Syarikat Samling Timber Sdn Bhd
A member of Samling Group of Companies

PUBLIC SUMMARY

of the

Forest Management Plan

for

Ulu Trusan Forest Management Unit

for the period 2017 to 2026

Warning: This Public Summary is presented here only for the purpose of complying with the requirements of the Malaysian Timber Certification Scheme and the associated MC&I SFM

Approved by:

James Ho Yam Kuan
Chief Operating Officer

Introduction

This is the public summary of the Forest Management Plan (FMP) written for the Ulu Trusan FMU which comprises the two long term Forest Timber Licences (FTLs) T/0280 and T/9115 issued to KTN Timor Sdn Bhd and Majulaba Sdn Bhd, respectively. These two FTLs are managed together as a single FMU.

It is expected that the FTLs will each be renewed for a sixty year period following certification.

The first period of the FMP is from 2017 to 2026. There will be a mid-term review in the fifth year to allow any policy changes and developments to be incorporated and the FMP to be revised to include the findings of the various monitoring activities.

Management Objectives

- to manage the forest resource in an economically viable manner that is ecologically sustainable, socially acceptable and of multiple benefits to the FMU's stakeholders; and in doing so
- comply with, and become certified using, the Principles, Criteria and Indicators of the Malaysian Timber Certification Scheme (MTCS) which is endorsed by the Programme for the Endorsement of Forest Certification (PEFC) of well-managed natural forest; and
- take due and appropriate recognition that a part of the FMU is within the Heart of Borneo corridor.

The Resource

The FMU is in Lawas District of Limbang Division, Sarawak. The FMU's Merarap camp lies some 70km by road south of Lawas Town. (Right click here to access Map A FMU location.) It has total area of 92,751 ha, 67% of which is within the proposed Ulu Trusan Protected Forest. A further 16% (15,195ha) lies within the Limbang Protected Forest and a small section (4,695 ha) is inside the proposed Trusan-Kelalan Protected Forest. The balance of the FMU is occupied by kampongs which have been excluded from the proposed protected forest areas. (Right click here to access Map B showing the land status.)

The topography of the FMU ranges from hilly to mountainous with the altitude ranging from 300m to 1,828m amsl. Gg. Pagon Priok (1,820 m) is located just outside the FMU in the Sarawak- Brunei international border zone.

The proposed Paya Maga Conservation Area[1] (11,073ha) is currently within the FMU and lies on the Sarawak-Sabah inter-state border where Gg. Matalan rises to 1,828 m.

About 69% of the FMU is classed as Terrain Class III with slopes between 20° and 35° and 15% is classed as Terrain Class IV with slopes greater than 35°.

[1] The Paya Maga highland is part of the Murud complex and includes two major peaks, Tuyo Peak and Matalan Peak. A scientific expedition was jointly organised by FDS and SFC in 2010. Numerous scientists from various institutions and NGOs from Malaysia, Brunei Darussalam and Indonesia participated in data collection in this exceptionally bio-diverse area. Four major forest types are found here and UPM, Bintulu, is continuing research on the forest ecology of three of these: montane oak forest (1,200-1,500 m amsl); upper Dipterocarp Forest (750-1,200 m amsl); and Hill Dipterocarp Forest (<750 m amsl). Ulu Trusan FMU management continues to assist UPM by providing logistical support and road access to the area and the FMU's surveyors and foresters participate in the fieldwork.

The Merit soil series covers more than half the area the whole of which is mainly underlain by the Meligan Formation.

Hill mixed dipterocarp forest (MDF) is the dominant forest type below 800m representing 63% of the area. Sub-montane forest, montane and kerangas forest all occur and peat forest has been recorded at 1,400 to 1,600m. There is a significant area of secondary forest on the better terrain.

