No.11
November 2014

11

Equatorial Biomass Society

Grant-in-Aid for Scientific Research (S)
Planted Forests in Equatorial Southeast Asia: Human-nature Interactions in High Biomass Society

Mammals and birds captured by camera traps in Anap Sustainable Development Unit.
(Photo by Hiromitsu Samejima)


Bulwer's pheasant


Lesser mousedeer


Banded civet

Sun bear

Sambar

Bearded pig

Recent Change of Edible Bird's Nest Trade in Sarawak: The Introduction of New Method and Sustainable Collection

Tetsu Ichikawa (Department of Tourism, Rikkyo University)

Introduction

The purpose of this paper is to report and analyze on the transformation process of the edible bird's nest trade in Sarawak, Malaysia. Recently the edible bird's nest trade has been booming in Malaysia (e.g. Lim & Earl of Cranbrook 2002, Voon 2012, Chew 2013). This influx in trade is influenced by factors including: the Chinese food culture, the Chinese perception of health, the ecological knowledge of local people, and the multi-ethnic network in this area. These characteristics are significant in the trade of edible bird's nest in Southeast Asian countries, including Sarawak. This paper will analyze the characteristics of the contemporary edible bird's nest trade in Sarawak from three viewpoints: the commodity chain, ecological knowledge and the ethnic relationship in this area. By considering these three viewpoints, this paper will examine how the edible bird's nest trade is transforming its nature in the Sarawak region through the introduction of a new method for collecting the edible bird's nest.

Since globalization can no longer be ignored in contemporary world, many scholars in humanities and social sciences have begun to consider how to integrate a global phenomenon into their research. This academic trend has influenced cultural anthropological studies, whose main research method is to conduct fieldwork in relatively small communities. However, anthropologists have long recognized the importance of a relationship between the micro scale communities and the macro scale phenomena prior to globalization studies prospering within the field of humanities and social sciences. Since the 1980s, the world-systems theory and the articulation theory have influenced socio-cultural anthropological research, with anthropologists seeking to understand their fieldwork date by considering the world-systems theory or transnationalism studies (cf. Lewellen 2002, Kearney 2004).

It is not easy for anthropologists to research a large-scale society to enable them to understand their field data. As ethnographic fieldwork in relatively small-scale communities is the main research method for anthropological research, anthropologists are faced with searching for a research framework to articulate their micro-scale ethnographic data and its macro-scale background. Should anthropologists research a large-scale society, such as a world system or a transnational phenomenon; it is necessary for them to consider and understand the interconnectedness between micro level communities in which they conduct their fieldwork and the macro level settings that surround the research site. Some scholars (cf. Marcus 1995, Brettell 2003) whose work include tracing population migration and commodity chain by conducting multi-sited ethnographical methods, can be understood as contributing towards overcoming the above problems.

By reflecting on this academic tendency, some studies analyze the characteristics of particular products' and their trade in world markets by researching not only the commodity chain but also the peculiarity of their ecological environment and the political economy, where the products are produced (e.g. Collins et al. 2000, Wadley 2005, Akamine 2010, West 2014). To understand the extended Chinese network from the local context, such research methodologies are instructive helpful.

Utilizing this framework, this paper will report on the edible bird's nest trade in contemporary Sarawak, Malaysia and discuss how ethnic Chinese in Sarawak have introduced a new method for collecting edible bird's nest and changed the trade network in this region. To analyze the above issues, the paper will focus on three topics: the transformation of the commodity chain, environmental knowledge of local peoples, and the ethnic relationship in Sarawak. In discussing these issues, the paper will concurrently consider the contemporary characteristics of the edible bird's nest in Sarawak trade and how the ethnic Chinese and other local people in Sarawak are utilizing a high-biomass natural environment in this region.

What is edible bird's nest?

Edible bird's nest, known as *yan wo* (燕窝) in Mandarin and *sarang burung* in Malay, is a rare and expensive Chinese food delicacy. Although the Chinese word yen means swallow, this delicacy is not a swallow's nest, but a swiftlet's nest. The swiftest is a biologically different species to the swallow. Among the members of the species, only two groups, which are *Aerodrams Maximus* and *Aerodrams Ficiphagus*, build edible nests by using their saliva. It is commonly believed that the swiftlets use sea weed to build their nests, thus their nests also taste like seaweed. While this is a prevalent belief, it is a false assumption as the swiftlets only use their saliva to build their nests. These two species commonly build their nest in limestone caves in inland and coastal areas in tropical Asia (Lim & Earl of Cranbrook 2002).

It is unknown when Chinese people began consuming edible bird's nests as a delicacy. However, some scholars believe that Chinese people already consumed edible bird's nest during the Tang dynasty. The edible bird's nest became a popular food in Chinese cuisine from the Ming dynasty, with edible bird's nest being used as one of the important dishes for the Manchu Han Imperial Feast, which is *man han quan xi* (满汉全席) in Mandarin, during the Qing dynasty. It has since been a prominent delicacy in Chinese cuisine on Mainland China and overseas within Chinese communities (Lim & Cranbrook 2002, Jordan 2004, Chiang 2011, Zhuan Ye Yan Wo Shang 2011).

Edible bird's nests are rarely produced in China and have been imported from Southeast Asia to China for over centuries (Ismail 2002:45, Chiang 2011:409-410). This remains to be the case today, with Southeast Asian countries being the main place of origin for edible bird's nests (Marcone 2005:1126). Nowadays edible bird's nest is considered to be a special regional product of the Southeast Asian region and is sold to overseas tourists of Chinese background. For example, edible bird's nests are regarded as one of the typical local products of Thailand and sold in the International Airport and in Chinatown in Bangkok. The edible bird's nest are sold as local delicacies in some shops and consumed as dessert in restaurants or from street venders on Yaowarat Road in Chinatown, a popular touristic destination in Bangkok. In Thailand, both the Thai people and the local Chinese consume the edible bird's nests.

In the same way as Thailand, the edible bird's nests are traded in Sarawak as a local product too. According to one Chinese businessperson in Kuching, the capital city in Sarawak, the main consumers of the edible bird's nest in Sarawak are Chinese people from various parts of East and Southeast Asian countries, such as Peninsular Malaysia, Singapore, Hong Kong, Taiwan and the People's Republic of China. As this paper will explain later, the bird's nests in Sarawak are not only sold in retail shops to the local customers but also exported to overseas countries such as Hong Kong and the People's Republic of China. Likewise, shark fin and sea cucumber are also exported, which are regarded as specialty products of the region. The edible bird's nests in Sarawak are traded through a so-called Chinese trading network, with sellers playing an important role connecting multiple locations and people in and beyond Southeast Asia.

In recent time, the structure of the trading network of edible bird's nest in Southeast Asia, including Sarawak, has changed its nature somewhat. One of the main reasons for this change is the introduction of a new method for collecting the edible bird's nests in this region. Traditionally edible bird's nests in Southeast Asian countries were collected in caves. These caves are located in tropical rainforests or in coastal area[1]. It is quite difficult for Chinese merchants to reach such natural environments, to enter the caves and to collect the bird's nest in the darkness. However, since a new method for collecting the edible bird's nest was introduced to Sarawak, it is no longer necessary for the local Chinese people to ask the local indigenous people to collect the nests. Consequently, this new method has changed the conventional ethnic relationship in the area as well as the pattern of the nest's trade.

Traditional trade of edible bird's nest in Sarawak

As mentioned above, the indigenous people collected the edible bird's nests in Sarawak from caves in the rainforest for centuries. These bird nests collected by the indigenous peoples were bought by other indigenous people or by Chinese middlemen, and then sold to Chinese merchants in

cities and towns. Following this some nests were exported overseas to countries such as Hong Kong, Taiwan, China and to Chinatown districts in other countries.

This edible bird's nest trade network partially overlaps with the traditional trade network in interior area of the Borneo Island. Like other parts of Southeast Asia, the indigenous peoples in Borneo have collected jungle products, which are highly valued in the outside world, such as China, India, the Middle East and Europe. These jungle products collected by the indigenous people in inland or upstream areas are mediated through other indigenous people downriver, to merchants in cities and towns. Again these jungle products are exported to other areas and consumed by people in other regions. These products may include animal meat and fur, elephant tusk, ironwood, rattan, aromatic tree, some kinds of resin, and bezoar stones. On the contrary, commercial or industrial products, such as processed food, sugar, salt, porcelain, ornaments, clothing, medicine, hardware have also been brought to the interior areas in the reverse direction. People in tropical rainforests in the Borneo Island have been articulated with the world system by trading these jungle products with people from other areas for centuries (e.g. Chew 1990, Brosius 1995, Wadley 2005). One of these products is the edible bird's nest (Ismail 2002, Chiang 2011).

The indigenous peoples in Borneo do not consume edible bird's nest by themselves. Whereas the edible bird's nest is consumed by locals, including non-Chinese, people in Vietnam and Thailand who have long been influenced by Chinese culture, the indigenous peoples in Borneo do not eat edible bird's nest and only consider it a commodity to sell to Chinese merchants.

Although the Chinese are the main buyers of the edible bird's nest in Sarawak, they do not consume the nests as their daily food because of its high price. The nests are usually consumed on special occasions or used as a valuable present to give to other people. For example, the nests are given as presents to those hospitalized, or those who recently left hospital because the nests are regarded as good for good for health and wellbeing. Moreover, the nests are also used as presents for the elderly on special occasions such as father's day and mother's day. Some restaurants in Sarawak serve edible bird's nest dishes. However, should someone want to eat the edible bird's nests, it is necessary to make a reservation for the dish before visiting the restaurants. Usually the restaurants do not prepare the bird's nests regularly because few customers order it. Even for the local Chinese in Sarawak, the edible bird's nest is regarded as a special dish, not a regular food to consume.

