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**DEVELOPMENT OF LANJAK ENTIMAU
WILDLIFE SANCTUARY AS A TOTALLY PROTECTED AREA
A STUDY ON THE VEGETATION
OF BATANG AI NATIONAL PARK, SARAWAK, MALAYSIA**

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EXECUTIVE SUMMARY

Three forest types were identified from the survey namely, young secondary forest of 8 years old, old secondary forest of about 40 years old and primary Mix Dipterocarp Forest (MDF). The old secondary forest has regenerated from farmlands that were cultivated for hill rice and then abandoned beginning in 1963 during the confrontation with Indonesia. In 1987 some of the families moved back into the area and cleared more forest.

A total of 334 species of plants were recorded from Primary MDF plots. Out of that number, 252 species were trees, while the remaining 82 species were non-trees comprising of climbers, herbs and palms. From the old secondary forest plots, 405 species of plants were recorded, of which 304 species were trees including saplings and seedlings, and 101 species were herbs, palms, ferns and fern-allies and climbers. From the young secondary forest plots of 8 years old, 22 species were recorded comprising of 16 species of trees and 6 species of non-trees.

The important timber family Dipterocarpaceae is the most dominant family in the MDF. The species include *Shorea macroptera*, *Shorea parvifolia* and *Shorea amplexicaulis*. In the old secondary forest plots, three species of Dipterocarpaceae were recorded. They were *Shorea amplexicaulis*, *Vatica vinosa* and *Hopea pachycarpa*.

Batang Ai National Park is an important Totally Protected Area not only for its flora and fauna richness but also besides Lanjak Entimau Wildlife Sanctuary (LEWS), an important and safe habitat for the remaining orangutan population in Sarawak. Its conservation role is best served by becoming a part of the Trans-boundary Biodiversity Conservation Area (TBCA) together with LEWS and Betung Kerihun National Park (BKNP).

The present study does not cover the whole forest areas in the park especially other forest types. Thus, further inventories should continue to gather more information on vegetation types, species composition, distribution and ecology that will serve as baseline data for vegetation mapping, zoning, planning and development. Apart from that the need for integrated management of the biological resources, especially with respect to the orangutan and rare bird species such as hornbills and Argus pheasant, should be considered.

Easy access to the park and sharing common boundary with the Indonesia is a great challenge in terms of resource protection. Strengthening enforcement and management presence on the ground to ensure total protection of the Park and its forest resources is crucial, especially to control illegal hunting, fishing and harvesting of timber and non-timber produce.

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iii
LIST OF PLATES	iv
GLOSSARY	v
ACKNOWLEDGEMENTS	vi
1.0 INTRODUCTION	1
2.0 BATANG AI NATIONAL PARK	1
3.0 OBJECTIVES OF THE STUDY	3
4.0 METHODOLOGY	3
5.0 RESULTS AND DISCUSSIONS	6
5.1 The Forest Habitats	6
5.2 Species Composition	7
5.2.1 Primary Forest	7
5.2.2 Old Secondary Forest	9
5.2.3 Young Secondary Forest	12
6.0 CONCLUSIONS AND RECOMMENDATIONS	13
Appendix 1	16
Appendix 2	17
Appendix 3	37
References	44

LIST OF TABLES

	Page
Table 5.1 : Taxonomic diversity and density of trees (≥ 10 cm dbh) in MDF plots.	7
Table 5.2 : Five most dominant families of trees (≥ 10 cm dbh) in MDF plots showing the number of genera, species and individuals.	7
Table 5.3 : Distribution of trees in MDF plots by diameter classes.	8
Table 5.4 : Five most common families of trees below 10 cm dbh in MDF plots.	9
Table 5.5 : Taxonomic diversity and density of trees (≥ 10 cm dbh) in old secondary forest plots.	10
Table 5.6 : Five most dominant families of trees (≥ 10 cm dbh) in old secondary forest plots	10
Table 5.7 : Distribution of trees by size classes in old secondary forest.	11
Table 5.8 : Five most abundant families of trees (≤ 10 cm dbh) in old secondary forest plots	11

LIST OF PLATES

	Page
Plate 1 : Eight years old secondary forest developed from land cleared for paddy plantation.	45
Plate 2 : Old secondary forest	45
Plate 3 : Primary Mixed Dipterocarp Forest	46
Plate 4 : Staff checking the bark of the tree	46
Plate 5 : “Miring” to appraise land spirits	47
Plate 6 : Abandoned local longhouse	47

GLOSSARY

ak or anak	son or daughter of
Batang	Main river
BANP	Batang Ai National Park
BKNP	Betung Kerihun National Park
dbh	diameter at breast height
ITTO	International Tropical Timber Organization
LEWS	Lanjak Entimau Wildlife Sanctuary
MDF	Mixed Dipterocarp Forest
m.a.s.l.	meter above sea level
m	meter
Nanga	River mouth or confluence
Rumah	House or longhouse
Sungai	River
SFM	Sustainable Forest Management
Tuai Rumah	headman of a longhouse
Tinting	Ridge
TPAs	Totally Protected Areas
TBCA	Transboundary Biodiversity Conservation Area
T.R.	Tuai Rumah
Ulu	upriver, interior

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1.0 INTRODUCTION

Sarawak is located in the north western part of the island of Borneo and accounts for about 28 % of the island's total land area of 451,865 km². It is estimated that more than 60 % of the island are still covered by forests. Floristically, it is also the richest in the Sunda Shelf. The forests are made up of complex communities of trees and numerous other plants such as herbs, climbers, epiphytes, stranglers, parasites and saprophytes. MacKinnon *et al.* (1996) estimated that about 10,000 to 15,000 species of flowering plants occurred on the island. At least 3,000 species of trees, including 267 species of dipterocarps of which 58% are endemics and found nowhere else (Ashton, 1982). It is also a home to more than 2,000 species of orchids, 1,000 species of ferns, more than half of the world's recorded species of *Nepenthes* (about 80 species worldwide), and 160 species of Zingiberaceae (Ibrahim, 1990).

Unfortunately, the biological diversity has been increasingly under threat due to poorly regulated development and non-sustainable harvesting of the island's rich natural resources that can lead to many species loss (MacKinnon 1990). One of the most effective ways to preserve biodiversity is to conserve the ecosystems to protect large areas of habitats that encompass viable populations of most constituent species.

In Sarawak, *in-situ* conservation is effected through the establishment of Totally Protected Areas (TPAs) that include a series of national parks, wildlife sanctuaries and nature reserves that are scattered throughout the State. This is in line with the promotion of sustainable forest management (SFM), and the recommendations of ITTO Mission to Sarawak in 1989/1990 that the conservation of biological diversity was best served through the *in-situ* preservation of the State's nature heritage. So far 16 forest areas have been gazetted as national parks, 4 as wildlife sanctuaries and 5 as nature reserves.

2.0 BATANG AI NATIONAL PARK

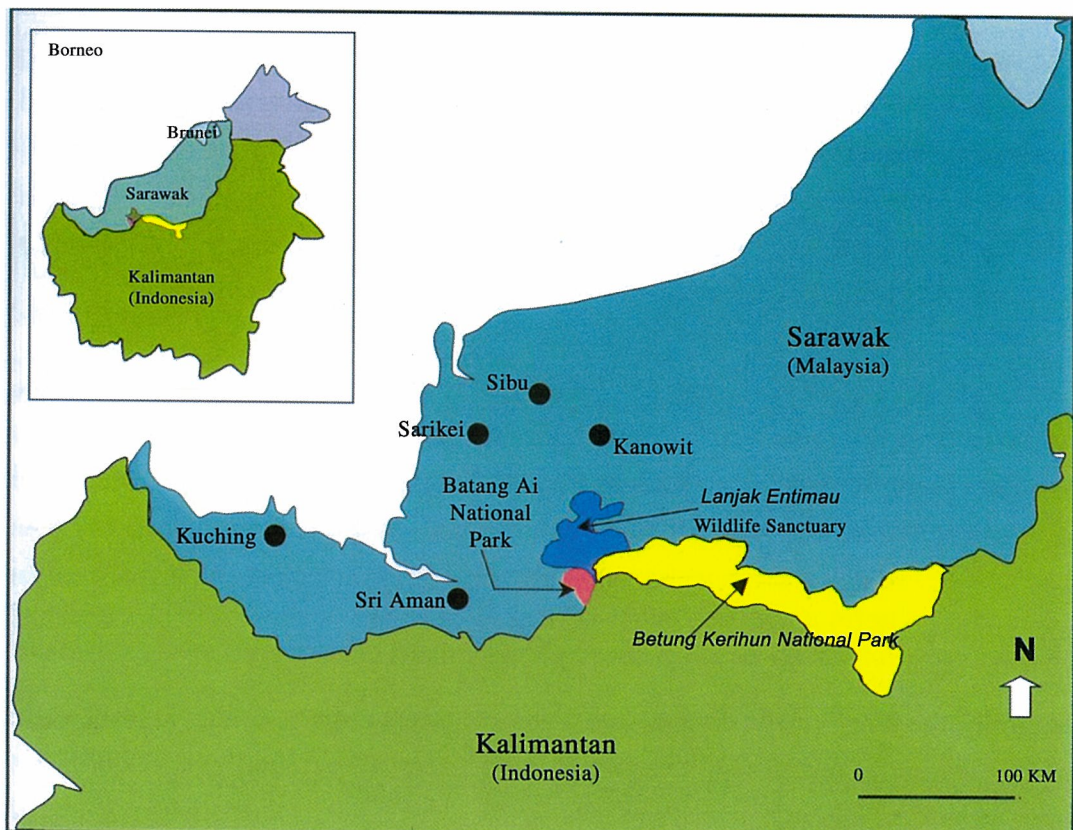
The survey was carried out in the Batang Ai National Park (BANP) for the following reasons:

- The Park abuts Lanjak Entimau Wildlife Sanctuary (LEWS) in the north and is separated only by a common boundary. Ecologically, the forests are continuous;
- BANP has been included as an integral part of the Transboundary Biodiversity Conservation Area (TBCA) that originally comprised of LEWS and Betung Kerihun National Park (BKNP) in West Kalimantan;

- Plants and animals do not recognise boundaries and their management within the components of the TBCA has to be integrated and collaborated, especially with respect to the orangutan and other threatened species;
- The resources are shared by the local communities in the buffer zones;
- Very little baseline information about the vegetation and flora is available as no systematic studies have been carried out.

