove (*Spilopelia chinensis*) as a pet (56%, nine out of 16 respondents), followed by Green Imperial Pigeon (*Ducula aenea*) (13%, two out of 16 respondents), Brahminy Kite (*Haliastur indus*) (13%, two out of 16 respondents) while Python (*P. reticulatus*), Cobra (*Naja* spp.) and Marbled cat (*Pardofelis marmorata*) are 6% (One out of 16 respondents) respectively. Besides, four of these respondents have kept more than one type of wildlife including the Silvered Langur (*T. cristatus*), Argus Pheasant (*Argusianus argus*) and Parrot (Family Cacatuidae). Approximately 69% (11 out of 16) respondents obtained wildlife from different sources (as gifts from people or captured within house compound) while 13% (two out of 16) respondents bought their wildlife pets, and the rest (three out of 16 respondents, 18%) obtained during hunting.

Awareness of Local Communities toward Wildlife Conservation and SWLPO 1998

A total of 69 out of 121 respondents (57%) were aware of the SWLPO 1998. Meanwhile, less than half of them did not know the wildlife protection act in its entirety. About 14% (17 out of 121 respondents) are aware of the status of Marbled Cat (*Pardofelis marmorata*) as a Totally Protected species while the remaining 86% (104 respondents) were unaware of the protection status under the SWLPO 1998. Approximately 39% (47 out of 121 respondents) claimed that these Totally Protected Animals can still be consumed although most of them (78%, 94 out of 121 respondents) acknowledged that killing and hunting wildlife would make its population decrease in numbers. In general, the respondents agreed (84%, 102 out of 121 respondents) that protecting wildlife is critical in conserving the environment.

DISCUSSION

Most of the food-related prohibited within the Melanau communities forbid the consumption of certain wildlife species mainly the Sambar Deer (*R. unicolor*) meat. Nevertheless, there is a substantial number of respondents who put up no restriction (44%) on consuming this species. Likewise, the Melanau prohibits the consumption related to Crocodiles (*C. porosus* and *T. schlegelii*) restricting the hunting of this species that may have contributed to the increase of the reptiles' population in the areas. Such practices play important roles in wildlife conservation, especially where humans and wildlife coexist. This prohibition of wildlife consumption contributes to sustainable wildlife management in traditional culture and should be integrated into modern techniques of wildlife conservation to encourage synergistic effort between local people and authorities (Ngoufo *et al.* 2014).

Although the use of wildlife in traditional medicines is not widespread within the study areas, some of the local communities are still very dependent on this practice. The continuity of these traditional practices was influenced by their effectiveness as claimed by past experiences from their kin or their own experiences, in line with those reported by Kendie *et al.* (2018) and Borah & Prasad (2017). The finding is consistent with previous studies on the use of wildlife to cure diseases and ailments in traditional practices of indigenous people across different regions (Tamang 2003; Mohd-Azlan and Fauzi 2006; Kendie *et al.* 2018). Although wildlife-based medicine appears to be practiced in the study area, much of the respondents reiterated that these practices are not as prevalent as in the past, due to modern medicines, today.

The human-wildlife conflicts in this area are predominantly caused by Bearded Pig (*S. barbatus*), Silvered langur (*T. cristatus*), Crocodiles (*C. porosus* and *T. schlegelii*). In the last four years (2013–2016), there were about 40 known cases of crocodile attacks reported throughout the state of Sarawak alone (Tisen 2016). However, there has been no crocodile attack ever reported in Rajang, Belawai, and Jerijeh areas. Other than that, the presence of animal pests such as Bearded Pig (*S. barbatus*) and Silver Leaf Monkey (*T. cristatus*) in the studied villages has led to the hunting of this species, as one of the methods to avoid further nuisances, and damage to their crops and fruit trees. This is also apparent in other parts of Sarawak where human-wildlife conflict incidents were reported by Yi and Mohd-Azlan (2018). Despite this, the existence of taboos that restrict the consumption of Bearded Pig (*S. barbatus*) and Silver Leaf Monkey (*T. cristatus*) might have contributed to the increase of its population within the study areas. In Northern Borneo for instance, the population of Bearded Pig (*S. barbatus*) in Northern Borneo is higher in Muslim-dominated areas compared to Non-Muslim areas (Bennett and Robinson 2000).