However, the edible bird's nest trade is now booming in Sarawak and many Sarawakians want to enter the market. As mentioned, the edible bird's nest was collected from caves by indigenous peoples in the inner area of Sarawak. However, some indigenous peoples have collected all the nests in the caves even when the swiflets are incubating their eggs and when young birds are not ready to leave their nests. This has resulted in a decrease in the amount of nests available for harvest (e.g. Chiang 2011:426). As the indigenous people essentially own the caves where the edible bird's nest it is difficult to regulate their activities. On the other hand, some Chinese middlemen do not collect the nests, which still have eggs or young birds as they try to collect nests sustainably.

Traditionally, there was a relatively clear separation in the trading roles of the edible bird's nest in Sarawak: indigenous peoples own the caves and collect the nests, local Chinese middlemen mediate the trade, and Mainland China imports and consumes them. The indigenous peoples in Borneo, who collect nests in caves in the jungle, have particular ecological knowledge about the swiftlets and the surrounding environment of the caves where swiftlets build their nests. Typical landscapes that produce the nests are limestone caves in the inland area of the jungle. As local Chinese cannot go to the cave and collect the nests by themselves, they have to rely on the indigenous peoples who have the ecological knowledge and ability to work in this area (Ismail 2002:50, Chiang 2011:426).

Recent change of edible bird's nest trade in Sarawak

Although the traditional trading network provided a relatively clear role for each ethnic group, this network has been changing its nature recently. Since 1990s, a new method for collecting the edible bird's nest has emerged from Indonesia to Sarawak. This new method involves

the construction of buildings, which look like warehouses that have small gates on its walls. By constructing these buildings, people in Sarawak, especially local Chinese, try to attract swiftlets to enter and to build their nests inside the houses. These buildings are referred to as farm houses, or bird houses in English and called *yan wu* (燕屋) in Mandarin. After this method was introduced from Indonesia, it flourished in Sarawak. Thus, the local Chinese in Sarawak do not necessarily go to the indigenous people's village in the remote areas and obtain edible bird' nest any more as they can produce the nest by themselves. This method enables the local Chinese to obtain the nests sustainably and to distribute them in large amounts. Since, this initiative, in 2010, the farm house business has boomed in Sarawak.

In 1980s, the price of the edible bird's nest was relatively cheaper than its current price. Furthermore, during this time its supply was also limited. According to one Chinese businessman in Kuching, the price of a raw bird's nest was about 80 Malaysian Ringgit[2] per 1kg in 1980s. But after introducing the farm house method, the supply of edible bird's nest has increased and so has its price. Nowadays, the price of the raw nest is about 5,000 Malaysia Ringgit per 1kg. At the same time, the demand for the edible bird's nest in Mainland China has also risen; thus, the edible bird's nest trade has become a profitable business in Sarawak. These days many Sarawakians, especially of ethnic Chinese, are participating in this business by constructing farm houses.

In 1990s following the introduction of the farm house business in Sarawak, the people of Sarawak may not have had enough knowledge in terms of farming and building the farm houses and merely constructed them in their own way. The people built simple farm houses in the hope of attracting swiftlets to nest inside. However, these simple farm houses were not successful in attracting the swiftlets. Gradually, the people in Sarawak improved its methods for attracting the swiftlets, to encourage them to build their nests inside the farm houses. In order to attract the swiftlets and to persuade them to enter, it is necessary to have sufficient knowledge of the swiftlet's habits and the ecological environment in which it inhabits. Thus, the people in Sarawak developed their knowledge on the swiftlet's ecology and learnt about methods for attracting them into the farm houses. For example, should a person aim to establish a business in a particular place, they will usually conduct research first by playing a CD, DVD or MP3 recoding of a swiftlet's cry to attract others and to see whether the swiftles will inhabit the farm house before construction begins. Furthermore, people in Sarawak also conduct research regarding the suitable shape of building in which swiftlets prefer to build their nests. The most popular method to attract swiftlets to these buildings is to use recording mediums, which record the cry of swiftlets. The farm house owners play these recoding mediums to attract swiftlets to their buildings. They also use computer to cut-and-paste favorable parts in these recoded medium and edit favorable version. For example, the farm house owners omit swiftlet's cries of fearing enemies and keep other cries which are made during nesting or brooding season. The farm house owners also condition inside of their farm houses by adjusting its temperature and humidity by using thermometers and sprinklers. Such methods are crucial to succeed in the farming business. Competition between farmers means that some farm house owners try to keep their farming know-how a secret. Consequently, some farm house owners hire watchmen or use surveillance cameras to keep strangers out and to prevent other from stealing their know-how. Exterminating swiflte's enemies is another important method for the farm house business. The farm house owners have to drive away or shoot raptors such as hawks and owls. As rats, ants and cockroaches can be enemies for eggs and baby birds, some farm house owners periodically visit their farm houses and exterminate them by using pesticide or rat poison.

Besides such technical know-how, the selection of landscape is also important for the farm house business. Traditionally, edible bird's nest has been collected in limestone caves located in inland area. However, many farm houses in inland area tend to fail to attract swiftlets. According to local people in Sarawak, the most suitable landscapes for farming are peat swan areas, mangrove forests and oil palm plantations in lowland or coastal areas. These landscapes are different from the traditional setting, where indigenous peoples in the inland area harvested nests.

As the selection of appropriate landscapes is crucial for the farm house business, Chinese businessmen make an effort to research suitable land in which they will build their farm houses[3].

As seen above, the farm house business with the new method is not a simple collection of edible bird's nests anymore. The characteristic of farm house business is a more scientific industry which needs knowledge of swifltet's habitat and its natural environment which it inhabits. Those who want to engage in this business have to apply their knowledge to attract swiftlets and to harvest the nests. Although the nest collections in the caves are still practiced by indigenous peoples in various parts of Sarawak, the traditional method of nest collection and farm house business method are quite different. The farm house method requires technological know-how. Some shops now specialize in farm house equipment, such as DVD or MP3 players, loudspeakers, sprinklers, humidifiers, and surveillance cameras. Moreover, books and magazines specializing in farm house business are published in Malaysia now. Business people who have succeeded in the business or scholars who have extensive knowledge of the farming industry are invited to have lectures on the farming industry in seminars with high reward. It is possible to say that the farm house business has become one of the centers of public attention for business in contemporary Malaysia, especially in Sarawak.

The farm house business has an impact not only on local business trend, but also on the ethnic relationship in Sarawak on which traditional nest's trade have been based: the indigenous peoples own the caves and collect the nests, while local Chinese mediate in the process and distribution of the nests, and Mainland China import and consume the nests. The new method, which requires scientific ecological knowledge, is changing the traditional ethnic relationship and the commodity chain for the edible bird's nest in Sarawak. Although traditionally, the indigenous people collected the nests from the caves, the farm house method for collecting the edible bird's nest has been flourishing in Sarawak. The expansion of the farm house business in Sarawak resulted in an increase in the number of edible bird's nest. Since the Chinese in Sarawak established the farming business, it is no longer necessary for them to rely on the indigenous people to obtain the nests from the caves in the jungle. The changing pattern of bird's nest trade occurred by the introduction of new method, which has transformed the local Chinese way of utilizing its natural environment and the ethnic relationship on which a traditional trading network was based upon. It is possible to say that the Chinese in Sarawak have occupied the edible bird's nest trade 'from upriver to downriver' since the introduction of the farm house method.

Conclusion

The edible bird's nest trade is not a new business in contemporary Sarawak. The farm house business can be understood as a new way to utilize the natural environment, the multiple ethnic relationships, and commodity chains in this area. As mentioned in this paper, the traditional ethnic relationship and the commodity chain can be summarized as follow: the indigenous peoples own the caves and collect nests, local Chinese middlemen mediate and distribute them, and people in Mainland China or Hong Kong import and consume them. In reality there exist more actors in the trade and the relationship is more complex, thus, the edible bird's nest trade network should be described as "commodity web", not a "commodity chain" (cf. Chew 2013:3).

The peculiarity of the new method is that it needs more scientific knowledge rather than traditional knowledge, which is practiced by the indigenous people. Although it is questionable whether the indigenous in Sarawak have sustainable knowledge of nest collection[4], they know about and are able to work in the natural environment in which the swiftlets build their nests. Before the introduction of this new method, the Chinese traders relied on the indigenous people to obtain the nests from the jungle (Chiang 2011:426). The introduction of this new method enables the Chinese to obtain edible bird's nests without neither going to the caves in the jungle nor asking the indigenous to go into the caves.

The importance of the landscape for nest collection has also changed. Peat swamp areas and mangrove forests are believed to be more favorable for constructing the farm houses, which are geographically different from the lime stone caves in inland areas, where traditional nest collection

was conducted. Chinese farm house owners are probing for more scientific knowledge of the swiftlet's ecology and are using technological equipment to succeed in the farming industry. Although traditional system for harvesting bird's nest continues to exist, the amount of house nests is increasing in contemporary Sarawak[5].

The characteristics of the edible bird's nest trade in contemporary Sarawak can be summarized as follows: 'from traditional ecological knowledge and practice to scientific ecological knowledge and practices', or 'from caves to farm houses'. Of course the contemporary structure of edible bird's nest in Sarawak has many actors and networks. Thus, it is not possible to over simplify its nature. However, the introduction of the new method for nest collection is transforming the ethnic relationship and environmental knowledge of the people in high-biomass society in Sarawak.