The FMU has been zoned into: **Protection**: 22,313ha (24.1%), **Production**: 55,406ha (59.7%), **Nature reserve and conservation area**: 11,719ha (12.6%) and **Community & water catchment**: 3,303a (3.6%). (Right click here to access Map I showing zoning and other information)

Forest management

The production forest will be managed on a polycyclic system based on prescribed DBH cutting limits (Selective Felling System) with the next harvest, and all subsequent harvests, provided by the residual stems (potential crop trees) and continued recruitment from natural regeneration. The production area is divided into 25 coupes each of about 2,200ha with, nominally, one coupe to be harvested each year. The FORMIND growth simulation model used by Samling derives a sustainable annual cut (AAC) at an optimal cutting cycle based on the DBH cutting limits currently imposed by FDS of 45cm and 50 cm for non-dipterocarps and dipterocarps, respectively. Using the data from the FRA the optimal cutting cycle was determined as being between 25 to 30 years (**see** Allowable Annual Cut below).

Harvest system

The use of reduced impact logging (RIL)[2], with break out and extraction by excavator based logfisher, is intended to minimise damage to the residual stand and regeneration, which will form the next and subsequent harvests. All trees to be harvested must be tagged, identified and their locations mapped. Tagged trees which are within 60m of the skid trail are felled, cross-cut and tree number tags are attached to both ends of the log which is then winched to the skid trail. From there logs are skidded by tractor to the landing.

At the landing the logs are measured and the LPI and CB tags are affixed at both ends of every log together with the hammer imprint of the licensee's property mark. The details of logs extracted are recorded on the Daily Production Return form which must be submitted to the One-Stop Compliance Centre and Customer Service Centre of SFC.

The logs are then trucked to the official stumping area where the royalty assessment is undertaken by SFC. As part of the assessment the logs are hammer marked "FD" and tagged. A Removal Pass is then issued by SFC; this serves as the permit to legally transport the logs to the Lawas log pond. It is the last link in the FMU's chain-of-custody.

Allowable Annual Cut and Yield Control

Exhaustive FORMIND[3] growth simulations based on FRA data show that an AAC in the region of 55,000m3 on a 25-30 year harvest cycle is sustainable indefinitely.

The AAC is species selective, i.e. the AAC computation assumes that only 75% and 60% of the species in species groups 1(emergent) and 2 (canopy) respectively, are commercial. Samling's

[2] Standard (RIL) harvesting is not permitted on slopes of more than 35º except on very short sections of such slopes.

[3] FORMIND is the successor to FORMIX3 which was used to determine the AAC for Samling's Ravenscourt FMU in 2017.

downstream is attempting to maximise the forest yield by using lesser known species previously not harvested.

The AAC will be re-evaluated at the mid-term review using data from additional FRA sampling units. (It is unlikely that the PSP data will have provided any meaningful results by that time.) At this time the commercial species composition of species groups 1 and 2 will also be re-examined.

Yield control is by area and volume. There are 25 coupes each with around 2,200ha of operable area. At present one coupe is to be worked each year but the actual annual production should not exceed the AAC.

Provisions for monitoring forest growth

The establishment of a network of Permanent Sample Plots (PSPs) is in progress. The PSPs are selected from the FRA sampling units so as to represent the variability of the forest condition over the production area. It is planned that re-measurement will, initially, be at two-year intervals. The final number of PSPs to be established will depend on the variability (coefficient of variance) of the FRA sampling units.

Environmental Safeguards

Environmental Impact Assessments (EIAs) were approved by Natural Resources and Environment Board (NREB) on 26 May 2010 and 8 June 2010 for T/0280 and T/9115 respectively.

The EIA reports include the study of environmental impact considerations, the conservation of the natural forest, water quality, waste disposal, use of pesticides and biological agents, mitigation measures for road construction and maintenance, tree felling and log skidding by tractors, environmental quality control and non-organic waste disposal, silvicultural management, forest protection/fire prevention, wildlife protection, protection of scenic landscapes and those with recreational potential, and safety and health of workers.

All rivers and streams that flow year round must have buffer zones (RBZs) established the width of which is determined according to NREB specification.

Quarterly Environmental Monitoring Reports (EMRs) are undertaken by external consultants and have been submitted to the NREB regularly following approval of the EIA. The main focus of the Environmental Monitoring Report (EMR) is on water quality[4] and any damage arising from the harvesting operations. The monitoring works for damages due to harvesting operations, as provided for under the Forest Ordinance, will continue for at least a year after the blocks are closed.