BANP is located in Sri Aman Division in western Sarawak (MAP 1). When it was gazetted in 1991 it had an area of 24,000 ha. With the recent extension in 2003 of another 8,100 ha it now has an area of 32,100 ha. Prior to the gazettement, the local Iban people have used the forest extensively for subsistence and livelihood. Large areas had been cleared for shifting agriculture and settlement, so much so that about 60 % of the Park is under secondary forest cover. Under section 7(2) of the National Parks and Nature Reserves Ordinance (1998), seven longhouses have been granted privileges to continue to collect the resources in the Park for domestic consumption only (see Appendix).

Map 1. Location of the Batang Ai National Park



Like LEWS, the topography of BANP is very steep and rugged, particularly in the northern region. The altitude range is 100 m to below 1,000 m a.s.l. The highest peak at Bukit Ensanga in the western boundary rises to 975 m. Other than the secondary forest, primary mixed dipterocarp forest (MDF) is found. Riparian and alluvial forests occur along the fringes and flood plains of the rivers and their tributaries.

The Park was established for the following purposes:

- i. To protect and conserve biological diversity at all levels;
- ii. To provide protection for Sarawak's only viable population of orangutan;
- iii. To serve as a water catchment to maintain the water quality of the Batang Ai Reservoir for electricity generation;
- iv. To promote scientific research and nature education;
- v. To preserve the unique traditional Iban culture, mystique beauty of the green forest, and the numerous plant and animal species;
- vi. To promote eco-tourism.

3.0 OBJECTIVES OF THE STUDY

This study was extended to the Park under the current Phase III of the LEWS Project in order to collect the necessary baseline data for integrated resource planning and management between LEWS and BANP as a continuous and common wildlife habitat. This habitat is further extended to cover the Betung Kerihun National Park (BKNP) in West Kalimantan as a Trans-boundary Biodiversity Conservation Area (TBCA). The Park's forest types map prepared by the Forest Department in the 1970s has not been revised and there is no documented report on the flora.

4.0 METHODOLOGY

The old forest type maps and aerial photographs taken in year 2000 were examined. The aerial photographs showed the appearance of the forest canopies and tree crowns that was closely related to the conditions of the existing vegetation types and their distributions. The recent photographs revealed mostly young secondary forest that has developed in recent years.

From these, suitable forest areas to conduct the survey were identified and marked. This was followed by several field visits between April and July 2002 to confirm the types, study the forest conditions, and to select suitable sites for the establishment of ecological plots.

The forest at Tinting Pedalai (N 01° 18.528', E 112° 04.189') near the Lubang Baya Ranger Station, and Tinting Kemuyang (N 01° 19.420' E 112° 05.612') near Nanga Lelayang (Map 2) were selected because they contain a good collection of the main forest types that are representative of the vegetation in the Park. The terrain is also relatively more gentle. The assistance and advice of a number of senior and knowledgeable local guides were sought to give a reliable history of past agricultural activities and to confirm the ages of the secondary forests.

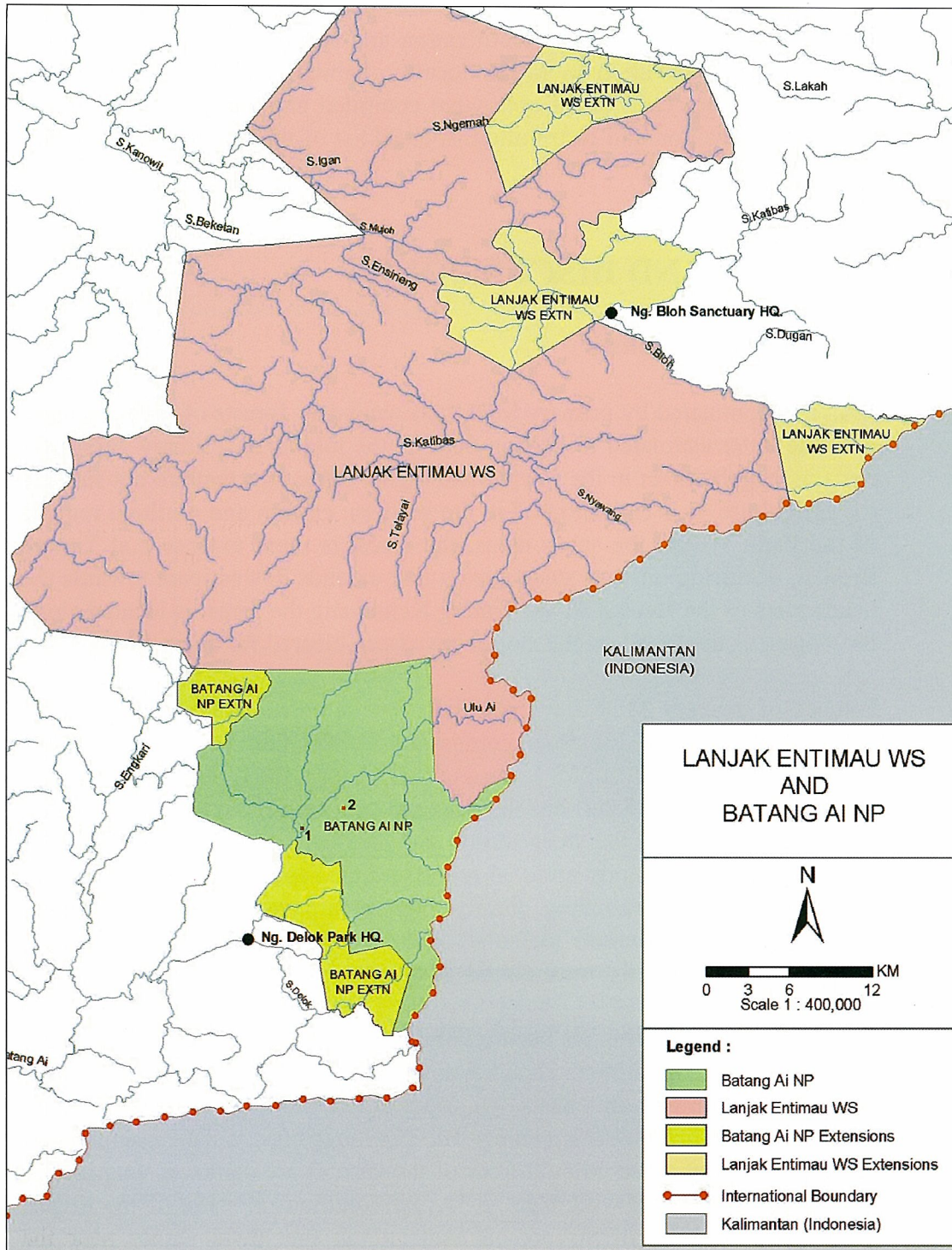
Altogether three forest types were identified for the survey. These were young secondary forest reliably aged at 8 years old, found at the slope of Tinting Pedalai; old secondary forests of about 35 to 40 years old that had developed from agricultural land abandoned around 1963 when most of the farmers left their farms and resettled in the Skrang area during confrontation with Indonesia; and primary mixed dipterocarp forest (MDF).

Owing to the steep terrain, ecological plots were located on the narrow ridge tops and their steeply descending slopes. Vegetation in the valleys were not surveyed. For each selected site, 3 sample plots each measuring 10 m x 40 m were demarcated, one on the ridge and one down the slope on each side of the ridge. Linear plots were used to accommodate the narrow ridges and long, steep slopes.

Altogether 13 plots were established in the primary MDF, comprising of 7 plots at Tinting Pedalai, and the remaining 5 plots at Tinting Kemuyang. There were a total of 23 plots in the old secondary forest aged between 35 to 40 years, with 10 plots located at Tinting Pedalai and 13 plots at Tinting Kemuyang. One plot was established at Tinting Pedalai in a young secondary forest aged about 8 years, according to the landowner Tuai Rumah Endan ak Luyoh. To facilitate enumeration, each plot was divided into subplots of 10 x 10 m.

Within each subplot, all trees attaining diameters at breast height (dbh) of 10 cm and above were measured, recorded and identified, except for the young secondary forest plots in which all trees attaining 5 cm dbh and above were measured and recorded. Within each main plot, one 5 x 5 m quadrat was randomly selected for enumerating all species of small trees and shrubs below 10 cm dbh, as well as saplings, seedlings, palms, herbs, climbers and epiphytes.

Map 2 : Location of the surveyed areas, marked as 1 and 2.



In the field, the plants were identified as far as possible at least up to the family level. Whenever necessary, leaf samples were collected, numbered and brought to the Herbarium for further identification and confirmation. Other than the descriptions, information as to the locality, habitats and local names were noted. Data from each forest type were compiled and analysed to study the species composition and distribution. A checklist of the recorded species was compiled.

5.0 RESULTS AND DISCUSSIONS

5.1 The Forest Habitats

BANP is dominated by primary MDF and secondary forests of different ages, with the latter estimated to occupy 60% of the total area. Primary MDF still remains largely intact in the steeper and higher ridge tops that are not suitable for agriculture. It is concentrated in the western, eastern and northern regions of the Park. Within the study areas, the forest is more extensive at Tinting Pedalai, occurring on very steep terrain that extends downstream towards the headwaters of the Batang Ai. At Tinting Kemuyang the forest is located along the ridges, as the forest on the slopes have been cleared for agriculture.

Patches of primary MDF have also been encountered around an old burial ground belonging to the Iban community at the foot of Tinting Pedalai (N 01° 18.325' E 112° 14.203'), across the river from the Lubang Baya Ranger Station. Although the forest has the structure of a typical MDF, it is smaller in stature due mainly to the steep terrain and shallow soils. Scattered big trees from the emergent canopy up to 35 m tall and are represented by members of the major timber producing family Dipterocarpaceae, including *Shorea macroptera* Dyer (Meranti melantai) and *Shorea parvifolia* Dyer (Meranti sarang punai), two of the most abundant species.

The old secondary forest has been reliably aged at between 35 to 40 years old because most of the farmers abandoned their farms beginning in 1963 during the confrontation with Indonesia. An important keystone species for the forest is *Cratoxylum arborescens* (Vahl.) Bl. (Geronggang), a late coloniser of cleared and burnt areas. Mature trees of the species are common. *Eugeissona utilis* Becc. (Pantu), a wild sago, is locally common on some of the ridges. Abandoned rubber gardens are encountered on the lower slopes near the riverbanks.