In contemporary Sarawak, the characteristics of edible bird's nest can be understood as not only being rare and expensive delicacies in Chinese food culture, but also as an object which has a complex system of meaning and values. The introduction of the farm house method based upon scientific knowledge, not folk knowledge, is transforming the commodity web, environmental knowledge, and the ethnic relationship in Sarawak. The Chinese food culture, new scientific knowledge and technique plays an important role in reorganizing the trade network which is based on an ethnic relationship and environmental knowledge of the people in this area[6].

Photo 1: Packaged edible bird's nests sold in a shop in Kuching. The top bird's nest is priced at RM 428, while the lower bird's nest is RM 598. (Photo by T. Ichikawa)

Photo 2: Edible bird's nest dessert sold in a restaurant in Kuching. The price of one cup of this dessert is RM 50. (Photo by T. Ichikawa)

Photo 3: A cave where swiftlets build their nests inside, in Kakus. (Photo by T. Ichikawa)

Photo 4: Swiftlets' nests built on a wall of a cave. (Photo by T. Ichikawa)

Photo 5: A farm house in Sematan. (Photo by T.Ichikawa)

Photo 6: A farm house on a building. The upper section of this building was renovated to attract swiftlets. (Photo by T. Ichikawa)

Photo 10: Various types of farm houses. The entrance of this farm house resembles a cave. In Asa Jaya. (Photo by T. Ichikawa)

Photo 7: A security monitor in a farm house. (Photo by T. Ichikawa)

Photo 11: Unprocessed black nests took from a cave.. (Photo by T. Ichikawa)

Photo 8: Equipment used to play recorded swiftlets' cry to attract them to the farm house. (Photo by T. Ichikawa)

Photo 12: Local female workers processing edible bird's nests in a factory in Kuching. (Photo by T. Ichikawa)

Photo 9: Various types of farm houses. The appearance of this farm house is similar to a longhouse. In Asa Jaya. (Photo by T. Ichikawa)

Photo 13: Edible bird's nests shops in Sheung Wan, Hong Kong Island. (Photo by T. Ichikawa)

Photo 14: Edible bird's nests sold in a shop at Sheung Wan, Hong Kong Island. (Photo by T. Ichikawa)

References

Akamine, Jun（赤嶺淳）
2010『ナマコを歩く：現場から考える生物多様性と文化多様性』新曜社。（*Walking with Trepang: Considering Bio-diversity and Cultural-diversity from the Field*. Shin'yo-sha.）

Arunotai, Narumon
2006 Moken Traditional Knowledge: An Unrecognized Form of Natural Resources Management and Conservation. *International Social Science Journal*. 58(187):139-150.

Brettell, Caroline
2003 *Anthropology and Migration: Essays on Transnationalism, Ethnicity, and Identity*. Altamira Press.

Brosius, Peter
1995 Bornean Forest Trade in Historical and Regional Perspective: The Case of Penan Hunter-Gatherers of Sarawak. In J. Fox (ed.) *Society and Non-Timber Forest Products in Tropical Asia*. Honolulu: East-West Center. (Occasional Papers, Environment Series, 19) pp.13-26.

Chew, Daniel
1990 *Chinese Pioneers on the Sarawak Frontier, 1841-1941*. Singapore: Oxford University Press.
2013 The Edible Bird's Nest Commodity Chain between Sarawak and East Asia. *Equatorial Biomass Society* 7:1-6

Chiang, Bien
2011 Market Price, Labor Input, and Relation of Production in Sarawak's Edible Bird's Nest Trade. In Eric Tagliacozzo & Wen-Chin Chang (eds.) 2011 *Chinese Circulation: Capital, Commodities and Networks in Southeast Asia*. Durham and London: Duke University Press. pp. 407-431.

Collins, Jane L., et al (eds.)
2000 *Commodities and Globalization: Anthropological Perspectives*. Rowman & Littlefield Pub Inc.

Geertz, Clifford
1973 *The interpretation of cultures*. New York: Basic Books.

Ismail, Mohamed Yusoff
2002 Sacred Food from the Ancestors: Edible Bird Next Harvesting among the Idahan. In David Y. H. Wu & Sidney C. H. Cheung (eds.) *The Globalization of Chinese Food*. Londogn & New York: RoutledgeCruzon. pp.43-55.

Jordan, David
2004 Globalization and Bird's Nest Soup. *International Development Project Review*. 26 (1):97-110.

Kearney, Michael
2004 *Changing Fields of Anthropology: From Local to Global*. Rowman & Littlefield Pubication.

Lewellen, Ted
2002 *The Anthropology of Globalization: Cultural Anthropology Enters the 21st Century*. Praeger Publication.

Lim Chan Koon & Earl of Cranbrook
2002 *Swiftlets of Borneo: Builders of Edible Nests*. Natural History Publications

Marcone, Massimo R.
2005 Characterization of the Edible Bird's Nest the "Caviar of the East". *Food Research International* 38(2005):1125-1134.

Suzuki, Haruka（鈴木遥）
2013「ツバメの巣ビジネス成功の秘訣：ツバメを呼び寄せるハウスの建築より」『熱帯バイオマス社会』第 12 号、7 － 10 頁。(Method of Succeed in Edible Bird's Nest Business: The Construction to Attract Swiftlets. *Equatorial Biomass Society (Japanese Version)* 12:7-10.)

Voon Ping Kiong
2012 Bold Entrepreneurs and Uncommon Enterprises: The Malaysian Chinese Experience. *Malaysian Journal of Chinese Studies* 1:101-118.

Wadley, Reed L. (ed.)
2005 *Histories of the Borneo Environment: Economic, Political and Social Dimensions of Change and Continuity*. Leiden: KITLV Press.

West, Paige
2012 *From Modern Production to Imagined Primitive: The Social World of Coffee from Papua New Guinea*. Duke University Press.

Zhuan Ye Yan Wo Shang (ed.)（專業燕窩商 編著）
2011『燕窩大全』香港中藥聯商会有限公司（*Complete Work of Edible Bird's Nest*. Hong Kong Union of Chinese Medicine Shops Limited Company.）

Notes

[1] For example in Thailand seafarer people, such as Moken, have been engaged in collecting edible bird's nest in caves off seashore cliffs and for selling them to other

[2] 1 Malaysia Ringgit is equivalent to about 3.3dollars in 2013, while it was about 10 US dollars during 1980s.

[3] For example Suzuki reports the construction of a farm house by mentioning her experience to build it with other scholars and local people (Suzuki 2013).

[4] Some scholars reported about sustainable nest collection practiced by indigenous peoples and Chinese traders in Borneo Island (Ismail 2002, Chew 2013). However, the overharvesting of nests in caves sometimes results in a decrease of the swiflet's population in some areas (Chiang 2011).

[5] However, the government of the People's Republic of China (PRC) restricted to import Malaysian edible bird's nests into their country in 2011 by declaring that the nests contained over the standard level of nitride. Since then it became difficult to export the Malaysian edible bird's nest to the PRC and Hong Kong and they came down in price. This incident is still influencing the edible bird's nest trade in Malaysia and the author is planning further research about an ongoing transforming process of the trade in this region.

[6] This paper is based on ethnographical research in Sarawak conducted continuously from 2010 to 2014 and financially supported by Grant-in-Aid for Scientific Research (S) and Grant-in-Aid for Young Scientists (B). Fieldwork was conducted in several areas in Sarawak especially in Kemena-Jelalong riverine system, and some cities in Sarawak, such as Kuching, Sematan, Bintulu and Miri. The research was also conducted in Hong Kong which is one of the main markets for edible bird's nest. The fieldwork was conducted with Dr. Daniel Chew, Dr. Motoko Fujita, and Ms. Yu Xin. I am deeply grateful for their support. I also express my sincere gratitude to Dr. Noboru Ishikawa, Dr. Ryoji Soda, Ms. Sonoko Tanaka and Mr. Hideki Nakane for their advice and support during my research. However, the author has full responsibility for this report.

Budget Single Story Bird House

Logie Seman (Ex-Assistant Forest Officer
Forest Department Sarawak)

Introduction

A study was conducted of bird houses that are used to lure the swiftlet 'burung walet'. The purpose of the study was to design a practical and innovative bird house that would provide better opportunities for rural or middle class people to participate in swiftlet farming and the sale of white edible bird's nests, which is considered a lucrative industry.

In Sarawak, wealthy people or companies initiated the construction of large bird houses, three to four stories high, which might cost between RM 300,000 to RM 400,000. An alternative is to build a single story bird house inclusive of infrastructure and electrical appliances for approximately RM 35,000, which is more affordable to enthusiasts. Moreover, less risk is anticipated against capital investment. Numerous small bird houses have proven to be strategically viable in terms of turnover and maintenance relative to the capital invested, and because of good expertise. Competition with other bird houses is a minor issue as long as the bird house is located in a primary flying path with a large supply of insects for the swiftlets to feed on. Thus, it is different from the concept of competition among star portfolio companies.

Indonesia and Thailand started swiftlet farming approximately 100 and 80 years ago, respectively. In West Malaysia, although it started slightly more than 30 years ago, large-scale businesses gathered momentum after the Asian Economic Crisis of 1997–1998; a period when many businesses experienced hard times and many of them closed down throughout the country. Another factor for the momentum was the great migration of swiftlets to Malaysia following the vast forest fires in Indonesia in 1997. The bird house industry in Sarawak also started during that period.