Many species (such as Pigeons (Family Columbidae)), Cobra (*Naja* spp.), Spotted Dove (*S. chinensis*), and Brahminy Kite (*Haliastur indus*) are caught as pets while the antlers of Sambar Deer (*R. unicolor*) and Muntjacs (*Muntiacus* spp.) are frequently sought as decorations. The hunter would often keep the antlers as a trophy. Further, the practice of this tradition can be seen throughout the study areas whereby Sambar Deer's (*R. unicolor*) and Muntjacs' (*Muntiacus* spp.) antlers were often kept and showcased, as this practice inherited from their past elders during which hunting activity was common. The use of antlers as decorations is also reported among the Iban, Bidayuh and, Malays communities in Sarawak (Mohd-Azlan and Fauzi 2006).

With different communities perceiving wildlife differently in this area; further study or invaluable information is needed to make sure mitigation and conservation action is specifically tailored for each region and in line with their traditional beliefs and cultures (Figure 2). Furthermore, the documentation of this indigenous knowledge such as animal-based medicines should be very helpful in the formulations of strategies for sustainable management and conservation of bio-resource (Kendie *et al.* 2018). This information presented also can be a nuance towards realistic planning, gaining trust for cooperation from the local people, thus avoiding unnecessary conflict with local people (Colfer *et al.* 2000). Furthermore, the knowledge if harnessed properly could prove to be a valuable asset, which could be integrated into modern development projects with valuable results (Lohani *et al.* 2008).

CONCLUSION

Borneo is home to myriad groups of indigenous people and the significance of wildlife in their traditional norms is truly symbolic in its own uniqueness of their culture. Relevant to this study, the local community itself should be the proud custodians of their forest and wildlife, with enough support from the local and foreign stakeholders also from the government

itself undoubtedly. The available documents on ethnozoology should be constantly utilised, improvised, and updated in supplementing the needs of this field of study, acting as a tool for community-based and biocultural conservation. This knowledge presented is useful to ensure that the future management plan is in line with the local traditional culture, regulations, and demands. Other than that, public awareness should be raised to a prominent degree until the roles of protecting wildlife and biodiversity are inculcated into the local communities. Apart from amending rules and policies, this set of laws should be publicised and acknowledged by the people with the aid given by local academicians and community-based volunteers, or a level in which the rationales for preserving the environment should never be questioned.

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Figures

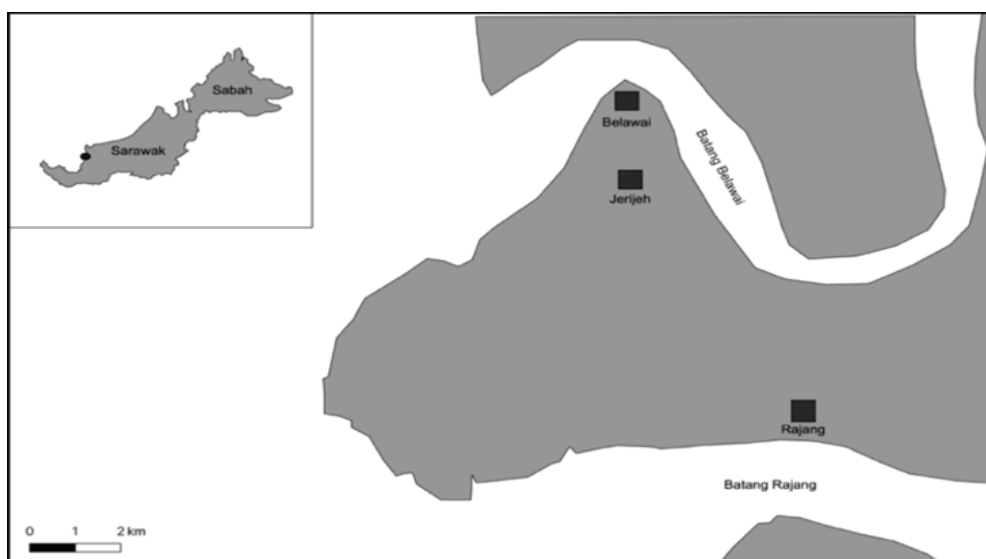


Figure 1: The location of study sites at the west coast of Sarawak. Belawai, Jerijeh, and Rajang are administered as Tanjung Manis District under Mukah Division. Batang Rajang is the main waterway in Sarawak and is an alternative access to Kuching and Sarikei town by boat.