Wildlife

The objectives of wildlife management include recognising the importance 'CAN': this is the triple concept of "Culture, Adventure and Nature" that embraces how wildlife impacts the culture of Sarawak, nature tourism, wildlife as a natural resource for rural peoples and wildlife to ensure healthy forest ecosystems.

"*A Master Plan for Wild Life in Sarawak*" was approved by the Cabinet as official policy in January 1997. The Master Plan dealt with the immediate issue of stopping over-exploitation by hunting and the provision of more natural habitats in which wildlife could continue to live.

[4] Water monitoring results are shown on the website (click the Monitoring tab on the menu)

The principal ordinance relevant to the protection, management and conservation of wildlife in Sarawak is the Wild Life Protection Ordinance 1990. Additional measures are the responsibility of the FMU holder, in line with DF Circular No. 6/99 dated 30 April 1999.
Following the recommendations of the Master Plan, the headmen and the camp managers are appointed as honorary wildlife rangers who will assist the government agencies in implementing the Master Plan. The wildlife rangers will also act as facilitators to promote awareness on the need for wildlife protection in their respective areas of responsibilities.

Ulu Trusan FMU together with the adjoining Ravenscourt FMU play a role in the Heart of Borneo (HoB) Corridor Project through provision of a wildlife corridor between Sabah to the north-east, Brunei to the west, via the Mulu National Park and Buda National Park, and Indonesia to the south-east (see section on the high conservation value assessment). Ravenscourt FMU has common boundaries with Pulong Tau National Park, the proposed Batu Buli National Park and the proposed Batu Iran National Park.

There are existing trans-boundary collaborations between Pulong Tau National Park in Sarawak and Kayan-Mentarang National Park in Indonesia, and Batang Ai National Park, Lanjak-Entimau Wildlife Sanctuary in Sarawak and Betung Kerihun National Park in Indonesia.

Rainfall
The mean monthly rainfall at Lg. Tengoa ranges from 245 mm in February to its highest at 410 mm in November. The driest year for the 10-year period at Lg. Tengoa was 2005 with annual total rainfall at 3,364 mm and the wettest year was 2008 with 4,297 mm.

At Lg. Sukang, the lowest mean monthly rainfall was 169 mm in February and the highest was 282 mm in November. The lowest annual rainfall was 2,330 mm in 2004 and the wettest year was 2008 with 3,276 mm. There are two distinct rainy seasons for both regions, i.e. March-May and September-November. The wettest years for Lg. Sukang were 2007, 2008 and 2009 and for Lg. Tengoa were 2006, 2007 and 2008.

Local population and its economy
The main ethnic group living inside and near to the FMU is the Lun Bawang. These Lun Bawang communities can be grouped into two clusters of settlements, each under a penghulu. The Lg. Sukang-Lg. Brayong Area is under Penghulu Meripa Tagal and the Lg. Luping Area - Lg. Semadoh Area comes under Penghulu Dennis Yahya Ading.

An extract from the conclusion given in the Social Impact Assessment[5] is given below. It highlights an ageing and dwindling population which in turn means ever decreasing pressure on most of those resources provided by areas close to the settlements. It would seem that more and more areas that were once farmed as hill rice will continue to fall out of the shifting cultivation cycle and revert to temuda and then to secondary forest.

> …Majority of the people interviewed were farmers (be it full time or part time) who depended on the farmlands and forest near their settlements for their livelihood. Farming, gathering and fishing are their major sources of food and therefore lands, rivers and forests are very important to them. Nevertheless, most of the younger generation who are more educated or physically fit have left the villages to work and search for a better living elsewhere. The numbers of farmers is expected to decline and the demand on farmlands will also decrease. The older folks who stay back also do not have the manpower to do much farming.

[5] Social Impact Assessment for Ulu Trusan FMU Ripan H. J. *et al* February 2018

> In view of these socio-economic settings of the local communities and the fact that the FMU management has all this while been making conscious efforts to maintain a good rapport with the local communities and leave out shifting agriculture areas and other sensitive areas, it is the view of the consultant that none of the households concerned would likely be severely affected by the FMU…"

The growing of hill rice under a shifting agriculture regime is a widely practised economic activity. Every household is engaged in this activity, clearing temuda, but very rarely old secondary forest, on the slopes along the existing logging roads and near the streams. Shifting cultivation has not encroached into primary forest for several decades. Other crops planted at subsistence level include maize and tapioca.