The main buyers of edible bird's nests are China, Hong Kong, Taiwan, and Singapore (Merikan 2007). Prior to a decrease in price in the middle of 2011 to RM 1,500 per kilogram of unprocessed edible bird's nest, the price per kilogram was between RM 4,500 to RM 6,000 depending on the quality. A kilogram of processed white edible bird's nest could obtain a retail price of RM 15,000 to RM 25,000 in Hong Kong and China. Consumption of edible bird's nests is considered a status symbol, they are attributed with health giving properties, and are used as a base mineral in the production of herbal and vitamin supplements (Merikan 2007). In Sarawak, few people consume the product, with the exception of the rich Chinese. Personally, I have consumed the product twice in my life; once sponsored by a Chinese friend, and another time sponsored by Dr. Fujita. One small bowl of the soup cost approximately RM 60 in Kuching.

Conditions of bird house construction

The swiftlets start to forage outside after dawn or as early as 5:30 am to 6:30 am, subject to good weather. They return at approximately 15:30 in the afternoon after foraging within a radius of approximately 25 kilometers, and enter the bird house before dusk. They have excellent flying agility. For this reason, they are able to mate in the sky and keep a ball of insects (bolus) in their mouths for the chicks inside the bird house.

According to Budiman (2010), there are three flying paths, the primary, secondary, and deviation paths. In the primary path, a big flock of swifts glide together from the same location. The most important sites for building bird houses are along swift foraging locations such as in coastal areas with mangrove forest, vast tracts of paddy fields, above secondary forests, and reforestation areas (except oil palm plantations), where there are plenty of insects. While foraging, they fly between 20 to 50 meters above the ground.

The secondary path is used by a smaller flock of swiftlets in pursuit of foraging locations, but it is not very far from the primary path. The deviation path is not a fixed gliding location. A very small number of swifts use the deviation path for two reasons. Firstly, when they are in pursuit of aerial insects in another spatial zone, and secondly, to deviate and keep safe from predators such as eagles and large bats. The deviation path is not suitable for locating a bird house.

The site for a bird house is very important. In Sarawak, most successful bird houses are located in coastal areas such as between Asa Jaya to Sebuyau/Lingga/Meludom, and between Pusa/Kabong to Sarikei/Sibu and Matu Daro. Other good coastal areas are between Mukah and Bintulu, and

between Similajau and Bekenu/Miri. Before erecting a bird house, the location suitability must be determined by playing the swift mating sound approximately between 6:30 to 9:00 in the morning and 16:00 to 19:00 in the afternoon at least five times a week. The location is suitable if at least fifty swiftlets react to the echolocation by gliding and hovering to the mating sound, flying at approximately 10 meters above the ground (Salekat 2010).

Zero degree latitude falls exactly at Pontianak, West Kalimantan, Indonesia. Sarawak is slightly above the equator. Hence, to reduce the heat from the sun, the length of the bird house must be oriented along the east to west direction with its "monkey house " and entrance facing the north. More heat is directed onto the southern side than the northern side. The following are a list of guidelines for reducing the heat from the external environment:

a. The roof must not be fixed to the upper beams of the building, but fixed approximately 0.5 meters above the beams, and approximately 2.0 meters above the beams at the apex of the roof. This open space is to accommodate radial ventilation, which also functions as an insulator to the building structure.

b. Thin aluminum roofing is effective, because it reflects heat from the outer surface, but it must be reinforced with an air duct insulator from the inside.

c. The roof of the "monkey house" should have approximately a 30 degree angle in order to reduce the afternoon heat from the west.

d. The drain should be approximately 0.3 meters wide × 0.45 meters deep and must touch the ground wall and the foundation by filling it with rain water. At the lower end of the drain, a faucet is installed to accommodate monthly cleaning. The main reasons to construct a drain in this manner are to create a cooling system and to avoid predators such as geckos, ants, and rats from entering the bird house.

e. According to Mulia (2009), the entrance should be 0.4 meters × 1.0 meter, but after bird's nest production starts it should be narrowed to 0.15 meters × 1.0 meter. The reason is to reduce excess light and heat besides avoiding predators such as owls and bats. It must be located approximately 40 cm below the roof.

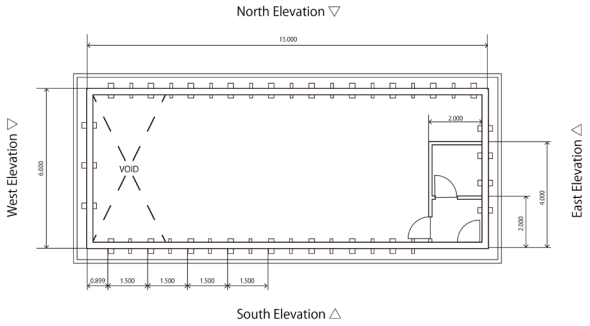


Figure 1: An example of bird house layout plan

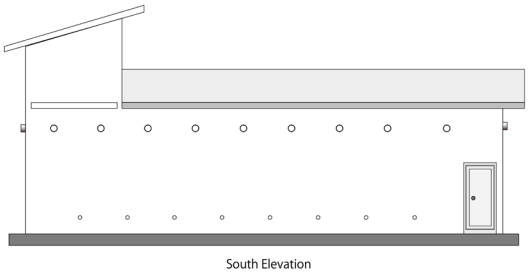


Figure 2: An example of bird house (South elevation)

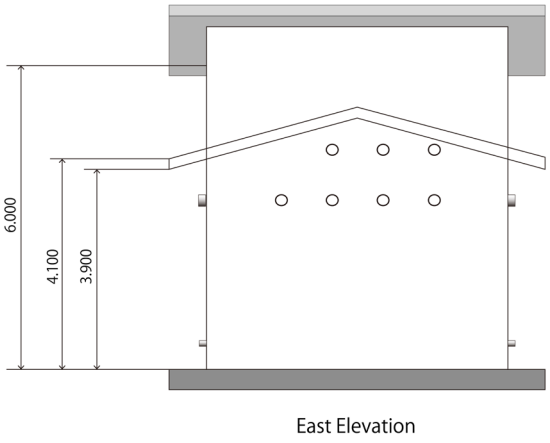


Figure 3: An example of bird house (East elevation)

The temperature inside the bird house must be between 26 to 29 °C with the humidity between 75%–95%. The ideal light intensity is around 3.0 lux (Mulia 2009, 2010). The roving area must not be smaller than 3.0 meters × 3.0 meters so that the young chicks can safely learn to fly inside. Other ventilation to maintain conductive humidity should be set using PVC pipes of 0.6 to 1.2 meters length installed 1.0 to 1.5 meters apart along each wall1 meter above the ground. Another row of louvres should be put approximately 3 meters above the lower row. The floor and walls must be concrete. To enhance

humidity, several buckets or jars filled with water are placed on the floor.

The floor must be showered with water twice a week. The ledges are best made of Meranti (Shorea spp.) timber approximately 2 cm × 15 cm with two shallow grooves horizontally, and should be placed on all sides of the bird house. The distance between the ledges is normally between 0.6 to 0.7 meters. A bird house should have double doors, with the main door facing south to reduce disturbance to the bird entrance facing north. For mating chirps, the main tweeter capable of echolocation should be placed at an angle of 60°above the entrance. Speakers with various tweeters for chick chirps are placed inside the "monkey house," whereas those for breeding chirps should be placed inside the nesting area.

A compact disc (CD) player producing swiftlet chirp sounds are used to attract swiftlets as well as to increase the population. A USB memory or memory card is recommended for storing the sounds. Stacks of amplifiers are needed to strengthen the birds chirping sound. The chirping sound must ideally be played between 6:00 to 10:00 in the morning and between 15:30 to 19:30 in the afternoon. Electrical appliances are available for sale in major towns of Sarawak, namely, Kuching, Sibu, Bintulu, and Miri.

License of bird house construction

Local markets for selling unprocessed white nests are never problematic. For example, in Pusa and Kabong areas, the buyers (towkey) from Sibu or Sarikei are willing to buy the product off-site. In major towns, the buyers are willing to purchase even bulk quantity, {without confirming if the suppliers have licenses issued by the Forest Department. In some places, such as Bintulu and Sibu, some people tend to manipulate the prices by forcing the suppliers to sell to them.

No license shall be given to bird houses located in shop lots or residential areas. The conditions for licenses to be approved are as follows:

a. Agricultural land not for specific purposes such as rice and rubber.

b. It must be a valid and un-collateral entity.

c. The land in question must be at least 15 kilometers away from major towns or cities; five kilometers away from small towns/bazars (e.g., Lingga, Meludam, Pandan, etc.), and at least one kilometer away from a longhouse or village.

Five sets of applications, including working papers, must be submitted to the Forest Department for processing. Copies are issued to the Sarawak Planning Authority (SPA), the Lands and Survey Department, the Health Department, and the Natural Resources and Environment Board (NREB). The SPA will initially arrange for an inspection by the four Departments, and the Forest Department will compile a respective report to the SPA, who will decide whether the application is to be approved or not. If approved, the applicant will be notified to collect the license upon payment of RM 300. Annual license renewal is also for RM 300.

It is unclear how the SPA selects successful applications. The members consist of the State Secretary, with two other VIPs, headed by the Chief Minister as the chairman. To date, the Forest Department has issued about 5,000 bird house licenses in Sarawak. According to a Forest Department officer, almost 3,000 applications have currently been submitted but approximately only 400 licenses have been issued.

I recommend a budget single story house, with a height of 4.0 meters for the breeding area and with a "monkey house" of up to 6.0 to 7.0 meters. The width and length are 6 meters and 15 meters, respectively. The estimated cost is RM 35,000 including electrical appliances. Unfortunately, the price for the unprocessed white nests still remains approximately RM 1,500/kg, since the price decreased in mid-2011. With a price of approximately RM 3,000/kg, the recommended bird house would be economically viable.

References

Budiman, A. et al. 2010. *Panduan bengkap wallet*. Jakarta: Perpustakaan Nasional.