Some of the families moved back into the area in 1987 and cleared more forest for hill rice and pepper plantation, thus creating young secondary forests of 5 to 10 years old. Presently, three longhouses are still located inside the Park, namely, Rumah Endan at Nanga Tibu, Rumah Mujab at Nanga Beretik and Rumah Kana at Nanga Sebarik on the Jingin river, each occupied by only a handful of older people. Young trees of Geronggang are the most dominant in this young forest.

5.2 Species Composition

5.2.1. Primary Forest

From the survey of the two Tinting (ridges), 334 species of plants were recorded, of which 252 species are trees and 82 species are non-trees, the latter comprising climbers, herbs, ferns and palms. Floristically, the Tinting Pedalai forest is much more diverse, containing a total of 120 species of trees with dbh of 10 cm and above, compared to 67 species from Tinting Kemuyang (Table 5.1).

The commercially important Dipterocarpaceae is the most dominant family in both sites with up to 11 species and an estimated 120 trees per hectare. Other important families are Euphorbiaceae, Myrtaceae, Burseraceae, Lauraceae and Fagaceae (Table 5.2). The most common Dipterocarpaceae species, especially along the ridges of Tinting Pedalai, are *Shorea macroptera*, *Shorea parvifolia* and *Shorea amplexicaulis* Ashton.

Table 5.1: Taxonomic diversity and density of trees (≥ 10 cm dbh) in MDF plots

Locality	No. of Families	No of Genera	No of Species	No of Trees in Plots	No of trees per Ha.
Tinting Pedalai	36	67	120	259	925
Tinting Kemuyang	29	45	69	137	685

Table 5.2 : Five most dominant families of trees (≥ 10 cm dbh) in MDF plots showing the number of genera, species and individuals

Tinting Pedalai				Tinting Kemuyang			
Family	Genus	Spp.	Trees	Family	Genus	Spp.	Trees
Euphorbiaceae	2	8	20	Dipterocarpaceae	3	11	29
Dipterocarpaceae	3	10	33	Burseraceae	3	7	18
Myrtaceae	2	10	26	Lauraceae	5	6	8
Fagaceae	2	8	20	Euphorbiaceae	3	4	6
Burseraceae	3	7	13	Myrtaceae	1	4	7

Of the common non-dipterocarps, Fagaceae is predominant in Pedalai but is absent in Kemuyang. Pedalai is also much richer in Euphorbiaceae and Myrtaceae, both in terms of species and their frequencies.

Tree distribution by diameter class is shown in Table 5.3. In the Tinting Pedalai plots, more than 60 % trees have attained diameters of 10 to 20 cm, while only 2 trees out of total 261 are over 60 cm, belonging to *Shorea parvifolia* and *Lithocarpus porcatius* Soepadmo (Empili). While the density of trees in the lower diameter classes in the two areas are comparable, there is a higher occurrence of big trees above 40 cm dbh at Kemuyang. The largest dipterocarps at Kemuyang belong to *Shorea macroptera* (65 cm dbh) and *Shorea falcifera* Dyer ex Brandis (75.2 cm dbh). Overall data from both areas indicate that more than 80 % of the trees fall within the 10 cm to 30 cm diameter range. This gives the forest a generally pole-like appearance.

Table 5.3 : Distribution of trees in MDF plots by diameter classes

Diameter Class (cm)	Tinting Pedalai		Tinting Kemuyang	
	No. of trees	% of Total	No of Trees	% of Total
10-20	166	63	78	56.9
20-30	66	25.9	32	23.3
30-40	17	6.5	12	8.8
40-50	9	3.4	10	7.3
50-60	1	0.4	3	2.2
60 +	2	0.8	2	1.5
Total	261	100	137	100

The emergent canopy is up to 35 to 40 m in height, and is composed of trees of *Shorea*, *Dipterocarpus*, *Swintonia* and *Atuna*, but their numbers are relatively small. Species of dipterocarps dominated the middle canopy at about 30 m in height. Their common non-dipterocarp associates are *Nephelium cuspidatum* Bl. (Rambutan hutan), *Crypteronia macrophylla* Beusekom (Ubah semut), and species of *Eugenia* and *Gironniera*. The lower canopy layer is made up of numerous pole-sized trees of dipterocarps (*Shorea* and *Vatica*), and non-dipterocarps dominated by members of the Euphorbiaceae, Myrtaceae and Burseraceae.

Saplings and seedlings are abundant in the undergrowth and are mostly below 10 cm in diameter. A total of 112 species were recorded, predominantly belonging to the families of Dipterocarpaceae, Euphorbiaceae, Myrtaceae, Fagaceae and Burseraceae (Table 5.4). Members of the family Gesneriaceae (e.g. *Cyrtandra* and *Didymocarpus*) are very common among the herbaceous flora. Climbers and palms are rare.

Table 5.4: Five most common families of Trees below 10 cm dbh in MDF plots

Family	No. of genera	No. of species	Trees	Family	No. of genera	No. of species	Trees
Dipterocarpaceae	3	10	33	Dipterocarpaceae	3	11	29
Euphorbiaceae	7	13	27	Burseraceae	3	7	18
Myrtaceae	2	10	26	Theaceae	2	3	9
Fagaceae	2	8	20	Crypteroniaceae	1	3	9
Sapindaceae	2	3	15	Lauraceae	5	6	8

It is interesting to find a consistent and high occurrence in species and frequencies of the Dipterocarpaceae among the undergrowth flora. This could be due to a recent flowering and fruiting event in the areas that has not been recorded.

There is a distinct difference in species composition among the major non-dipterocarps as the two sites do not share any of the common groups of families. The low occurrence of the Euphorbiaceae at Kemuyang is unexpected as this family is usually very well represented in the MDF.

5.2.2. Old Secondary Forest

For the purpose of this report, forests that are approximately 40 years old are described as old secondary forest. The forest has regenerated from farmlands that were cultivated for hill rice and then abandoned. Structurally, the forest has three canopy layers with the top or emergent canopy attaining a height of 30 m. Recorded emergent species were *Koompassia malaccensis* Maingay (Menggris), *Cratoxylum arborescens*, *Prunus arborea* (Bl.) Kalkman (Enteli) and *Baccaurea hookeri* Gage (Tampoi). These have a widely scattered distribution and their numbers are low.

The middle canopy stands at 20 to 25 m, and is dominated by trees of *Cratoxylum arborescens*, *Nephelium cuspidatum* Blume var. *multinerve* Radlk (Rambutan hutan) and *Prunus spicata* Kalkm. (Enteli). Trees in the lower canopy range between 10 m and 15 m. The main species are *Eugenia kunstleri* King (Ubah), *Nephelium cuspidatum* var. *multinerve*, *Artocarpus odoratissimus* Blanco (Pingan), *Crypteronia macrophylla* Beusekon (Ubah semut) and *Gironniera parvifolia* Planch. (Medang kasap). Species of *Cratoxylum*, *Prunus* and *Crypteronia* are latecomers in the secondary succession, having displaced earlier pioneers such as *Macaranga* and *Ficus*.

The dense undergrowth is due much to the presence of numerous saplings and seedlings, herbs and other young plants. Members of the Euphorbiaceae,

Myrtaceae, Burseraceae and Lauraceae are most abundant among the saplings and seedlings. The herbaceous plants normally grow in dense clusters, and are dominated by species of Gesneriaceae and Zingiberaceae. The most common climber is *Spatholobus* (family Leguminosae).

A total of 405 species of plants were recorded from the sample plots. Of this total, 304 species were trees and shrubs (including saplings and seedlings), while 101 species were herbs, palms, ferns and fern-allies, and climbers. For trees reaching 10 cm in diameter, the Tinting Kemuyang plots are poorer in families (29) and genera (54), but are richer in species (117). The number of tree species from Tinting Pedalai is 107, belonging to 35 families and 67 genera (Table 5.5).

The most dominant families of trees above 10 cm dbh are Myrtaceae, Lauraceae, Euphorbiaceae, Fagaceae, Clusiaceae (Guttiferae) and Burseraceae. As expected, the Dipterocarpaceae was poorly represented with only 3 species of young trees, namely *Shorea amplexicaulis*, *Vatica vinosa* and *Hopea pachycarpa* with their seed source coming from a patch of primary MDF that is located about 20 m away. Of the three species recorded, two were found at Tinting Pedalai, namely *Shorea amplexicaulis* with a total of 12 saplings and seedlings, with the biggest sapling at 5 cm dbh; and *Vatica vinosa* with 3 individuals. The biggest sapling was 3.1 cm dbh. At Tinting Kemuyang, only *Hopea pachycarpa* (Heim) Symington was found, represented by only 2 saplings up to 3.9 cm dbh. Only *Eugenia* (family Myrtaceae) occurred at Tinting Kemuyang and was represented by 19 species, compared to a total of only 5 species at Pedalai.

Table 5.5: Taxonomic diversity and density of trees (≥ 10 cm dbh) in old secondary forest plots.

Locality	No. of Families	No. of Genera	No of Species	No of Trees	No of trees/ha
Tinting Pedalai	35	67	107	329	823
Tinting Kemuyang	29	54	117	359	690

Table 5.6 : Five most dominant families of trees (≥ 10 cm dbh) in old secondary forest plots

Tinting Pedalai				Tinting Kemuyang			
Family	Genus	Spp.	Trees	Family	Genus	Spp.	Trees
Lauraceae	6	9	26	Myrtaceae	1	19	46
Fagaceae	3	9	23	Lauraceae	2	11	23
Euphorbiaceae	6	7	18	Euphorbiaceae	8	10	22
Burseraceae	3	6	12	Fagaceae	3	8	18
Myrtaceae	2	5	45	Clusiaceae (Guttiferae)	2	6	7

Distribution by diameter classes shows that more than 90% of the trees at Kemuyang and Pedalai are below 40 cm dbh, but trees in the larger size classes (30 cm and above) are more common at Kemuyang (Table 5.7). No trees have exceeded 60 cm dbh in both areas. The largest trees in the plots are *Baccaurea hookeri*, *Cratoxylum arborescens*, and *Nephelium mangayi* Hiern. (Mujau), all attaining 50 cm dbh.