Wet paddy is cultivated also at a subsistence level with any surplus sold as a need for cash arises during the year.

Fruit trees are grown around the villages. These include durian, langsat, rambutan, pineapple and banana. Such produce is mainly for own consumption with modest road sales made.

Free-range rearing of livestock is practised around the settlements with buffalo, cattle and pig providing both income and protein. In particular, buffalo are very important because they form an integral cultural element in the Lun Bawang way of cultivating wet paddy. They are also used as payment of dowries. Small scale earing of poultry is common in most settlements.

Hunting is no longer important for the villagers as there is a dearth of larger wildlife in the nearby forest. The enforcement of the Wildlife Protection Ordinance coupled with the control of fire arms has further curtailed hunting activity in the FMU. Game meat, if any, is for the hunter's own consumption and prohibited for sale.

Fishing in inland rivers has declined in importance due to the reduction in fish stocks. The villagers rear tilapia, ikan sultan and ikan merah in their own small-scale fish ponds near their houses. This practice is mainly found at Lg. Tanid, Lg. Semadoh Rayeh and Lg. Semadoh Naseb.

The villagers occasionally fish in Btg. Trusan and its tributaries to supplement and vary their diet. The fish species caught are mainly eels, catfish, semah, haluan and baung. Only excess catch, which is rare, is sold.

Tagang system was introduced as part of the Heart of Borneo Initiative under sustainable agriculture to Lg. Kerabangan in the Lg. Semadoh cluster and to Lg. Lutok, Lg. Remirang, Lg. Resina, Lg. Tuyu, Punang Brayong, Lg. Berayong Tengah and Lg. Sukang in the Lg. Sukang cluster. Under this system, no fishing is allowed during the closed season.

The practice of collecting jungle produce from the adjacent older temuda to supply the daily needs is common. The jungle produce includes timber, wild fruits and wild vegetables all of which are for own use and consumption. Natural materials such as rattan, bamboo and palm roots are gathered and made into handicrafts such as floor mats, trays, baskets and hats. Again, these are mainly for own use and *ad hoc* roadside sale. The introduction of modern household utensils has further reduced the dependence on forest produce.

The main source of household cash income is from employment, either in the private sector or in government. Households who possess large herds of buffaloes, or are industrious

planters of paddy or who receive remittance from family members working elsewhere, have a relatively high level of disposable income. Others less fortunate or less industrious have significantly less. Hence, there can be a large income disparity between households and between the settlements.

Services in the area

Gravity-feed water supply systems which provide relatively clear water are available at the cluster of villages around Lg. Sukang. Some households also utilise water tanks to harvest rain water. Pour-flush pit latrine systems are commonly used to avoid direct discharge of human waste into the river.

There is as yet no public electricity supply in the settlements and the communities have to rely on their own generators or those provided by the government. Some of the settlements still use kerosene and pressure lamps for home lighting. Other settlements have installed min-hydro dams for power generation.
There is no public telephone service in the settlements and villagers must make use of hand phones as the only means of telecommunication.

The settlements rely on the Samling main road to get to the sealed government road that leads to Lawas Town. But as there is no public transport service villagers must use their own or chartered private vehicles.

The rural air service to Lg. Semadoh has been discontinued. There are several Twin Otter flights a week from Lawas to Ba Kelalan but this does not really serve the FMU community as Ba Kelalan is more than 60 km south of Lg. Semadoh

Other

The SIA records four active and several old burial grounds together with sites of cultural and historical interest within the FMU. (See map in the HCV section.)

The potential activities for recreation include mountain climbing, jungle trekking, bird watching, safari, picnic and white water rafting, longhouse visits and observing traditional festive events.