Merikan, H. S. 2007. *Abstract of the 2007 Malaysian swiftlet farming industry report*. Penang: SMI Association of Penang.

Mulia, H. 2009. *Buku pinter budi daya bisnis walet*. Jakarta: PT Agro Media Pustaka.

Mulia, H. 2010. *Cara jitu memikat walet*. Jakarta: PT Agro Media Pustaka.

Salekat, H. N. 2010. *Membangun rumah walet hemat biaya*. Jakarta: PT Agro Media Pustaka.

Notes

[1] "Monkey house" is coined by Indonesians as "rumah munyit," where the swiftlets are roving inside where a small entrance is placed. This is also called roving area.

Medium to Large Ground-dwelling Mammals around Settlement Areas in Bintulu Division, Sarawak

Hiromitsu Samejima (Center for Southeast Asian Studies, Kyoto University
Jason Hon (WWF Malaysia)

Introduction

Borneo Island is a global biodiversity hotspot, with approximately 221 species of land mammals recorded (Payne et al. 2005). Wild animals are also important sources of protein for the local communities. Medium- to large-sized mammals, especially bearded pig *Sus barbatus* and sambar deer *Rusa unicolor*, are commonly hunted and consumed by inland communities. However, human activities such as shifting agriculture, commercial logging, and development of oil palm or industrial tree plantations have led to the degradation and disappearance of natural forests. Forest degradation and deforestation reduce the area and quality of habitat for many mammalian species, resulting in a cascading effect on their populations and threatening food security of inland communities. Although some mammalian species have been reported to inhabit secondary forests (Meijaard et al. 2005, McShea et al. 2009, Hon et al. 2012), the adaptability of specific species is not well known.

Some authors have asserted that hunting activities by local communities are the main factor responsible for the decrease in diversity and abundance of middle- to large-sized mammals in Borneo, especially Sarawak, whereby the forest has become an "empty forest" (Bennett et al. 2000, Harrison 2011). However, the magnitude of hunting pressure on animal populations has not been well evaluated. Several studies have applied a line transect census, recording the frequencies of animals encountered by researchers along line transects established around villages (Bennett et al. 2000, Parry et al. 2007). However, mammals can shift their activity times where hunting pressure is high or competitive species are present. Thus, a decrease in the encounter frequency around human settlements may not be due to population decrease but rather due to time shift of activity patterns. Some reports also have asserted that the population decline of mammals in a national park is caused by intensive hunting (Harrison 2011). However, this decline may also result from loss of habitat types (such as swamp forest) around the national park that are used by animals when food resources inside the park are scarce. The density of game species and hunting activity around villages should be evaluated quantitatively to test the "empty forest" hypothesis.

To evaluate the impact of landscape change and hunting activity on medium- to large-sized mammals in forests surrounding the villages, we evaluated the hunting activity of local communities and conducted camera trapping around their villages in Bintulu Division, Sarawak.

Materials and Methods

Study site

We selected four settlement areas in Bintulu, Sarawak, Malaysia: Sujan, Lavang, Jelalong, and Ulu Anap (Fig. 1). In each area, we selected a village as the focal point and drew an 8 × 8 km square with the focal point as the centroid of the square. Two to five villages were included inside each square (Table 1).

One of the sites, Sujan, encompasses two distinct land uses. Because the southern part of Sujan is a part of a large oil palm plantation, we divided the Sujan area into two study areas: Sujan plantation and Sujan village. The Sujan village area is relatively flat, comprising a mosaic landscape of secondary forests formed after shifting agricultural activities and small-scale oil palm plantations established by the villagers (Hon 2014). A dipterocarp-dominated natural forest is rare in this area.

The areas in Lavang and Jelalong are mostly covered by secondary forests, owing to the high concentrations of settlements, with pockets of natural dipterocarp forests situated in the further reaches of the interiors. In general, the vegetation around Lavang comprises oil palms and acacia trees owing

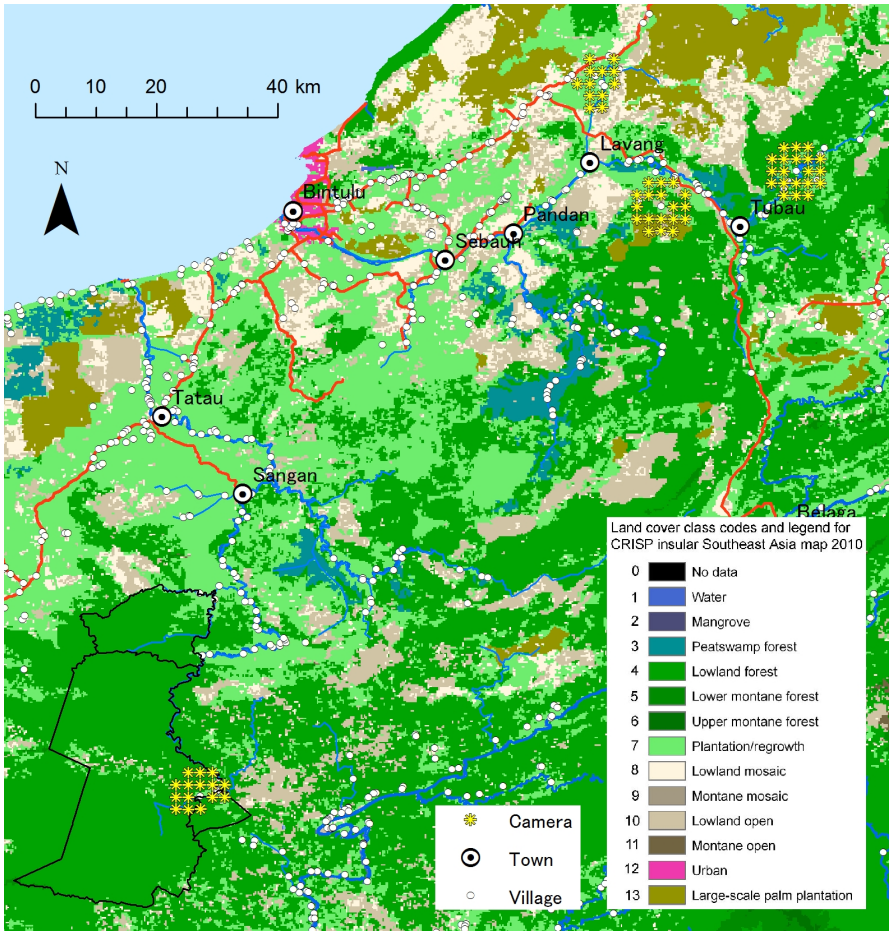


Figure 1: Four study areas and the Anap Sustainable Development Unit (ASDU)
Source of the vegetation map and classification is Mittinen et al. (2012).

to the presence of large-scale oil palm and industrial tree plantations. The Jelalong area is surrounded by natural forests predominantly comprising dipterocarps. In the Lavang area, there are also pockets of forests containing dipterocarps, but these are isolated in comparison to the more contiguous and more widely extended forests in the Jelalong area. The Lavang and Jelalong rivers run through the respective areas, creating swamp forests along the rivers that become submerged several times a year during high-rainfall months.

Ulu Anap lies in the upper reaches of the Anap River, which flows through a logging concession area. Under a holistic management system called the Anap Sustainable Management Unit (ASDU), the area is mostly managed by a private company carrying out selective logging. Most of the area is covered by the dipterocarp-dominated forest, with narrow secondary forests created by shifting agriculture along the main rivers. The area is relatively steep and there are no apparent large swamp forests here.

Community Survey Interview for Hunting Activity

In each study area, we visited all communities in June 2014 to investigate the hunting intensity. We conducted interviews to record the numbers of total households, households that usually stay in the village, and active hunters. We define an “active hunter” as a person who on average goes to hunt more than once a month. Some of the villages visited were empty, the probable reason being that all occupants had moved to towns for most of the time or had left to work in their oil palm plantations situated along main roads outside of the study areas. Villages with no residents present during our visit were excluded from our analysis.

Camera-trapping

In each study area, we generated sampling points in a reticular pattern with interval of 2-km originating from the centroid (location of the focal village) in the 8 x 8 km study area. We determined the coordinates of these sampling points and recorded them in handheld GPS units. We traveled to each sampling point using the GPS and installed an automatic infrared sensor digital camera (Bushnell Trophy Cam), also known as a camera trap. Some of the sampling points were inadvertently located inside areas that were being prepared for establishing new oil palm plantations, acacia tree plantations, or other forms of development. As these areas were not safe or suitable for setting up camera traps, we excluded them.

At each sampling point, we attached a camera onto a sturdy tree at a height of 50–100 cm above ground. This position generated a field of view of approximately 7.0 ± 3.6 m^2 (mean ± SD). We set the camera to record in video mode for a duration of 30 seconds upon triggering. The sampling period was from June 2013 to July 2014[1], with one visits made in this interval to change the batteries of the camera traps and to download the data.

For data management, we sorted the videos according to date and time, and identified the animal species and number captured per video based on Payne et al. (2005), Myers (2009), and Phillipps and Phillipps (2009). Only medium- to large-sized mammals and birds were identified and tabulated. Smaller species such as rats, squirrels, tree shrews, and bats were excluded.

To calculate the index of abundance, we used the mean trapping rate (MTR), which is the number of records per 100 camera working days. We calculated the MTR of each species at each study area. The same species recorded within a 30-min period were treated as one record. We tested the differences of MTR among the five study areas by bootstrapping. In comparing each pair of areas, we randomly resampled the camera sampling points to allow redundancy, calculated the MTR of the new set of sampling points, and compared the differences in MTR between the two study areas. We repeated the process 100 times and tested the distribution of the difference.