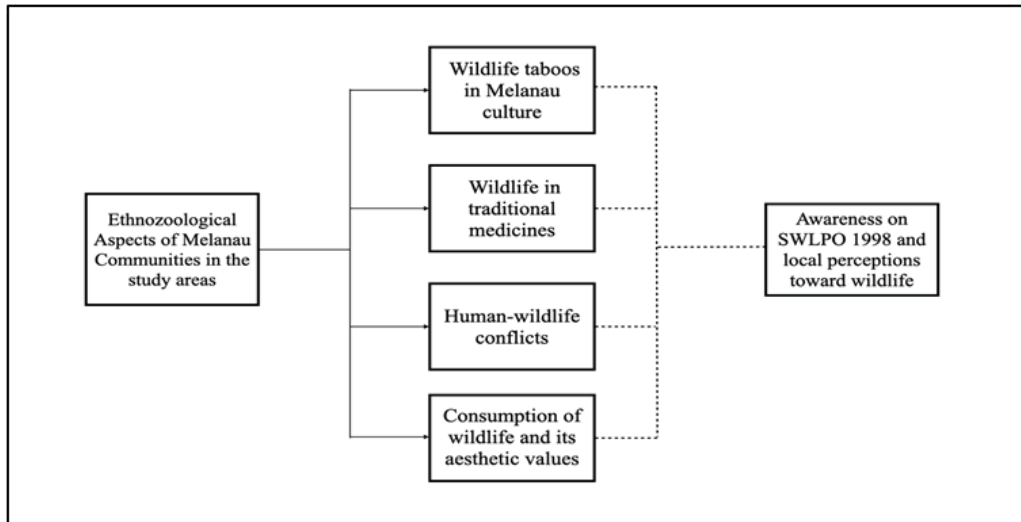


Figure 2: The chart is summarising the relationships between the Melanau people and its wildlife in the study areas. The information on local awareness toward SWLPO 1998 is included in this study to provide insight into their understanding of wildlife conservation status in Sarawak.

Tables

Table 1: Socio-demographic features of respondents in study areas included in the survey with a total of 121 respondents.

Demographic Features		No of Respondents	Percentage (%)
<i>Gender</i>			
	Male	75	62
	Female	46	38
<i>Age range</i>			
	15-25	13	11
	26-35	16	13
	36-55	51	42
	>55	41	34
<i>Religion</i>			
	Muslim	121	100
<i>Education</i>			
	No formal education	3	2
	Primary	39	33
	Secondary/SPM	64	53
	Tertiary (STPM, Diploma, Pra-u)	12	10
	Degree	3	2
<i>Working Sector</i>			
	Unemployed	49	41
	Self-employed	48	40
	Government Sector	11	8
	Private Sector	13	11
<i>Income</i>			
	<RM500	18	15
	RM500-RM1000	59	49
	RM1001-RM1500	24	20
	>RM1500	20	16
<i>Monthly Expenses</i>			
	<RM100	1	1
	RM101-RM500	47	39
	RM500-RM1000	59	49
	>RM1000	14	11

Table 2: List of wildlife's Scientific and English Common names corresponding to its local names in Melanau Language.

Common English and Scientific name	Common name in Malay	Melanau name
Silver Leaf Monkey (<i>Trachypithecus cristatus</i>)	Lutong	Lutong
Flying Fox (<i>Pteropus</i> spp.)	Keluang	Semawak
Bats (Order: Chiroptera)	Kelawar	Nawai
Leopard cat (<i>Prionailurus planiceps</i>)	Kucing Hutan	Ngau Utan
Brahminy Kite (<i>Haliastur indus</i>)	Helang	Kenyew
Monkey (<i>Macaca fascicularis</i>)	Kera	Kuyat
Irrawaddy Dolphin (<i>Orcaella brevirostris</i>)	Lumba-lumba/ empesut	Bung
Bearded Pig (<i>Sus barbatus</i>)	Babi Hutan	Babui
Monitor Lizard (<i>Varanus salvator</i>)	Biawak	Meruwak/ Merawak
Proboscis Monkey (<i>Nasalis larvatus</i>)	Monyet Belanda	Belanda
Saltwater Crocodiles and False Gharial (<i>Crocodylus porosus</i> , <i>Tomistoma schlegelii</i>)	Buaya	Bayah
Otter (Family <i>Lutrinae</i>)	Memerang	Dengen
Civets (Family <i>Viverridae</i>)	Musang	Dimong
Reticulated python (<i>Python reticulatus</i>)	Ular Sawa	Nipah planan
Cobras (<i>Naja</i> spp.)	Ular Tedung	Nipah Sinuk
Pangolin (<i>Manis javanica</i>)	Tenggiling	Ayam
Birds	Burung	Manuk