Table 5.7 : Distribution of trees by size classes in old secondary forest

Diameter Class (cm)	Tinting Pedalai		Tinting Kemuyang	
	No. of trees	% of Total	No of Trees	% of Total
10-20	227	69.6	230	62.2
20-30	81	24.8	83	22.4
30-40	9	2.8	38	10.3
40-50	8	2.5	15	4.1
50-60	1	0.3	4	1.1
Total	326	100	370	100

Trees below 10 cm dbh are equally rich, but species composition of the major families are different. Myrsinaceae and Moreaceae were absent at Kemuyang while Leguminosae and Myrtaceae were not recorded at Pedalai (Table 5.8). Only Rubiaceae, Euphorbiaceae and Sapindaceae were common to both areas.

A 30-year forest plot in Ulu Katibas, LEWS, was found to be dominated by species of the Lauraceae, Euphobiaceae, Meliaceae, Sapindaceae, Leguminosae and Burseraceae [Chai *et al.*, in Kuswanda, Chai and Nengah, (eds.), 1999]. The two surveys have indicated the consistent presence of the same group of dominant tree families in the different forest sites, although species composition was found to differ. Secondary succession and colonisation are believed to be related to a number of factors such as the history of the sites, soil properties, seed source, prevailing condition for germination, species competition and adaptability (Chai *et al.*, in Kuswanda *et al.*, eds., 1999).

Table 5.8: Five most abundant families of trees (≤ 10 cm dbh) in old secondary forest plots.

Tinting Pedalai				Tinting Kemuyang			
Family	Genera	Species	Trees	Family	Genera	Species	Trees
Rubiaceae	7	12	52	Euphorbiaceae	7	26	59
Myrsinaceae	1	2	48	Rubiaceae	10	16	44
Euphorbiaceae	8	11	39	Sapindaceae	2	4	37
Moraceae	2	5	37	Myrtaceae	1	12	33
Sapindaceae	2	2	37	Leguminosae	7	9	24

5.2.3. Young Secondary Forest

The young secondary forest surveyed at Tinting Pedalai was reliably aged at 8 years old. Tuai Rumah Endan ak Lunyoh, the headman of a longhouse, cleared the forest for hill rice cultivation in the late 1980s. Similar forest had also been encountered in nearby locations opposite Tinting Pedalai and across the Lubang Baya River.

The forest is open, has a simple two-storey structure and a pole-like appearance, and is fairly dense. A total of 58 trees were recorded from within the 10 x 40 m plot. *Ilex cissoidea* Loes. (Kerdam) is the only tree that has exceeded 15 m in height, while more than 75% fall within the range of 8 to 10 m. Individuals below 10 cm dbh account for over 70% of the total population. *Eugenia corymbifera* Koord. & Valet. (Ubah daun besar) is the biggest tree with a diameter of 19 cm.

Cratoxylum arborescens has already become established as one of the most common and biggest components with an average height of 11 m. Other associated common species are *Macaranga gigantea* Muell-Arg (Euphorbiaceae) or Merkubong in Iban, and *Archidendron clypearia* (Jack) Nielsen (Leguminosae), known as Kenarang to the Iban .

Altogether 22 species from 21 genera and 19 families were recorded, comprising of 13 species of trees above 5 cm dbh; the remaining 9 species were non-tree flora made up of herbs such as *Curculigo latifolia* Dryand. (Lemba) and *Phrynium capitatum* Willd. (Ririk), *Calamus* sp.; and climbers like *Spatholobus* sp. and *Tetrastigma pedunculare* (Wall.) Planch.

The dense undergrowth is due to the presence of saplings and seedlings, dense clusters of herbs and thick layers of ferns. The dominant species are *Curculigo latifolia*, *Pteridium aquilinum* and *Blechnum orientale* Linn.

The study on species colonisation and succession in shifting agriculture areas in the Tatau area in the Bintulu Division by Chai (1995) indicated that Euphorbiaceae and Moraceae were the most dominant families. *Macaranga* spp. (Euphorbiaceae), *Glochidion* spp. (Euphorbiaceae), *Ficus* spp. (Moraceae), *Melastoma malabatricum* Blanco (Melastomataceae), *Trema orientalis* (L.) Bl. (Ulmaceae) and *Callicarpa pentandra* Roxb. (Verbenaceae) were most frequently accounted among the early woody pioneers in the first three years and were still present in the year-5 to year-10 plots except for *Trema orientalis*.

With the exception of *Macaranga* sp., none of the other species recorded by Chai (1995) were encountered in the present study. One possible reason for this

is that shifting cultivation in the Tatau region was more extensive with the result that remnant of the secondary forest were located some distances away. In the Batang Ai area, shifting cultivation plots were smaller and more restricted, and are surrounded by primary MDF. This may account for the fact that there is a dominance of old secondary and primary forest species such as *Cratoxylum arborescens*, *Glochidion* spp. and *Eugenia* spp. Another possible reason could be the difference in the soil properties. The soils in Batang Ai are shallow and believed to be poorer in nutrients.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Batang Ai National Park is interesting in that over 60 % of its forest were cleared for settlement and traditional farming for several generations before it was gazetted in 1991. Available records show that primary mixed forest is concentrated in the northern, western and eastern portions of the Park (Meredith, 1993). The terrain in the north abutting LEWS is extremely rugged and steep, although the elevation is well below 1,000 m.a.s.l. Riparian forest is another important forest type along the Batang Ai and its tributaries. Forest on alluvial is limited due to the very steep terrain.

Altogether, 595 species from 92 families were recorded from the sample plots in MDF and secondary forest. Trees and shrubs make up 430 species, while 165 species are mostly herbs, palms and climbers. The most abundant families are Euphorbiaceae with 46 species, Rubiaceae with 32 species, Palmae with 30 species, Myrtaceae with 27 species and Leguminosae with 26 species. The Dipterocarpaceae is equally common. Of the total of 20 species, 17 were recorded from the primary forest and the remaining 3 species from the old secondary forest.

Further inventories in the hill forest may not discover many more vegetation types other than those that are already known, but will be necessary in order to accurately map their distributions and extent, and gather more information on the flora and its ecology. Further studies may also reveal unusual habitats for flora and fauna, particularly in the rugged terrain. The riparian forest and alluvial forest, although limited in extent, are ecologically very important. Their flora has not been fully documented.

The Park is known to support a wealth of diverse but sparse fauna that includes 18 species of mammals, 179 species of birds including 4 species of hornbills (Meredith, 1993), and 62 species of fish (I. Abdullah, 2004). Many planted fruit trees in the old secondary forest provide a good source of food for the big mammals and birds.

Although BANP is an important TPA in its own right, its conservation role is best served by becoming a part of the TBCA together with LEWS and BKNP. Within the state boundary, LEWS and BANP provide the only sizeable and safe sanctuary for the remaining orangutan populations in Sarawak. Phase III of the LEWS project took note of this important fact, and included the present study, and the studies on orangutan and fish, to collect additional baseline information for integrated conservation management and planning.

The diverse forest habitats, flora and fauna are important assets for promoting eco-tourism, research, educational and recreational activities in which the local communities can actively participate. The Park's easier access from Kuching is an advantage. It is hoped that the proposal to develop a community-based research and training centre at Batang Ai under Phase III of the LEWS project will be pursued.

The present study covers only a small area of the forest, and the baseline data collected are inadequate for vegetation mapping, zoning, planning and development, especially in the long term, and should be continued by Sarawak Forestry Corporation. It would also be useful to conduct a study to discover the full potential of the forest resources for sustainable utilization.

As the Park is accessible not only from the nearby towns and settlements, but also from neighbouring Kalimantan, total protection of the resources remains a great challenge. Evidence of encroachment and poaching has been discovered, including jungle camps and animal traps. Illegal fishing in several rivers and tributaries has become more rampant. The Park is an important catchment and natural habitat for biodiversity, and contributes significantly to the socio-economic and cultural developments of the local communities. This fact must not be taken for granted. If enforcement is not strengthened, the habitats will gradually and surely deteriorate, and the biodiversity affected. Eco-tourism cannot be effectively developed when the vegetation is damaged and the rivers are polluted.

The following recommendations are made:

- Continue the vegetation and flora inventory to collect sufficient baseline information for vegetation mapping, zoning, planning and development;
- The Park has a rich and diverse collection of plants that possess ethnobotanical properties. Studies to tap their economic potential can bring social and financial benefits;
- Only a draft management plan exists, prepared in 1993. More baseline data on the flora and fauna will be needed to enable a long term management plan to be developed;

- As the Park is contiguous with LEWS in the north, consider the need for integrated management of the biological resources, especially with respect to the orangutan and the rare bird species such as the hornbills and Argus pheasant;
- Strengthen enforcement and management presence on the ground to ensure total protection of the Park and its forest resources. Train and involve the local communities in protection and management;
- Step up efforts to create greater awareness among all the local stakeholders, including those residing in the nearby towns and settlement schemes outside the buffer zones. The programme should also be extended to the rural schools.

A list of longhouses to which privileges to hunt and collect jungle produce in the Park has been granted.