Camera-trapping in the Anap Sustainable Development Unit

Prior to this study, we had conducted another study using similar approaches in the ASDU from May 2011 to June 2013 (Samejima and Hon 2014). A total of eight sampling plots were established, each measuring 1 km in diameter, and eight cameras were set at random sampling points inside each plot giving a total of 64 sampling points. The total sampling effort was 41,467 camera-trap days. Inside the ASDU, hunting is minimal, as it is restricted by the management company. The eight plots were far (at least 4 km apart) from the nearest villages. Thus, the impact of hunting on animal communities inside these eight plots was considered low. We generated MTRs from camera traps in these eight plots for comparison with the other five study areas.

Results

Community Survey

In total, we surveyed 14 villages and a total of 377 households. Of this number, 231 (61.3%) households had some people present in the village. Of the 231 households, 39 (16.9%) had active hunters, mostly comprising only one person per household. Most villagers who do not hunt buy wild meat from these active hunters in their own village or from other neighboring villages.

Camera-trapping

In the five settlement areas, we recorded a total of 2,267 videos comprising mammals and terrestrial birds. A total of 25 species of mammals were identified from 2,134 records and four terrestrial bird species from 133 records. The total effort was 16,253 camera-trap days. Five species not recorded in these five settlement areas were recorded at ASDU: Malay weasel (*Mustela nudipes*), otter civet (*Cynogale bennettii*), Sunda clouded leopard (*Neofelis diardi*), marbled cat (*Pardofelis marmorata*), and southern red muntjac (*Muntiacus muntjak*).

Table 1: List of study areas

Name	Main vegetation type	Number of communities	Number of households			Number of camera set points	Total camera-trap days
			Total	Stay	With active hunters		
Sujan plantation	Oil palm plantaion	0				9	2267
Sujan village	Secondary forests mixed with oil palm	2	48	46	8	8	1842
Lavang	Secondary forests surrounded by oil palm plantations	4	185	100	15	18	2260
Jelalong	Secondary forest + logged natural forest	3	69	38	8	11	4781
Ulu Anap	Seconday forest + logged natural forest	5	75	47	8	15	5103

Table 2: Species recorded by camera traps in the five study areas

Class	Order	Scientific name	Common name	Number of images	Threated status
Mammalia	Erinaceomorpha	*Echinosorex gymnura*	moon rat	14	
	Pholidota	*Manis javanica*	Sunda pangolin	13	EN
	Primates	*Macaca fascicularis*	long-tailed macaque	85	
		Macaca nemestrina	southern pig-tailed macaque	683	VU
	Rodentia	*Hystrix brachyura*	common porcupine	58	
		Trichys fasciculata	long-tailed porcupine	89	
		Hystrix crassispinis	thick-spined porcupine	91	
	Carnivora	*Helarctos malayanus*	sun bear	34	VU
		Martes flavigula	yellow-throated marten	3	
		Viverra tangalunga	Malay civet	44	
		Arctictis binturong	binturong	1	VU
		Arctogalidia trivirgata	small-toothed palm civet	3	
		Paguma larvata	masked palm civet	1	
		Paradoxurus hermaphroditus	common palm civet	12	
		Hemigalus derbyanus	banded civet	58	VU
		Prionodon linsang	banded linsang	1	
		Herpestes semitorquatus	collared mongoose	3	
		Herpestes brachyurus	short-tailed mongoose	15	
		Prionailurus bengalensis	leopard cat	48	
		Catopuma badia	Borneo bay cat	1	EN
	Artiodactyla	*Sus barbatus*	bearded pig	437	
		Tragulus kanchil	lesser mousedeer	125	
		Tragulus napu	greater mousedeer	64	
		Muntiacus atherodes	Bornean yellow muntjac	164	
		Rusa unicolor	sambar	87	VU
Aves	Galliformes	*Rollulus rouloul*	crested partridge	6	
		Lophura ignita	crested fireback	61	
		Lophura bulweri	Bulwer's pheasant	12	VU
		Argusianus argus	great argus	54	

Among the 29 species of mammals and terrestrial birds in the five settlement areas and the ASDU, 20 showed obvious patterns of MTR. We categorize the patterns of MTR into seven types.

1) Abundant in oil palm plantation

- *Prionailurus bengalensis* (leopard cat)

2) More abundant in more degraded forest areas, such as Sujan village, Lavang, and Jelalong, than in the ASDU

- *Hystrix crassispinis* (thick-spined porcupine)
- *Macaca fascicularis* (long-tailed macaque)
- *Tragulus napu* (greater mousedeer)
- *Tragulus kanchil* (lesser mousedeer)
- *Rusa unicolor* (sambar)
- *Lophura ignita* (crested fireback)

3) Not significantly different among forested areas (Sujan village, Lavang, Jelalong, Ulu Anap, and ASDU)

- *Macaca nemestrina* (southern pig-tailed macaque)
- *Sus barbatus* (bearded pig)

4) More abundant in intact forest area

4-1) Abundant in Lavang, Jelalong, Ulu Anap and ASDU

- *Rollulus rouloul* (crested partridge)
- *Argusianus argus* (great argus)

4-2) Abundant in Jelalong, Ulu Anap and ASDU

- *Martes flavigula* (yellow-throated marten)
- *Paradoxurus hermaphroditus* (common palm civet)
- *Hemigalus derbyanus* (banded civet)

4-3) Abundant in Ulu Anap and ASDU but also observed in degraded forest areas

- *Helarctos malayanus* (sun bear)
- *Muntiacus atherodes* (Bornean yellow muntjac)

4-4) Abundant only in Ulu Anap and ASDU

- *Lophura bulweri* (Bulwer's pheasant)
- *Viverra tangalunga* (Malay civet)
- *Manis javanica* (Sunda pangolin)

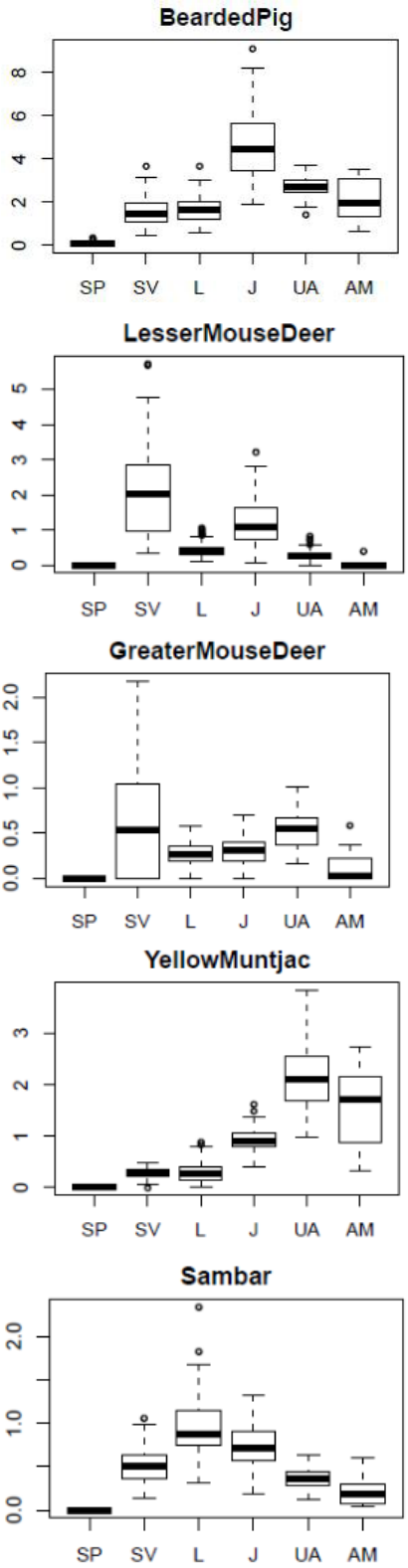


Figure 1: Mean trapping rate of major game species in SP: Sujan plantation, SV: Sujan village, L: Lavang, J: Jelalong, UA: Ulu Anap, and AM: Anap Sustainable Development Unit.
The boxplots in SP, SV, L, J, and UA show the distribution of MTR with 100 bootstrap replications. The boxplot in ASDU shows the distribution of MTR in the eight sampling plots.

Discussion

This is one of the first studies to investigate medium to small ground-dwelling mammals and birds in degraded habitats in the tropical region (Azlan J. 2006). There are obvious differences of adaptability to human-induced landscape change among the animal species. Most species did not recorded in oil palm plantation although leopard cats are moderately abundant. Malay civet and Sunda pangolin are abundant in natural forests dominated by dipterocarps (for example, in the ASDU), but are very rare in degraded areas, such as Sujan village, Lavang, and Jelalong.

The species recorded only in intact forest areas (only in ASDU or mostly in ASDU, Ulu Anap, and Jelalong) are considered to be species vulnerable to forest disturbances and degradation. Yellow muntjac and small carnivores, such as Malay civet and banded civet, are also known to be vulnerable to intensive logging activity (Samejima et al. 2012), and our results from this study support this argument. For these vulnerable species, it is important to maintain the cover of natural forests. Logging concession areas that practice sustainable forest management, as shown by this study, can play vital roles in providing the essential habitats for these species.