Table 3: The table shows detailed relationships between the cultural taboos of the local communities and wildlife. The wildlife species that are related to the taboos are commonly associated with some superstitious beliefs.

Wildlife species	Details
Sambar Deer (<i>Rusa unicolor</i>)	Pregnant women are forbidden from consuming Sambar deer meat. The mother might lose the child if doing so. Consuming this meat is forbidden to some local people, in which the whole descendants of the family cannot consume the meat.
Irrawaddy Dolphin (<i>O. brevirostris</i>)	Any Dolphin that was found entangled inside the fisherman's fishing net should not be released or harvested. The local people believe that the other dolphins will come and attack the fisherman for harming the members of the pod.
Saltwater Crocodile and False Gharial (<i>C. porosus</i> , <i>T. schlegelii</i>)	The local people believe that killing a crocodile is forbidden to avoid unforeseen consequences from happening.
Python (<i>Python reticulatus</i>)	If the wife is pregnant, the husband cannot kill or hunt these animals to avoid unnecessary events from happening to the child such as unexpected death, diseases that lead to death, and other unforeseen circumstances.
Silver Leaf Monkey (<i>Trachypithecus cristatus</i>)	
Monitor Lizard (<i>Varanus salvator</i>)	
Archerfish (Family <i>Toxotidae</i>)	Food taboos. Some local people cannot eat archerfish or known as <i>Ikan Sumpit</i> to the locals. They believe those who consume the fish will get eye diseases.
Stingrays (Family <i>Myliobatiformes</i>)	Food taboos. Some people and its whole family member cannot eat this fish to avoid bad omens such as sudden death, diseases that lead to death, and other unforeseen circumstances.

Table 4: Three species of wildlife with medicinal properties in traditional healing practices among the local communities.

Wildlife	Parts or Derivatives used	Medicinal Use	Prescription
Saltwater Crocodile and False Gharial (<i>C. porosus</i> and <i>T. schlegelii</i>)	Meat	To cure asthma and breathing problems	Grind the meat and leave it dry under sunlight before mixing it with water and drink. Also, cook, grill, or smoke the meat before eating.
Bornean Sun Bear (<i>H. malayanus</i>)	Bile and Meat	To cure body ache, asthma, breathing problems, and provide extra strength to the body	The meat is cooked before consumption while the bile is preferred to be eaten raw.
Sambar Deer (<i>R. unicolor</i>)	Penis	To cure diseases	The penis will be ground, left dry under sunlight, and mix with water before drink.

Table 5: Detail information on wildlife disturbances that have been occurring in the study areas as reported by respondents

Wildlife	Details	Ways to overcome wildlife disturbances
Silvered Leaf Monkey (<i>T. cristatus</i>)	Destroy crops, invades people's house to steal food. The langurs threaten the safety of local people as they become aggressive when they were chased away by the people.	Chase away the langurs without any physical contact. Kill by putting poison in the food lure.
Bearded Pig (<i>S. barbatus</i>)	Destroy crops such as coconut and fruit trees.	Killed using a shotgun. The local people set up a cage trap to catch the bearded pig. The carcass will be given to the Iban people in the area.
Saltwater Crocodile and False Gharial (<i>C. porosus</i> and <i>T. schlegelii</i>)	The presence of the Crocodiles threatens the safety of fishermen. The fishermen feel unsafe to go out to the sea or river for fishing as they claim there are too many Crocodiles in the area. The crocodiles also destroy fishermen's fishing nets and crab traps.	The locals must be extra careful while conducting any sea or river activities to avoid the Crocodiles.
Reticulated Python (<i>P. reticulatus</i>)	Threatens the safety of local people especially during working in the farm or going out for hunting.	The local people must be extra careful during farming or hunting.
Monitor Lizard (<i>V. salvator</i>)	Prey on chicken reared by the local community	No practical method was applied.