- i. Rumah Rimong ak Alek (Tapang Jarau Entambah). Has since moved to Skrang Resettlement Scheme;
- ii. Rumah Mujab ak Tibuk (Ng. Beretik)
- iii. Rumah Nira ak Cheong, later became Rumah Endan ak Luyoh (Ng. Tibu)
- iv. Rumah Kana ak Median (Sg. Jengin)
- v. Rumah Chaneing ak Resa (Pala Taong)
- vi. Rumah Along ak Dana, later became Rumah Nyumbang ak Janguk (Ng. Sumpa)
- vii. Rumah Kasi ak Sanggong (Jambu)

A CHECKLIST OF TREE FLORA IN DIFFERENT FOREST HABITATS

Primary Mixed Dipterocarp Forest

Family	Botanical name	Local name
Alangiaceae	<i>Alangium javanicum</i> (Bl.) Wangerin	
	<i>Alangium longiflorum</i> Merr.	Midong
Anacardiaceae	<i>Buchanania sessilifolia</i> Bl.	Rengas
	<i>Buchanania</i> sp.	Terentang Chit
	<i>Camptosperma auriculatum</i> (Bl.) Hook. f.	Terentang
	<i>Gluta beccarii</i> (Engl.) D. Hou	Rengas
	<i>Gluta wallichii</i> (Hook. f.) D. Hou	Rengas
	<i>Mangifera khoonmengiana</i> Kost.	Raba
	<i>Semecarpus glaucus</i> Engl.	Rengas
	<i>Swintonia foxworthyi</i> Elmer	Pitoh
Anisophylleaceae	<i>Anisophyllea beccariana</i> Baill.	Mertama
Annonaceae	<i>Cyathocalyx havilandii</i> Boerl.	Pendok
	<i>Cyathocalyx pruniferus</i> (Maingay ex Hook. f. & Thoms.) J. Sincl.	Pendok
	<i>Goniothalamus malayanus</i> Hook. f. & Thoms.	Selukai
	<i>Polyalthia cauliflora</i> Hook. f. & Thoms.	Semukau
	<i>Polyalthia motleyana</i> (Hook. f.) Airy Shaw	Semukau
	<i>Xylopiya lanceolata</i> Ridl.	Sengkajang
Aquifoliaceae	<i>Ilex cissoidea</i> Loes.	Kerdam
	<i>Ilex cymosa</i> Bl.	Kerdam
Araliaceae	<i>Arthrophyllum</i> sp.	Tumbuh kelapa
Bombacaceae	<i>Durio griffithii</i> (Mast.) Bakh.	Durian
Burseraceae	<i>Canarium apertum</i> H.J.Lam	Seladah
	<i>Canarium fusco-calycinum</i> Stapf ex Ridl.	Seladah

	<i>Canarium littorale</i> Bl.	Seladah
	<i>Dacryodes incurvata</i> (Engl.) H.J. Lam	Seladah
	<i>Dacryodes longifolia</i> (King) H.J. Lam	Seladah
	<i>Dacryodes rostrata</i> (Bl.) H.J. Lam	Seladah
	<i>Dacryodes rugosa</i> (Bl.) H.J. Lam	Seladah
	<i>Santiria apiculata</i> A.W. Benn.	Seladah
	<i>Santiria conferta</i> A.W. Benn.	Seladah
	<i>Santiria laevigata</i> Bl.	Seladah
	<i>Santiria megaphylla</i> Kalkm.	Seladah
	<i>Santiria rubiginosa</i> Bl.	Seladah daun kecil
Celastraceae	<i>Microtropis kinabaluensis</i> Merr. & Freeman	Perupok
Clusiaceae (Guttiferae)	<i>Calophyllum soulattri</i> Burm.	Bintangor
	<i>Calophyllum banyengii</i> P.F. Stevens	Bintangor
	<i>Garcinia beccarii</i> Pierre	Kandis
	<i>Garcinia blumei</i> Pierre	Kandis
	<i>Garcinia caudiculata</i> Ridl.	Kandis
	<i>Garcinia nervosa</i> Miq.	Kandis
	<i>Kayea congestiflora</i> P.F. Stevens	Mergasing
	<i>Mesua borneensis</i> P.F. Stevens	Mergasing
	<i>Mesua calophylloides</i> (Ridl.) Kosterm.	Mergasing
Convolvulaceae	<i>Erycibe glomerata</i> Bl.	Nyalin kikir
	<i>Erycibe impressa</i> Hoogland	Nyalin kikir
Crypteroniaceae	<i>Crypteronia glabriflora</i> Pereira & Wong	Ubah semut
	<i>Crypteronia griffithii</i> Cl.	Ubah semut
	<i>Crypteronia macrophylla</i> Beusekom	Ubah semut
Chrysobalanaceae	<i>Atuna racemosa</i> Rafin.	Merbatu
Dilleniaceae	<i>Dillenia excelsa</i> (Jack) Gilg	Simpoh
Dipterocarpaceae	<i>Dipterocarpus conformis</i> Slooten	Keruing
	<i>Dipterocarpus kunstleri</i> King	Keruing
	<i>Hopea bullatifolia</i> P.S. Ashton	Luis

	<i>Hopea griffithii</i> Kurz	Luis
	<i>Hopea latifolia</i> Symington	Luis
	<i>Hopea pachycarpa</i> (Heim) Symington	Luis
	<i>Hopea</i> sp.	Luis
	<i>Shorea faguetiana</i> Heim	Lun
	<i>Shorea amplexicaulis</i> Ashton	Engkabang pinang
	<i>Shorea angustifolia</i> Ashton	Resak
	<i>Shorea asahi</i> Ashton	Selangan batu
	<i>Shorea domatiosa</i> Ashton	Selangan batu
	<i>Shorea falcifera</i> Dyer ex Brandis	Selangan batu
	<i>Shorea macroptera</i> Dyer	Meranti melantai
	<i>Shorea parvifolia</i> Dyer	Meranti sarang punai
	<i>Vatica brevipes</i> P.S.Ashton	Resak
	<i>Vatica dulitensis</i> Symington	Resak
	<i>Vatica micrantha</i> Slooten	Resak
	<i>Vatica oblongifolia</i> Hook. f.	Resak membangan
	<i>Vatica vinosa</i> Ashton	Resak
Ebenaceae	<i>Diospyros borneensis</i> Hiern	Kayu malam
	<i>Diospyros siamang</i> Bakh.	Kayu malam
Elaeocarpaceae	<i>Elaeocarpus acrantherus</i> Merr.	Pabum
	<i>Elaeocarpus canipes</i> Knuth	Perdu
	<i>Elaeocarpus ferruginea</i> Rich.	Perdu
	<i>Elaeocarpus griffithii</i> (Wight) A. Gray	Perdu
	<i>Elaeocarpus marginatus</i> Stapf ex Weibel	Sengkurat
	<i>Elaeocarpus mastersii</i> King	Sengkurat
Euphorbiaceae	<i>Agrostistachys borneensis</i> Becc.	Malau pucuk
	<i>Agrostistachys longifolia</i> (Wight) Benth. ex Hook.	Malau pucuk
	<i>Antidesma cordatum</i> Airy Shaw	Bernai

<i>Aporusa falcifera</i> Hook. f.	Kayu masam
<i>Aporusa prainiana</i> King ex. Gage	Jangau
<i>Aporusa benthamiana</i> Hook. f.	Kayu masam
<i>Aporusa frutescens</i> Bl.	Kayu masam
<i>Aporusa grandularis</i> Airy Shaw	Kayu masam
<i>Aporusa lucida</i> (Miq.) Airy Shaw	Kayu masam
<i>Baccaurea macrocarpa</i> (Miq.) Muell. Arg.	Tampoi
<i>Baccaurea racemosa</i> Muell. Arg	Engkuni
<i>Baccaurea sumatrana</i> (Miq.) Muell. Arg.	Puak burung
<i>Cephalomappa beccariana</i> Baill.	Arau
<i>Cleistanthus nitidus</i> Hook. f.	Pala beriak
<i>Koilodepas laevigatum</i> Airy Shaw	Puti
<i>Macaranga pearsonii</i> Merr.	Purang
<i>Macaranga winkleri</i> Pax ex Hoffm.	Purang
<i>Mallotus brevipetiolatus</i> Gage	Ensarai
<i>Mallotus eucaustus</i> Airy Shaw	Ensarai
<i>Mallotus griffithianus</i> Hook. f.	Ensarai
<i>Mallotus korthalsii</i> Muell. Arg.	Ensarai
<i>Mallotus penangensis</i> Muell. Arg.	Ensarai
<i>Neoscortechinia forbesii</i> (Hook. f.) Pax ex. S. Moore.	Bulang (L) Bantas
<i>Pimelodendron griffithianum</i> (Muell. Arg.) Benth.	Kelampai sitak
<i>Trigonopleura malayana</i> Hook. f.	Sidek
<i>Castanopsis clemensii</i> Soepadmo	Berangan biris
<i>Castanopsis javanica</i> (Bl.) A. DC.	Berangan biris
<i>Castanopsis motleyana</i> King	Berangan
<i>Castanopsis psilophylla</i> Soepadmo	Berangan
<i>Lithocarpus coopertus</i> (Blanco) Rehd.	Empili
<i>Lithocarpus ferrugineus</i> Soepadmo	Empili
<i>Lithocarpus jacobsii</i> Soepadmo	Empili

Fagaceae

	<i>Lithocarpus kunstleri</i> (King et Hook. f.) A. Camus	Empili
	<i>Lithocarpus meijeri</i> Soepadmo	Empili
	<i>Lithocarpus porcatus</i> Soepadmo	Empili
	<i>Lithocarpus sundaicus</i> (Bl.) Rehd.	Empili
	<i>Quercus subsericea</i> A. Camus	Empili
Flacourtiaceae	<i>Hydnocarpus beccariana</i> Sleum.	Senumpul
	<i>Hydnocarpus borneensis</i> Sleum.	Senumpul
	<i>Hydnocarpus kunstleri</i> (King) Warb.	Senumpul
	<i>Hydnocarpus pinguis</i> Sleum.	Senumpul
	<i>Hydnocarpus sumatrana</i> (Miq.) Koord.	Senumpul
	<i>Hydnocarpus woodii</i> Merr.	Senumpul
Gonystylaceae	<i>Gonystylus affinis</i> Ridl.	Ramin
	<i>Gonystylus bancanus</i> (Miq.) Kurz	Ramin
	<i>Gonystylus acuminatus</i> Airy Shaw	Ramin
Hypericaceae	<i>Cratoxylum arborescens</i> (Vahl.) Bl.	Geronggang
Icacinaceae	<i>Stemonurus umbellatus</i> Becc.	Semburuk
Lauraceae	<i>Alseodaphne albifrons</i> Kosterm.	Medang
	<i>Cinnamomum crassinervium</i> Miq.	Medang teja
	<i>Cryptocarya laevigata</i> Bl.	Medang
	<i>Dehaasia brachybotrys</i> (Merr.) Kosterm.	Medang
	<i>Dehaasia firma</i> Bl.	Medang
	<i>Endiandra macrophylla</i> Bl.	Medang bejubai
	<i>Lindera pipericarpa</i> Boerl.	Medang
	<i>Lindera</i> sp.	Medang
	<i>Litsea cylindrocarpa</i> Gamble	Medang
	<i>Litsea ferruginea</i> (Bl.) Bl.	Medang
	<i>Litsea garciae</i> Vidal	Medang
	<i>Litsea lanceolata</i> (Bl.) Kosterm.	Medang
	<i>Litsea oppositifolia</i> (Bl.) Vill.	Medang