It is notable that six species of wildlife, thick-spined porcupine, long-tailed macaque, greater mousedeer, lesser mousedeer, sambar, and crested fireback, were more abundant in village areas than in the natural dipterocarp forest in the ASDU. We consider two nonexclusive hypotheses to explain the results. The first hypothesis is that these species prefer a degraded habitat to intact forest. Sambar has been known to prefer foraging on young shoots of trees and grass on the forest floor, which are more abundant in degraded forests where the canopy is more open. The productivity of trees in degraded forests is higher than that in mature natural forest, so that fruits and young leaves are also more abundant. Such conditions are favorable to generalist species such as long-tailed macaque. The second hypothesis is that these species prefer a swamp forest. Crested fireback and mousedeer are known to be more abundant in swamp forests along rivers (Samejima et al. 2012, Samejima and Ong 2012). The soil along rivers may be more fertile and has become their preferred habitat. In addition, the high MTR recorded for long-tailed macaque may be the result of restricted mobility in the canopy caused by the lower cohesiveness of forest canopies in more degraded areas. When this occurs, tree-climbing species and arboreal species such as long-tailed macaque may have to descend to the ground more often to move between neighboring trees.

In contrast, the MTR of bearded pig and pig-tailed macaque were not different among the four forested areas of Sujan village, Lavang, Jelalong, and Ulu Anap and ASDU. Bearded pig and pig-tailed macaque feed on a wide range of food resources and can adapt to a wide variety of habitats. Some of the local people mentioned what they believe to be an increasing population density of bearded pigs in areas where there are many oil palm plantations. We treat their statement with caution and believe that hunting could have become easier in such habitats, leading them to perceive that the bearded pig population had increased. Leopard cat was the only species that was abundant in oil palm plantations. We speculate that their abundance is due to the availability of food resources, especially rats inside oil palm plantations.

Considering the hunting pressure on animals, the MTRs of major game species such as bearded pig, sambar, and mousedeer were not obviously low but rather abundant in the village areas. Although there are sizable numbers of active hunters in these areas, hunting pressure may not have reached such a high level that the population of major game species is affected. For this reason, we question the "empty hypothesis," whereby hunting pressure can become so intensive as to reduce wildlife populations. However, the low MTR for Sunda pangolin in the village area may actually be the result of high poaching pressure, largely due to the high price paid for this animal and the high demand created by the black market. The scarcity of small carnivores in the village areas may

be also caused by hunting activity, although they are not the main target species for hunting. More study is necessary to confirm their vulnerability to hunting pressure and the reason (for example, low productivity or Allee effect).

Acknowledgment

We thank the management of Zedtee sdn bhd, Wong Ing Yung and his staff in the ASDU, and Aziz and George Mike of Keresa Oil Palm Plantation for permission and ground support for conducting this study. We also thank the villagers of Rh. Majang, Rh Limai, Rh. Aying, Rh. Resa, Rh. Udau, Rh. Jusong, and Rh. Mawang for their kind assistance in fieldwork.

Research permission was granted by the Forest Department of Sarawak (NCCD.907.4.4 (Jld.7) -67). Financial assistance was from Grant-in-Aid for Scientific Research (S) 22221010 from the Japan Society for the Promotion of Sciences.

References

Azlan, J., M. 2006. Mammal Diversity and Conservation in a Secondary Forest in Peninsular Malaysia. Biodiversity and Conservation 15:1013-1025.

Bennett, E. L., A. J. Nyaoi, and J. Sompud. 2000. Saving Borneo's Bacon: The Sustainability of Hunting in Sarawak and Sabah. Pages 305-324 in J. G. Robinson and E. L. Bennett, editors. Hunting for Sustainability in Tropical Forests. Columbia Press., New York.

Harrison, R. D. 2011. Emptying the Forest: Hunting and the Extirpation of Wildlife from Tropical Nature Reserves. BioScience 61:919-924.

Hon, J. 2014. Land Use Mapping Exercise along Kemena River - Tubau - lower Jelalong. Equatorial Biomass Society 9:10-16.

Hon, J., S. Sakai, Y. K. Choy, M. Koizumi, K. Kishimoto-Yamada, M. Ichikawa, Y. Kato, T. K. Takano, T. Itioka, R. Soda, and H. Samejima. 2012. Distribution and trend of animal abundance in the Rajang and Baram regions, Sarawak, based on questionnaire survey. Pages 158-165 in Collapse and Restoration of Ecosystem Networks with Human Activity. Research Institute for Humanity and Nature.

McShea, W. J., C. Stewart, L. Peterson, P. Erb, R. Stuebing, and B. Giman. 2009. The importance of secondary forest blocks for terrestrial mammals within an Acacia/secondary forest matrix in Sarawak, Malaysia. Biological Conservation 142:3108-3119.

Meijaard, E., D. Sheil, R. Nasi, D. Augeri, B. Rosenbaum, D. Iskandar, T. Setyawati, M. Lammertink, I. Rachmatika, A. Wong, T. Soehartono, S. Stanley, and T. O'Brien. 2005. Life after logging: Reconciling wildlife conservation and production forestry in Indonesian Borneo. Center for International Forestry Research, Jakarta, Indonesia.

Myers, S. 2009. A field guide to the birds of Borneo. Talisman Publishing, Singapore.

Parry, L., J. Barlow, and C. A. Peres. 2007. Large-vertebrate assemblages of primary and secondary forests in the Brazilian Amazon. Journal of Tropical Ecology 23:653-662.

Payne, J., C. M. Francis, and K. Phillips. 2005. A Field Guide to the Mammals of Borneo. The Sabah Society, Kota Kinabalu.

Phillipps, Q., and K. Phillipps. 2009. Phillipps' Field Guide to the Birds of Borneo. Beaufoy Books, Oxford.

Samejima, H., and J. Hon. 2014. Ground-dwelling Mammals and Birds Recorded by Camera Traps in Logged-over Forest in Anap Sustainable Development Unit, Sarawak, Malaysia. Equatorial Biomass Society 10:1-6.

Samejima, H., P. Lagan, and K. Kitayama. 2012. Impacts of two different forest management practices on the abundance of mammals. Pages 89-111 in K. Kitayama, editor. Co-benefits of sustainable forestry -Ecological studies of a certified Bornean rain forest. Springer.

Samejima, H., and R. Ong. 2012. Distribution of Mammals in Deramakot & Tangkulap Forest Researves, Sabah, Malaysia. Center for Southeast Asian Studies, Kyoto University.

Notes

[1] Camera data at two points in Lavang and three points in Jelalong were not yet collected when this paper was written. Data from these five points will be added.

Research Report on Wildlife Habitat and Hunting: From the Miri-Bintulu Road to Samarakan

Yumi Kato (Hakubi Center for Advanced Research, Kyoto University)
Hiromitsu Samejima (Center for Southeast Asian Studies, Kyoto University)

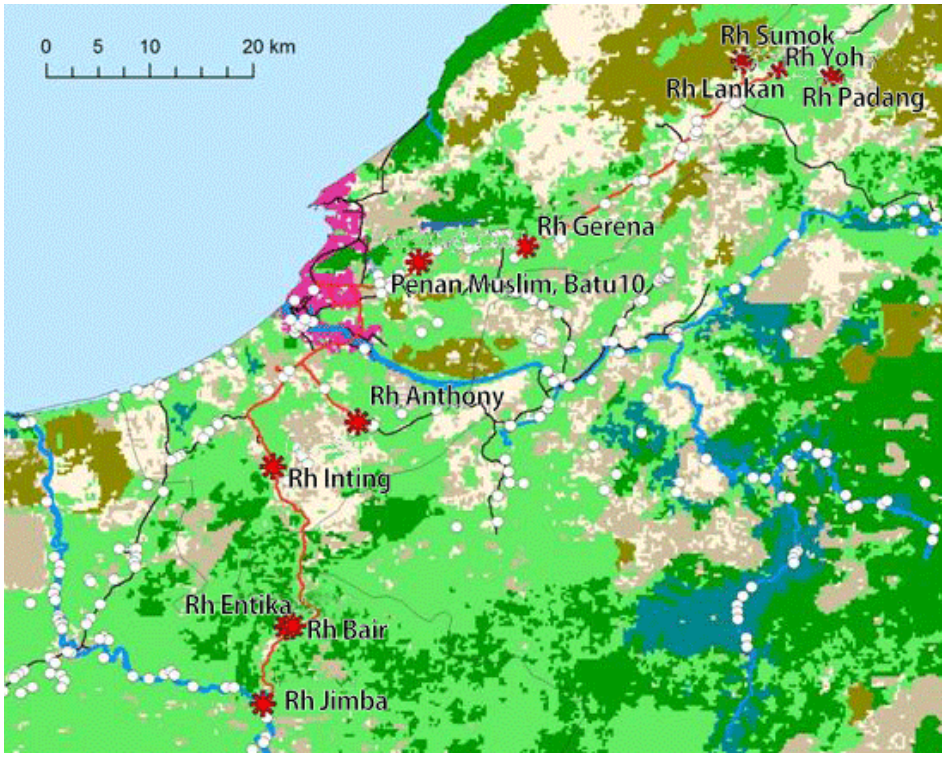
Introduction

We conducted a survey of wildlife hunting and other subsistence activities of villagers in Bintulu Division from July 1 to 3, 2012. The purpose of this survey was to assess the variety of habitat conditions for wildlife and hunting activities in different landscapes, from natural forest-dominated areas to oil palm plantation-dominated areas.

The survey targeted 11 villages (see map):

1. Six villages along the Miri-Bintulu road
2. Four villages along the Samarakan road
3. One village near Sungi Silas

These villages include nine Iban majority villages and two Penan-Muslim majority villages.



Map: Research Sites

Research Method

We interviewed the village headman and other members of the village for approximately 1–2 hours regarding their subsistence activities, particularly hunting. The interview addressed the number of major species hunted each year, e.g., bearded pig, sambar, barking deer, and mouse deer. Below we report the overview of our fieldwork.