The Lg. Sukang cluster of settlements is applying to join FORMADAT (the Alliance of the Indigenous Peoples of the Highlands of Borneo). This is a trans-boundary, grassroots initiative which aims to increase awareness and understanding of the communities of the highlands; maintain cultural traditions; build local capacity and encourage sustainable development in the Heart of Borneo. This aim is to be achieved through community-based eco-tourism; organic farming and agro-forestry; communication and information technology and the preservation of the cultural and natural heritages of the highlands in a way that will benefit present and future generations. The FORMADAT committee in Lg. Semadoh has set up a committee for Lg. Semadoh Rivers Conservation Project. The intention is that selected riverbanks in the vicinity of Lg. Semadoh will be protected from further erosion by local community activities using a “Local Tree and Bamboo Planting on Riverbank Programme” and “River Adoption and Protection Programme”, both of which are to be undertaken by community *gotong-royong* initiatives.

The *Conflict Resolution Guidelines for SFM for community consultation* is followed for the resolution of any conflicts that might arise.

High Conservation Value Areas

A High Conservation Value assessment was completed by external consultants in early 2018 and is the subject of a separate report[6]. (Right click here to access the Master HCV map showing the locations of HCV areas.) As determined from the zoning in the FMU's general harvest plan less than 60% of the gross area of the FMU is classed as production forest leaving more than 40% in various forms of protected and conservation areas together with areas of agriculture (shifting and settled).

Some salient points from the HCV report are noted below.

The FMU is separated from Brunei's Ulu Temburong National Park by the 1km wide international buffer zone (HCV 1.1). A part of the production area in the east of the FMU is separated from Sabah's Meligan Virgin Jungle Reserve by the proposed Paya Maga Conservation Area.

A number of HCV species are present: 37 species of fauna and 10 of flora were identified as rare or threatened or endangered (RTE) (HCV 1.2), and five species of fauna and 28 flora were identified as endemic (HCV 1.3). Areas of critical temporal use were also identified (HCV 1.4). The bat roost at Gg. Doa is well protected as it lies within the proposed Paya Maga Conservation Area; salt licks have been identified.

The FMU provides some linkage between other forest complexes as it adjoins forest timber licences (including Ravenscourt FMU), an ITP licence and it is partly within the HoB. (HCV 2).

Dipterocarp forest, most of it cut-over, covers the greater part of the FMU. This forest type is well represented in the 220,000 km^2 of the HoB and cannot be considered as endangered (HCV3). The upland kerangas forest has been accorded endangered status.

The altitude of the FMU ranges from 400m to 1,800m above sea level with the terrain generally hilly to mountainous. About 14% is TCIV - with slopes of more than 35º - and 70% is TCIII with slopes of 20º to 35º (HCV 4.1). To maintain the integrity of the river systems buffer zones (RBZs) are mandatory for all permanent water ways. The width of the RBZ is determined by the width of the river or stream and is prescribed by NREB (HCV 4.2). Harvesting and all other mechanical activity are prohibited within RBZs.

The Sabah-Sarawak Gas Pipeline (SSGP) passes through the FMU. It is underground for the greater part of its length; this, together with reasonably evenly distributed monthly rainfall that averages annually in excess of 2,200mm, means that the pipeline should not be considered as a major fire hazard. (HCV4.3) However, rupture of the pipeline has occurred on more than one occasion (without fire) and the FMU must always be alert to its potential as a hazard. There should be a similar awareness of the adjoining LPF/0005. However, the adjacent area will not be planted for several more years to come.

The HCV report suggested that HCV 5 was present primarily in the provision of water catchment protection to safeguard a supply of clean water for domestic use. Most of the other services – provision of a supply of firewood, wild fruits and vegetables, building and handicraft materials – are sourced from nearby areas of old temuda and secondary forest. (Refer to the extract from the SIA quoted in an earlier section of this summary.) Hunting, generally with access by motorbike, is probably the only activity that makes use of the FMU's

[6] High Conservation Value Forest [sic] Report, Ulu Trusan FMU, Ling C. Y., *et al* February 2018

operational areas. Thus, provided that any water catchments within the active coupes are protected, the negative impact of harvesting (and of any other forest management operation) carried out in the FMU should be negligible.

A very positive impact is that of Samling's maintenance of a major part of the main road that leads from the Ravenscourt FMU to the Ulu Trusan FMU's Merarap camp and then north to the Samling log pond. This road also links with the sealed government road that leads to Lawas Town.