Lecythidaceae	<i>Barringtonia curranii</i> Merr.	Putat
	<i>Barringtonia lanceolata</i> (Ridl.) Payens	Putat
	<i>Barringtonia reticulata</i> Bl.	Putat
Leguminosae	<i>Adenanthera kostermansii</i> Nielsen	
	<i>Adenanthera borneensis</i> Brace ex King	
	<i>Archidendron clypearia</i> (Jack) Nielsen	Kenarang
	<i>Dialium indum</i> L.	KerANJI
	<i>Dialium kunstleri</i> Prain	KerANJI
	<i>Fordia borneensis</i> Ridl.	Biansu
	<i>Fordia coriacea</i> Dunn	Biansu
	<i>Fordia splendidissima</i> (Blume ex Miq.) J.R.M. Buijsen	Biansu
	<i>Koompassia malaccensis</i> Maingay ex Benth.	Menggris
Loganiaceae	<i>Fagraea crassipes</i> Benth.	Tembusu / Sukong ranyai (L)
	<i>Fagraea gigantea</i> Ridl.	Tembusu
Melastomataceae	<i>Anerinckleistus setulosus</i> Schwartz	
	<i>Kibessia azeura</i> (Bl.) DC	Pulu
	<i>Melastoma</i> sp.	Kemunting
	<i>Oxyspora beccarii</i> (Cogn.) J.F. Maxwell	Kemunting
	<i>Pternandra coerulescens</i> Jack	Pulu
	<i>Pternandra gracilis</i> J.F. Maxwell	Pulu
	<i>Pternandra hirtella</i> (Cogn.) J.F. Maxwell	Pulu
Meliaceae	<i>Aglaiia hiernii</i> King	Segera
	<i>Aglaiia megistocarpa</i> Merr.	Segera
	<i>Chisocheton ceramicus</i> (Miq.) DC	Segera
Moraceae	<i>Artocarpus odoratissimus</i> Blanco	Pingan
	<i>Artocarpus rigidus</i> Bl.	Pala munsuh
	<i>Artocarpus dadah</i>	Dadah
	<i>Artocarpus integer</i> (Thunb.) Merr.	Cempedak
	<i>Artocarpus nitidus</i> Trec.	Selangking
	<i>Artocarpus peltatus</i> Merr.	
	<i>Ficus aurata</i> (Miq.) Miq.	Tempan

Myristicaceae	<i>Gymnacranthera contracta</i> Warb.	Kumpang
	<i>Horsfieldia brachiata</i> (King) Warb.	Kumpang
	<i>Horsfieldia brachiata</i> (King) Warb. var. <i>sumatrana</i>	Kumpang
	<i>Knema cf. cinerea</i> (Poir) Warb. var. <i>alpina</i> J. Sincl.	Kumpang
	<i>Knema cinerea</i> (Poir) Warb. var. <i>alpina</i> J. Sincl.	Kumpang
	<i>Knema glauca</i> (Bl.) Warb.	Kumpang
Myrsinaceae	<i>Ardisia beccariana</i> Mez.	Merjemah
	<i>Ardisia borneensis</i> Scheff.	Merjemah
	<i>Ardisia colorata</i> Roxb.	Merjemah
	<i>Ardisia lanceolata</i> Roxb.	Merjemah
	<i>Ardisia lepidotula</i> Merr.	Merjemah
Myrtaceae	<i>Eugenia alcinae</i> Merr.	Ubah
	<i>Eugenia ampullaria</i> Stapf	Ubah
	<i>Eugenia arcuatineria</i> Merr.	Ubah
	<i>Eugenia brachypoda</i> Merr. & L. M. Perry	Ubah
	<i>Eugenia chlorantha</i> Duthie	Ubah
	<i>Eugenia cuneiformis</i> Merr. & L. M. Perry	Ubah
	<i>Eugenia elliptilimba</i> Merr.	Ubah
	<i>Eugenia grandis</i> Wight	Ubah
	<i>Eugenia hoseana</i> King	Ubah
	<i>Eugenia kunstleri</i> King	Ubah
	<i>Eugenia lineata</i> (Bl.) Dunthie	Ubah
	<i>Eugenia macromyrtus</i> Koord. & Valet	Ubah
	<i>Eugenia</i> sp.	Ubah
<i>Tristaniopsis whiteana</i> Griff.	Selunsor putih	
Olacaceae	<i>Ochanostachys amentacea</i> Mast.	Sentikal
Oleaceae	<i>Chionanthus lucens</i> R. Kiew	Mok
	<i>Olea brachiata</i> Merr.	Mok

Polygalaceae	<i>Xanthophyllum amoenum</i> Chod.	Nyalin
	<i>Xanthophyllum ecarinatum</i> Chod.	Nyalin
	<i>Xanthophyllum flavescens</i> Roxb.	Nyalin
	<i>Xanthophyllum</i> sp.	Nyalin
Proteaceae	<i>Helicia petiolaris</i> Benn.	Palis
Rosaceae	<i>Prunus arborea</i> (Bl.) Kalkm.	Enteli
Rubiaceae	<i>Canthium umbelligerum</i> Miq.	Tulang ular
	<i>Diplospora beccariana</i> King & Gamble	Kopi hutan
	<i>Ixora blumei</i> Zoll. ex Merr.	Gergansai
	<i>Ixora capitellata</i> Bremek.	Gergansai
	<i>Lasianthus clementis</i> Merr.	Sabar bubu
	<i>Lasianthus maingayi</i> Hook. f.	Sabar bubu
	<i>Pleiocarpidia capituligera</i> (Ridl.) Bremek.	Sabar bubu
	<i>Porterandia anisophylla</i> (Jack ex Roxb.) Ridl. Bl.	Engkudu hutan
Psychotria laxiflora Bl.	<i>Randia scortechinii</i> King & Gamble	
	<i>Tarenna fragrans</i> (Bl.) Koord. et Valetton	Sabar bubu
	<i>Urophyllum hirsutum</i> Hook. f.	Mengkudu hutan
	<i>Urophyllum nigricans</i> Wernh.	Sabar bubu
Sapindaceae	<i>Lepisanthes fruticosa</i> (Ridlk.) Leenh.	Engkelili hutan
	<i>Lepisanthes amoena</i> (Hassk.) Leenh.	Engkelili hutan
	<i>Nephelium cuspidatum</i> Bl.	Rambutan
	<i>Nephelium cuspidatum</i> Bl. var. <i>multinervia</i> Leenh.	Kedabang
	<i>Nephelium maingayi</i> Hiern.	Rambutan
	<i>Nephelium ramboutan-ake</i> (Labill.) Leenh.	Kedabang
	<i>Xerospermum laevigatum</i> Bl.	Ilat / Tundun biawak
	<i>Xerospermum norronhianum</i> Bl.	Ilat

Sapotaceae	<i>Palaquium dasyphyllum</i> (De Vries) Pierre ex Dubard	Nyatoh
	<i>Palaquium elegans</i> Griff. & H. J. Lam	Nyatoh
	<i>Palaquium majas</i> H. J. Lam	Nyatoh
	<i>Palaquium stipulare</i> Pierre ex Durbarb	Nyatoh daun besar
Sterculiaceae	<i>Scaphium macropodum</i> (Miq.) Beumee ex Heyne	Kembang semangkok
	<i>Scaphium parviflorum</i> Kost.	Kembang semangkok
Theaceae	<i>Adinandra acuminata</i> Korth.	Legai
	<i>Adinandra clemensiae</i> Kobuski	Legai
	<i>Adinandra cordifolia</i> Ridl.	Legai
	<i>Ternstroemia magnifica</i> Stapf ex Ridl.	Legai
	<i>Ternstroemia penangiana</i> Choisy	Legai
Tiliaceae	<i>Brownlowia ovalis</i> Kosterm.	Baru
	<i>Microcos antidesmifolia</i> Burret	Baru
	<i>Pentace borneensis</i> Pierre	Baru
	<i>Pentace laxiflora</i> Merr.	Baru
	<i>Pentace</i> sp.	Baru
Trigoniaceae	<i>Trigoniastrum hypoleucum</i> Miq.	Nyalin bintik
Ulmaceae	<i>Girroniera parvifolia</i> Planch.	Medang kasap
	<i>Girroniera subaequalis</i> Planch.	Medang kasap
	<i>Girroniera nervosa</i> Planch.	Medang kasap
Verbenaceae	<i>Teijsmanniodendron</i> sp.	Entabuluh

Old Secondary Forest

Family	Botanical name	Local Name
Anacardiaceae	<i>Buchanania sessifolia</i> Bl.	Terentang chit
	<i>Camptosperma auriculatum</i> (Bl.) Hook. f.	Terentang bertelinga
	<i>Gluta velutina</i> Bl.	Rengas
	<i>Semecarpus bunburyanus</i> Gibbs.	Rengas
Anisophylleaceae	<i>Anisophyllea beccariana</i> Baill.	Mertama
	<i>Anisophyllea corneri</i> D.Hou	Mertama
	<i>Anisophyllea disticha</i> (Jack) Baill.	Mertama ribu
Annonaceae	<i>Cyathocalyx havilandii</i> Boerl.	Pendok
	<i>Polyalthia cauliflora</i> Hook. f. & Thoms.	Semukau
	<i>Polyalthia motleyana</i> (Hook. f.) Airy Shaw	Semukau wangi
	<i>Polyalthia</i> sp.	Semukau wangi
Aquifoliaceae	<i>Ilex cissoidea</i> Loes.	Kerdam
	<i>Ilex clemensiae</i> Heine	Kerdam
	<i>Ilex havilandii</i> Loes.	Kerdam
Araliaceae	<i>Arthrophyllum ovatum</i> Ridl.	Tumbuh kelapa
Bombacaceae	<i>Durio griffithii</i> (Mast.) Bakh.	Rian Burung
	<i>Durio lanceolatus</i> Mast.	Durian
Burseraceae	<i>Canarium apertum</i> H. J. Lam	Seladah
	<i>Canarium fusco-calycinum</i> Stapf ex Ridl.	Seladah
	<i>Canarium littolare</i> Bl.	Seladah
	<i>Canarium merrillii</i> H. J. Lam	Seladah
	<i>Canarium pilosum</i> A.W. Benn. ssp. <i>pilosum</i>	Seladah
	<i>Dacryodes cf. pubarula</i> (Benn.) H. J. Lam	Seladah
	<i>Dacryodes longifolia</i> (King) H. J. Lam	Seladah
	<i>Dacryodes nervosa</i> (H. J. Lam) Leenh.	Seladah
	<i>Dacryodes rostrata</i> (Bl.) H. J. Lam	Kemayau
	<i>Santiria apiculata</i> A.W. Benn.	Seladah
<i>Santiria apiculata</i> Benn. var. <i>apiculata</i>	Seladah	