Research Report

Sunday, July 1, 2012

On the first day of our research, we first visited and conducted interviews at Kampung Penan Muslim, Batu 10, situated along the Miri-Bintulu road. The gate of the community was intricately decorated and the houses appeared to be well constructed. The village has a community hall, mosque, playground, and even a Wi-Fi network. A community event called "Karnival Gawaw" was in progress when we visited the village. The headman of the village looked quite busy but was very kind to us. At this event, a futsal match was held and government-sponsored display booths introducing the activities of police, clinics, and Wi-Fi networks were present. The headman guided us to each booth and explained the activities to us. His words were full of pride at his village's successful modernization. Our interviews were focused mainly on the way of life of the villagers (wage labor, rice and oil palm cultivation) as well as hunting activities. We decided not to ask them to fill in our hunting record sheet, because they do not hunt animals much. Then, we changed the focus of

the interviews to other topics such as the history of the community and the relationships with other Penan Muslim communities.

Rh. Garena was the second village that we visited to conduct interviews. The village is located further north of the Miri-Bintulu road. The longhouse was under construction. The community appeared to have land issues and the headman told us in detail of the problems they were facing. Later, we managed to ask him about the subsistence activities of the people in the village (rice cultivation, oil palm cultivation, and wage labor). According to him, many villagers are still hunting actively. We asked the headman about the hunting methods and hunting range. According to the villagers, hunting is also active in other communities around this village.

After taking lunch at Similajau Café, we visited Rh. Sumok, very close to the Sime Darby oil palm plantation. It is an Iban community. The longhouse of the community was under construction; therefore, we conducted our interview with the headman at his temporary residence (dampa'). We interviewed the headman about the residents' economic activities. Rice cultivation, rubber latex collecting, and wage labor are the main subsistence activities. We asked details about oil palm cultivation, which has become the main business of the community. Hunting was not popular in this village.

The fourth village, Rh. Padan, an Iban village, is located at Simpang Bakun, down the road from Miri-Bintulu. The headman was not present in the village; therefore, we conducted the interview with other villagers. In this village, people actively engage in oil palm as well as pepper and other vegetable cultivation. However, rice cultivation is no longer practiced. We asked about the local hunting methods and the presence or absence of wild mammals.

Monday, July 2, 2012

The second day began with a visit to a longhouse on the road through Samarakan to Anap River. The first longhouse of the day, Rh. Inting, was an Iban longhouse. The longhouse was under construction because the longhouse had recently moved to this region from Segan River. In the course of the interview about their economic activities, one interviewee began to complain that he had been cheated by an oil palm mill when he sold oil palm fruit bunches. Therefore, we started to ask about oil palm cultivation, rice cultivation, wage labor, and other matters. The land issue appeared to cast a shadow on the community. In this village rice and oil palm cultivation were pursued actively, although hunting was not. We then headed south along the Samarakan road.

The next village, Rh. Entika, an Iban longhouse, is located far south of the Samarakan road. At the time when we visited, most villagers were out in the fields. We were fortunate, though, to meet the wife of the headman of the village, who was kind enough to give us an interview. The community had moved to this area from Anap River after a pulp mill of Borneo Pulp and Paper was planned to construct at the area. In this area, there are three longhouses in similar circumstances. Land shortage is the biggest issue faced by the residents. According to her, wage labor in the city is popular and hunting is no longer popular in this longhouse.

Next, we continued down the Samarakan road to visit another Iban longhouse, Rh. Bair. In this longhouse, we met more villagers than in any other village during our survey. Many of them were very cooperative; therefore, we could interview many villagers and not just the headman. Several villagers complained about the inconvenience forced upon them by the relocation due to the new construction of the pulp mill. Land and water shortage is becoming a major issue. In this longhouse, swidden rice

Photograph 1: Measuring the size of a jawbone from a bearded pig

and oil palm cultivation are still actively conducted, so that not many people go to urban areas in search of jobs. A few villagers are active hunters; therefore, we asked detailed questions such as the habitat conditions of certain animals in the forest.

Rh. Jimbai was the eighth village we visited. It is located near the end of the Samarakan road and along Tatau River. This longhouse has many households; however, many villagers were working in the city and therefore we did not see them. Not many people engage in agriculture; neither rice nor oil palm cultivation is actively conducted in this longhouse, although some villages practice fishing. Our interview revealed that hunting is also not actively practiced in this longhouse, although a few people practice it. The lesser mouse deer and other small animals are their main game instead of other larger wildlife. We asked the villagers in detail about their views on wildlife habitats in their surroundings.

After taking a late lunch at Niah Café, we set off for Sebauh. The ninth survey village, Rh. Anthony, is an Iban longhouse. The longhouse is known for Nanas Silas, a pineapple cultivation area. Many villagers actively produce and sell pineapples as well as cassava and other vegetables in Bintulu market. Oil palm production is also popular, although other agriculture, including rice cultivation, is not. Hence, our interview was focused mainly on vegetable production and hunting activities in the longhouse. There are apparently some villagers who practice hunting.

Tuesday, July 3, 2012

The 10th village of our research, Rh. Yoh, is a Penan-Muslim community that is located along the upper Labang River. We conducted an interview about thier history, including the period of nomadic life, migration, and the community's interactions with other Penan groups. Then, we shifted the topic to recent subsistence activities. Oil palm cultivation is practiced; however, agriculture in general is no longer active, and nobody engages in rice cultivation any more. The interview revealed that hunting is not actively practiced.

We visited Rh. Limai, our last destination, located very close to Rh. Yoh. The longhouse is very long; two buildings face each other on the road. The headman of the Iban longhouse was a shopkeeper and appeared to be busy carrying goods into his store. We waited for a while and then began our interview. The community is the earliest settlement in this area that moved from Skrang. All other Iban longhouses in the neighborhood branched off from this longhouse. During the interview, we asked the villagers about their subsistence activities and the community's history. Approximately half of the villagers practiced both rice and oil palm cultivation. In this longhouse, people are relatively active hunters. We obtained information from the villagers about their hunting patterns and the populations of certain animals in the vicinity of the village.

During our survey, we conducted interviews in the communities along the Miri-Bintulu road and Samarakan. We collected data about their hunting methods, hunting range, animal habitat around the village, and subsistence activities in 11 villages. We plan to analyze the data and conduct further research in August 2012 to compare data of other communities in different vegetation areas.

Photograph 2: Interviewing villagers about their subsistence activities and hunting activities

The List of Project Members

Noboru Ishikawa	Anthropology	Center for Southeast Asian Studies, Kyoto University
Ryoji Soda	Geography	Graduate School of Literature and Human Sciences, Osaka City University
Yasuyuki Kono	Natural Resources Management	Center for Southeast Asian Studies, Kyoto University
Kaoru Sugihara	Global History	National Graduate Institute for Policy Studies
Kosuke Mizuno	Agriculutural Economics	Center for Southeast Asian Studies, Kyoto University
Naoko Tokuchi	Forest Ecosystem Ecology	Field Science Education and Research Center, Kyoto University
Motomitsu Uchibori	Cultural Anthropology	Faculty of Liberal Arts, The Open University of Japan
Hiromitsu Samejima	Ecology	Center for Southeast Asian Studies, Kyoto University
Motoko Fujita	Bird Ecology	Center for Southeast Asian Studies, Kyoto University
Osamu Kozan	Hydrology	Center for Southeast Asian Studies, Kyoto University
Keitaro Fukushima	Forest Ecosystem Ecology	School of Urban Environmental Sciences, Tokyo Metropolitan University
Makoto Tsugami	Cultural Anthropology	Liberal Arts, Tohoku Gakuin University
Katsumi Okuno	Cultural Anthropology	College of Liberal Arts, J.F.Oberlin University
Masahiro Ichikawa	Southeast Asian Area Study	Faculty of Agriculture, Kochi University
Miyako Koizumi	Ecological Anthropology	Graduate School of Agriculture, Kyoto University
Fumikazu Ubukata	Natural Resource Economics	Graduate School of Environmental Science, Okayama University
Tetsu Ichikawa	Cultural Anthropology	Department of Tourism, Rikkyo University
Yucho Sadamichi	Life Cycle Assessment	The National Institute of Advanced Industrial Science and Technology
Nathan Badenoch	Southeast Asian Studies	The Hakubi Project /Center for Southeast Asian Studies, Kyoto University
Koji Tanaka	Southeast Asian Studies	Kyoto University Research Administration Office (KURA)
Kyoko Sakuma	Cultural Anthropology	Graduate School of Asian and African Area Studies (ASAFAS), Kyoto University
Atsushi Kobayashi	Historical Science	National Graduate Institute for Policy Studies
Wil de Jong	Forest Governance	Center for Integrated Area Studies, Kyoto University
Daisuke Naito	Southeast Asia Area Studies	Center for International Forestry Research
Jason Hon Shung Sun	Animal Ecology	World Wildlife Fund, Malaysia
Yumi Kato	Cultural Anthropology	The Hakubi Project /Center for Southeast Asian Studies, Kyoto University
Atsushi Ota	History of Early Modern and Modern Indonesia and the Malay World	Graduate School of Letters, Hiroshima University,
Yuichi Kano	Ecology	Graduate Education and Research Training Program in Decision Science for a Sustainable Society, Kyushu University
Yayoi Takeuchi	Ecology	National Institute for Environmental Studies
Kuniyasu Mokudai	Physical Geography	Pro Natura Foundation Japan

Center for Southeast Asian Studies, Kyoto University
46 Shimoadachi-cho, Yoshida Sakyoku, Kyoto 606-8501
TEL/FAX: +81-75-753-7338
http://biomasssociety.org
E-mail: nakane@cseas.kyoto-u.ac.jp
Editors: Hiromitsu Samejima, Hideki Nakane

Hunting with dogs, the Jelalong River
June 2014
(Photo by Hiromitsu Samejima)