The FMU also provides employment for those with the relevant skills or who wish to be trained to obtain such skills.

The HCV report gives recommendations for the maintenance of the HCV attributes some of which are given below:

- Buffer zones should be maintained along the boundaries of TPAs.
- A buffer zone along the inter-state (Sarawak-Sabah) border and buffer along the international border (Sarawak-Brunei) should be maintained.
- The "No Hunting" policy should be maintained and enforced to the extent possible (although local residents are allowed to hunt for their own use.)
- The DF Circular No. 6/99 should be prominently posted to help reinforce the above.
- Critical temporal use areas and salt licks should be excluded from the operation area. Buffer zones must be established round such areas.
- The FMU is to be managed in such a manner that enables wildlife to move from one part of the forest to another as operations move from coupe to coupe.
- Boundaries adjacent to the conservation zones, terrain class IV and shifting cultivation area should be clearly demarcated on the map for reference.
- RIL harvesting techniques should be used.

That more than 40% of the FMU lies outside of the production area and most of that is in protected areas, e.g. RBZs, border buffer zones, conservation and steep areas, etc. This should help to ensure that the existing populations of fauna and flora maintain their diversity within the FMU.

Community Liaison and Development

The FMU Conservation and Community Development (CCD) Committee, Community Representative Committee (CRC) and SFM Liaison Committee serve as platforms for achieving a balance of the economic, environmental and social interests.

For the community development projects, the "help for self-help" principle is applied. Accordingly, the local community participate in, and are responsible for, those functions and activities of development measures that they can provide by their own means. Assistance for the community development project might come from FDS, the FMU holder and any agency (whether government or non-government) able to provide know-how and/or funds that are not otherwise available to the community.

Health, Safety and Environment

The FMU operates under Samling's Health, Safety and Environment Policy and follows the Safe Practice Guidelines. In addition to their work instructions and toolbox talks, the workers are either sent for training courses, or trained within the FMU in the prescribed activities (directional felling, the proper usage of chainsaws and safety aspects, log extraction and log

loading) by designated trainers. This is periodically reviewed. There is in-house training of occupational safety and health practices for the workers. A Safety and Health Committee ensures compliance with the Occupational Safety and Health Act 1994, and the relevant legislative regulations and guidelines that are applicable to the respective work places.

Monitoring

Monitoring is required to ensure that the environmental protection measures are implemented and that they are effective and comply with mitigation requirements. The FMU has formulated an Environmental Policy (EP) in compliance with the PEFC-endorsed Malaysian Timber Certification Scheme (MTCS) for well-managed natural forests. In addition NREB is implementing the use of internal environmental compliance assessments (ECAs) to replace the third party EMRs. Samling's Ravenscourt FMU is the site of an ECA pilot study[7] to be undertaken in early 2018. Once this study is complete and following a revision of the guidelines the ECA will become standard practice for all those areas that have an EIA; this will include Ulu Trusan FMU.

Similarly, the social and economic effects on the communities of continuing to operate the FMU[8] must be monitored.

As mentioned under the section **Provisions for monitoring forest growth** a system of permanent sample plots (PSPs) will, after some years, provide data that allow monitoring of the composition and observed changes in the flora and to a lesser extent the fauna. The PSP data will also provide for the monitoring of forest growth and dynamics in terms of growth rates, recruitment, regeneration and general condition of the forest.

The Ulu Trusan FMU has only recently been established. This means that the monitoring of some of the attributes as required by the MC&I is also a new feature in the FMU's management portfolio. In this regard the following summary might usefully be noted:

- Yield of forest products (logs) harvested is monitored through the FMU's production records for royalty assessment held in the camp office.
- Growth rates, regeneration and condition of the forest together with the composition and change of the flora are monitored through the establishment of permanent sample plots (PSPs). The environmental impact of harvesting on flora will also be captured by PSP data and post-harvest assessment.
- Data from the HCV assessment will be used to assist in monitoring fauna in conjunction with *ad hoc* records of observations by FMU staff. Two conservation executives are now employed by Samling in the Lawas Region. As part of their duties they will be responsible for toolbox talks that will develop staff awareness and competence to assist in observing and recording.
- The HCV assessment (HCV5) suggested varying degrees of dependence on some attributes of the FMU. This dependence and any changes will need to be monitored.
- Costs will be monitored by budgetary controls in which productivity and the efficiency of forest management will of necessity also feature.