	<i>Santiria grandiflora</i> Kalkm.	Seladah
	<i>Santiria laevigata</i> Bl.	Seladah
	<i>Santiria megaphylla</i> Kalkm.	Seladah
	<i>Santiria rubiginosa</i> Bl.	Seladah daun kecil
Chrysobalanaceae	<i>Parinari canarioides</i> Kosterm.	Merbatu
	<i>Parinari glaberrima</i> Hassk.	Merbatu
	<i>Parinari polyneura</i> Miq.	Merbatu
Clusiaceae (Guttiferae)	<i>Calophyllum banyengii</i> P.F. Stevens	Kandis
	<i>Calophyllum gracilipes</i> Merr.	Bintangor
	<i>Calophyllum recurvatum</i> P.F. Stevens	Bintangor
	<i>Calophyllum rubiginosum</i> Hend. & Wyatt-Sm.	Bintangor
	<i>Calophyllum soulatri</i> Burm.	Bintangor
	<i>Calophyllum</i> sp.	Bintangor
	<i>Calophyllum teysmanii</i> Miq.	Bintangor/ Cenaga
	<i>Garcinia beccarii</i> Pierre	Kandis
	<i>Garcinia blumei</i> Pierre	Kandis
	<i>Garcinia caudiculata</i> Ridl.	Kandis
	<i>Garcinia dryobalaniodes</i> Pierre	Kandis
	<i>Garcinia motleyana</i> Pierre	Kandis
	<i>Garcinia nervosa</i> Miq.	Kandis
	<i>Mesua myrtifolia</i> (Baill.) Kosterm.	Mergasing
Crypteroniaceae	<i>Crypteronia glabriflora</i> Pereira & Wong	Ubah semut
	<i>Crypteronia griffithii</i> Cl.	Ubah semut
	<i>Crypteronia macrophylla</i> Beusekom	Ubah semut
	<i>Crypteronia paniculata</i> Bl.	Ubah semut
Dilleniaceae	<i>Dillenia excelsa</i> (Jack) Gilg	Simpoh
Dipterocarpaceae	<i>Hopea pachycarpa</i> (Heim) Symington	Luis
	<i>Shorea amplexicaulis</i> Ashton	Meranti kawang pinang licin
	<i>Vatica vinosa</i> Ashton	Resak

Ebenaceae	<i>Diospyros anadamanica</i> (Kurz) Bakh.	Kayu malam
	<i>Diospyros beccarii</i> Hiern	Kayu malam
	<i>Diospyros borneensis</i> Heirn	Kayu malam
	<i>Diospyros confertiflora</i> (Heirn) Bakh.	Kayu malam
Elaeocarpaceae	<i>Elaeocarpus beccarii</i> A. DC.	Perdu / Empedu
	<i>Elaeocarpus canipes</i> Knuth	Perdu / Empedu
	<i>Elaeocarpus conoideus</i> Korth.	Perdu / Empedu
	<i>Elaeocarpus ferruginea</i> Rich.	Perdu / Empedu
	<i>Elaeocarpus griffithii</i> (Wight) A. Gray	Perdu / Empedu
	<i>Elaeocarpus nitidus</i> Jack	Perdu / Empedu
	<i>Elaeocarpus pedunculatus</i> Wall. ex Mast	Perdu/ Empedu
	<i>Elaeocarpus stipularis</i> Bl.	Perdu / Empedu
Erythroxylaceae	<i>Erythroxylum cuneatum</i> Kurz	Manding
Euphorbiaceae	<i>Antidesma cordatum</i> Airy Shaw	Berenai
	<i>Antidesma leucopodum</i> Miq.	Berenai
	<i>Antidesma tomentosum</i> Bl.	Berenai
	<i>Aporusa subcaudata</i> Merr.	Kayu masam
	<i>Aporusa antennifera</i> (Airy Shaw) Airy Shaw	Kayu masam
	<i>Aporusa benthamiana</i> Hook. f.	Kayu masam
	<i>Aporusa confusa</i> Gage	Kayu masam
	<i>Aporusa elmeri</i> Merr.	Kayu masam
	<i>Aporusa falcifera</i> Hook. f.	Kayu masam
	<i>Aporusa frutescens</i> Bl.	Kayu masam
	<i>Aporusa prainiana</i> King ex Gage	Kayu masam
	<i>Aporusa subcaudata</i> Merr.	Kayu masam
	<i>Baccaurea hookeri</i> Gage	Jelintik
	<i>Baccaurea macrocarpa</i> (Miq.) Muell. Arg.	Puak
	<i>Baccaurea sumatrana</i> (Miq.) Muell. Arg	Tampoi
	<i>Breynia coronata</i> Hook. f.	Manyam
	<i>Breynia racemosa</i> (Bl.) Muell. Arg.	Manyam
	<i>Glochidion littorale</i> Bl.	Kenanang

	<i>Hevea brasiliensis</i> Muell. Arg	Getah
	<i>Macaranga beccariana</i> Merr.	Purang
	<i>Macaranga caladiifolia</i> Becc.	Purang semut
	<i>Macaranga gigantea</i> Muell. Arg	Merakubong
	<i>Macaranga hosei</i> King ex Hook. f.	Purang taji
	<i>Macaranga petanostyla</i> Airy Shaw	Benuah
	<i>Macaranga recurvata</i> Gage	Purang
	<i>Macaranga</i> sp.	Purang
	<i>Macaranga winkleri</i> Pax et Hoffm.	Purang
	<i>Mallotus brevipetiolatus</i> Gage	Ensarai
	<i>Pimelodendron griffithianum</i> (Muell. Arg) Benth.	Kelampai sitak
	<i>Trigonopleura malayana</i> Hook. f.	Sedi
Fagaceae	<i>Castanopsis foxworthyi</i> Schottky	Berangan
	<i>Castanopsis clemensii</i> Soepadmo	Berangan biris
	<i>Castanopsis costata</i> (Bl.) A. DC.	Berangan
	<i>Castanopsis hypophoenicea</i> (Seem.) Soepadmo	Berangan
	<i>Castanopsis javanica</i> (Bl.) A. DC.	Berangan biris
	<i>Castanopsis psilophylla</i> Soepadmo	Berangan
	<i>Lithocarpus bennettii</i> (Miq.) Rehd.	Empili
	<i>Lithocarpus cantleyanus</i> (King ex Hook. f.) Rehd.	Empili
	<i>Lithocarpus conocarpus</i> Rehd.	Empili
	<i>Lithocarpus hallieri</i> (Seem.) A. Camus	Empili
	<i>Lithocarpus jacobsii</i> Soepadmo	Empili
	<i>Lithocarpus kunstleri</i> (King et Hook. f.) A. Camus	Empili
	<i>Lithocarpus meijeri</i> Soepadmo	Empili
	<i>Lithocarpus nieuwenhuisii</i> (Seem.) A. Camus	Empili
	<i>Lithocarpus porcatus</i> Soepadmo	Empil
	<i>Lithocarpus pusillus</i> Soepadmo	Empili

	<i>Lithocarpus reflexus</i> King	Empili
	<i>Lithocarpus sundaicus</i> (Bl.) Rehd.	Empili
	<i>Lithocarpus urceolaris</i> (Jack) Merr.	Empili
	<i>Quercus argentata</i> Korth.	Empili
Flacourtiaceae	<i>Hydnocarpus anomala</i> (Merr.) Sleum.	
	<i>Hydnocarpus beccariana</i> Sleum.	Senumpul
	<i>Hydnocarpus kunstleri</i> (King) Warb.	Senumpul
	<i>Hydnocarpus tenuipetala</i> Sleum.	Senumpul
Gonystylaceae	<i>Gonystylus acuminatus</i> Airy Shaw	Ramin
	<i>Gonystylus borneensis</i> (Tiegh.) Gilg	Ramin
Hypericaceae	<i>Cratoxylum arborescens</i> (Vahl.) Bl.	Geronggang
	<i>Cratoxylum cochinchinense</i> (Lour) Bl.	Geronggang
Icacinaceae	<i>Stemonurus umbellatus</i> Becc.	Semburuk
Ixonanthaceae	<i>Ixonanthes reticulata</i> Jack	Inggi burung
Lauraceae	<i>Alseodaphne albifrons</i> Kosterm.	Medang
	<i>Alseodaphne coriacea</i> Kosterm.	Medang
	<i>Beilschmiedia glauciphylla</i> Kosterm.	Medang
	<i>Beilschmiedia maingayi</i> Hook. f.	Medang
	<i>Cinnamomum crassinervium</i> Miq.	Medang tija
	<i>Dehaasia incrassata</i> (Jack) Kosterm.	Medang
	<i>Dehaasia</i> sp.	Medang
	<i>Dehaasia turfosa</i> Kosterm.	Medang
	<i>Endiandra macrophylla</i> Bl.	Medang
	<i>Endiandra rubescens</i> (Bl.) Miq.	Medang
	<i>Lindera pipericarpa</i> Boerl.	Medang
	<i>Lindera</i> sp.	Medang
	<i>Litsea crassifolia</i> (Bl.) Boerl.	Medang
	<i>Litsea ferruginea</i> (Bl.) Bl.	Medang
	<i>Litsea garciae</i> Vidal	Medang enkala
	<i>Litsea lanceolata</i> (Bl.) Kosterm.	Medang
	<i>Litsea oppositifolia</i> (Bl.) Vill.	Medang
	<i>Litsea trunciflora</i> Gamble	Medang