Some notes on the proposed Paya Maga Conservation Area

[7] This is one of six pilot studies being conducted to test the NREB ECA procedures prior to state-wide rollout.

[8] KTN Timor Sdn Bhd (T/0280) has been in continuous operation since 1984.

From the flora component, orchids and gingers are the two most diverse plant groups. The orchids with 45 genera consisting approximately 130 species and the gingers with 12 genera comprising 40 species were recorded. Twelve species of *Rhododendrons* are recorded in the area which is possibly the highest spot for *Rhododendrons* of Sarawak.

Apart from the orchids, gingers and rhododendrons, other species such as ferns, bryophytes and fungi are also abundant in the area. Among these plant groups there many new records.

The fauna component is also exceptionally rich. Large numbers of mammals, birds and insects have been recorded which is comparatively higher than those in the Lanjak Entimau Wildlife Sanctuary.

Barking Deer (genus *Muntiacus*) with vernacular names such as Common Muntjak, Red Muntjak, Indian Muntjak or Kijang in Malay are found to visit occasionally and feed on clay or mineral salt at the salt licks.

Leopard Cat is the commonest wild cat but rarely encounter as they are nocturnal in nature. The various local names are *Kuching Hutan* (Malay), *Mayau tebiang* (Iban) and *Tubang* (Murut/Kelabit).

Primates include Muller's Bornean Gibbon (*Hylobates muelleri*), also known as Grey Gibbon, Red Langur (*Presbytis rubicunda*) and Hose's Leaf Monkey (*Presbytis hosei*).

The Rodents include squirrels, rats and porcupines; all grouped together in the order Rodentia. The Giant Squirrel (*Ratufa affinis*) is the only squirrel species that has been sighted brachiating in the tree canopy around Gg. Doa. There were only 3-4 species of rat species recorded and they are the Whitehead's Rat (*Maxomys white-headii*), Long-tailed Giant Rat (*Leopoldamys sabanus*) and Chest-bellied Spiny Rat (*Maxomys ochraceiventer*).
There are also Yellow-throated Martens (*Martes flavigula*) which belong to the family of Mustelidae. They are usually found alone or in pairs.

The bats are grouped into the order Chiroptera. About eight species from 3 families of bats were captured during the expedition. Most of the species are from the family Pteropodidae which represents five genera that consist of six species. The most common bat species is Tailless Fruit Bat (*Megaeprops ecaudatus*), followed by Dusky Fruit Bat (*Penthetor lucasil*) and Short-nose Fruit Bat (*Cynopterus brachyotis*).

Two genera of snakes were recorded namely, Asthenodipsas genus and Liopelitis genus. The former genus is represented by *A. laevis* which is the Smooth Slug Snake. The latter genus is represented by *L. tricolor* which is the Malayan Ringneck or *Ular Berbelang Melayu.*

Many resident birds which are recorded in Sarawak inhabit the hill and sub-montane forests of Paya Maga. They include several unique and endemic species such as Whitehead's Broadbill (*Calyptomena whiteheadii*), Orange-breasted Trogon (*Harpactes oreskios dulitensis*), Black Oriole (*Oriolus hosii*), Crimson-Breasted Flower Pecker (*Prionochilus percussus*) and many others. An early estimation suggested that the number of species might reach about 50-70.

Paya Maga Highland is part of the Murud complex which includes two major peaks, Tuyo Peak and Matalan Peak. Four major forest types are found in the area, namely Hill Dipterocarp Forest, Sub-montane, Peat Forest and Mossy Forest.

The HoB corridor includes the proposed Paya Maga Conservation Area where UPM, Bintulu has commenced research on the forest ecology of three types of forests: montane oak forest (1,200-1,500 m amsl); upper Dipterocarp Forest (750-1,200 m amsl); and Hill Dipterocarp Forest (<750 m amsl). Ulu Trusan FMU management continues to assist by providing logistical support and road access to the conservation area. The FMU's surveyors and foresters also participate in the fieldwork.