Lecythidaceae	<i>Barringtonia curranii</i> Merr.	Putat
	<i>Barringtonia lanceolata</i> (Ridl.) Payens	Putat
	<i>Barringtonia reticulata</i> (Bl.) Miq.	Putat paya
	<i>Barringtonia sarcostachys</i> (Bl.) Miq.	Putat
Leguminosae	<i>Archidendron clypearia</i> (Jack) Nielsen	Kenarang
	<i>Archidendron clypearia</i> (Jack) Nielsen <i>var casai</i>	Kenarang
	<i>Archidendron jiringa</i> (Jack) Nielsen	Jering hutan
	<i>Bauhinia endertii</i> K. Larsen & S.S. Larsen	
	<i>Biansu coriacea</i> Dunn	Biansu
	<i>Dialium indum</i> L.	KerANJI madu
	<i>Fordia borneensis</i> Ridl.	Biansu
	<i>Fordia</i> sp.	Biansu
	<i>Fordia splendidissima</i> (Bl. ex Miq.) J.R.M.Buijsen	Biansu
	<i>Koompasia malaccensis</i> Maingay ex Benth.	Menggris
	<i>Parkia speciosa</i> Hassk.	Petai
	<i>Spatholobus oblongifolius</i> Merr.	Akar kemedu
Loganiaceae	<i>Fagraea crassipes</i> Benth.	Sukong ranyai
	<i>Fagraea elliptica</i> Roxb.	Tembusu
Melastomataceae	<i>Kibessia azeura</i> (Bl.) DC.	Pulu
	<i>Memecylon campanulatum</i> C.B.Cl.	Nipis kulit
	<i>Pternandra gracilis</i> J.F.Maxwell	Pulu
	<i>Pternandra hirtella</i> (Cogn.) J.F.Maxwell	Pulu
Meliaceae	<i>Aglaia odoratissima</i> Bl.	Segera ai
	<i>Aglaia forbesii</i> King	Segera
Moraceae	<i>Artocarpus anisophyllus</i> Miq.	Bintawa
	<i>Artocarpus elasticus</i> Reiw. ex Bl.	Tekalong
	<i>Artocarpus integer</i> (Thunb.) Merr.	Cempedak
	<i>Artocarpus nitidus</i> Trec.	Selangking
	<i>Artocarpus odoratissimus</i> Blanco	Pingan
	<i>Artocarpus rigidus</i> Bl.	Pala munsuh
	<i>Ficus brunneo-aurata</i> Corner	Tempan
	<i>Ficus uncinata</i> Becc.	Entimau

Myristicaceae	<i>Gymnacranthera forbesii</i> (King) Warb.	Kumpang
	<i>Gymnacranthera forbesii</i> (King) Warb. var. <i>grassinervis</i> (Warb.) Sincl.	Kumpang
	<i>Horsfieldia brachiata</i> (King) Warb.	Kumpang
	<i>Horsfieldia brachiata</i> (King) Warb. var. <i>sumatrana</i>	Kumpang
	<i>Horsfieldia grandis</i> (Hook. f.) Warb	Kumpang
	<i>Knema cinerea</i> (Pair) Warb. var. <i>sumatrana</i>	Kumpang
	<i>Knema cinerea</i> var. <i>pentinervia</i> (Sinc.) Sincl.	Kumpang
	<i>Knema elmeri</i> Merr.	Kumpang
	<i>Knema glauca</i> (Bl.) Warb.	Kumpang
Myrsinaceae	<i>Ardisia beccariana</i> Mez.	Merjemah
	<i>Ardisia colorata</i> Roxb.	Merjemah
	<i>Ardisia lanceolata</i> Merr.	Merjemah
	<i>Ardisia lancifolia</i> Merr.	Merjemah
	<i>Ardisia lepidotula</i> Merr.	Merjemah
	<i>Ardisia marginata</i> Bl.	Merjemah
Myrtaceae	<i>Eugenia alcinae</i> Merr.	Ubah
	<i>Eugenia ampullaria</i> Stapf	Ubah
	<i>Eugenia anisosepala</i> Duthie	Ubah
	<i>Eugenia barringtoniodes</i> Ridl.	Ubah
	<i>Eugenia brachypoda</i> Merr. & L. M. Perry	Ubah
	<i>Eugenia caudatilimba</i> Merr.	Ubah
	<i>Eugenia cephalanthum</i> Ridl.	Ubah bunggang
	<i>Eugenia chlorantha</i> Duthie	Ubah
	<i>Eugenia corymbifera</i> Koord. et Valetton	Ubah daun besar
	<i>Eugenia cuneiformis</i> Merr. & L. M. Perry	Ubah
	<i>Eugenia elliptilimba</i> Merr.	Ubah
	<i>Eugenia fastigiata</i> (Bl.) Koord. & Valetton	Ubah
	<i>Eugenia grandis</i> Wight	Ubah

	<i>Eugenia griffithii</i> Duthie	Ubah
	<i>Eugenia havilandii</i> Merr.	Ubah
	<i>Eugenia hemsleyana</i> King	Ubah
	<i>Eugenia hoseana</i> King	Ubah
	<i>Eugenia kuchingensis</i> Merr.	Ubah
	<i>Eugenia kunstleri</i> King	Ubah
	<i>Eugenia lineata</i> (Bl.) Duthie	Ubah
	<i>Eugenia ochneocarpa</i> Merr.	Ubah
	<i>Eugenia punctilimba</i> Merr.	Ubah
	<i>Eugenia rejangensis</i> Merr. & L. M. Perry	Ubah
	<i>Tristaniopsis whiteana</i> Griff.	Selunsor putih
Ochnaceae	<i>Brackenridgea hookeri</i> A.Gray.	Ubah midin
Olacaceae	<i>Ochanostachys amentacea</i> Mast.	Sentikal
	<i>Scorodocarpus borneensis</i> Becc.	Bawang hutan
Oleaceae	<i>Chionanthus havilandii</i> Kiew	Mok
	<i>Chionanthus laxiflora</i> Bl.	Mok
	<i>Chionanthus lucens</i> R. Kiew	Mok
	<i>Olea brachiata</i> Merr.	Mok
Polygalaceae	<i>Xanthophyllum affine</i> Korth. ex. Miq.	Nyalin
	<i>Xanthophyllum cordatum</i> Korth. ex. Miq.	Nyalin
	<i>Xanthophyllum ecarinatum</i> Chod.	Nyalin
	<i>Xanthophyllum flavescens</i> Roxb.	Nyalin
	<i>Xanthophyllum parvifolium</i> Meijden	Nyalin
Rhizophoraceae	<i>Carallia borneensis</i> Oliv.	Rabong
	<i>Carallia brachiata</i> (Lour.) Merr.	Rabong
Rosaceae	<i>Prunus arborea</i> (Bl.) Kalkm.	Enteli
	<i>Prunus grisea</i> (Muell.) Kalkm.	Enteli
	<i>Prunus spicata</i> Kalkm.	Enteli
	<i>Trigonopleura malayana</i> Hook. f.	Sedi

Rubiaceae	<i>Anthocephalus chinensis</i> (Roxb.) Miq.	Kelampayan
	<i>Canthium confertum</i> Korth.	Tulang ular
	<i>Canthium umbelligerum</i> Miq.	Tulang ular
	<i>Diplospora beccariana</i> King & Gamble	Kopi Hutan
	<i>Ixora blumei</i> Zoll. ex. Merr.	Gergansai
	<i>Lasianthus clementis</i> Merr.	Sabar bubu
	<i>Lasianthus inaequalis</i> Bl.	Sabar bubu
	<i>Lasianthus maingayi</i> Hook. f.	Sabar bubu
	<i>Nauclea</i> sp.	Sabar bubu
	<i>Pleiocarpidia anisophylla</i> (Jack ex. Roxb.) Ridl.	Sabar bubu
	<i>Pleiocarpidia borneensis</i> (Miq.) Bremek.	Sabar bubu
	<i>Pleiocarpidia capituligera</i> (Ridl.) Bremek	Sabar bubu
	<i>Pleiocarpidia paniculata</i> (Ridl.) Poir.	
	<i>Porterandia anisophylla</i> (Jack ex Roxb.) Ridl.	Mengkudu hutan
	<i>Psychotria elmeri</i> Merr.	Engkerebai
	<i>Randia grandifolia</i> Ridl.	Mengkudu hutan
	<i>Randia grandis</i> (Korth.) Val.	Mengkudu hutan
	<i>Tarenna fragrans</i> (Bl.) Koord. et Valetton	Nyarum hutan
	<i>Timonius borneensis</i> Valetton	Bar
	<i>Urophyllum borneensis</i> Miq.	Sabar bubu
	<i>Urophyllum griffithianum</i> Hook. f.	Sabar bubu
	<i>Urophyllum nigricans</i> Wernh.	Sabar bubu
	<i>Xanthophytum borneense</i> (Valetton) Axelius	Sabar bubu
	<i>Xanthophytum</i> sp.	Sabar bubu
Rutaceae	<i>Tetractomia latifolia</i> Ridl.	Jari manok
	<i>Tetractomia tetrandrum</i> (Roxb.) Merr.	Rawang
Sapindaceae	<i>Lapisanthes fruticosa</i> (Ridlk.) Leenh.	Engkelili hutan
	<i>Lapisanthes amoena</i> (Hassk.) Radlk.	Engkelili
	<i>Nephelium cuspidatum</i> Bl.	Kedabang

	<i>Nephelium cuspidatum</i> Bl. var. <i>multinerve</i> Leenh.	Kedabang
	<i>Nephelium maingayi</i> Hiern	Mujau
	<i>Nephelium ramboutan-ake</i> (Labill.) Leenh.	Pudun
	<i>Xerospermum laevigatum</i> Bl.	Tundun biawak
Sapotaceae	<i>Madhuca kingiana</i> Brace v.d. Assem	Nyatoh
	<i>Palaquium rufo-lanigerum</i> P.Royen	Nyatoh
	<i>Palaquium gutta</i> (Hk. f.) Baill.	Nyatoh
	<i>Palaquium</i> spp. (2 Species)	Nyatoh
	<i>Palaquium stilupare</i> Pierre	Nyatoh
Sonneratiaceae	<i>Duabanga moluccana</i> Bl.	Sawih
Sterculiaceae	<i>Scaphium macropodum</i> (Miq.)	Kembang semangkok
	<i>Sterculia laevis</i> Wall.	Melebu
Theaceae	<i>Adinandra</i> cf. <i>verrucosa</i> Stapf	Legai
	<i>Adinandra clemensiae</i> Kobuski	Legai
	<i>Adinandra dumosa</i> Jack.	Legai
	<i>Ternstroemia bancana</i> Miq.	Legai
	<i>Ternstroemia penangiana</i> Choisy	Legai
Thymeliaceae	<i>Enkleia malaccensis</i> Griff.	
Tiliaceae	<i>Brownlowia glabrata</i> Stapf ex Ridl.	Bunsi
	<i>Grewia</i> sp.	Bunsi
	<i>Microcos antidesmifolia</i> Burret	Baru
	<i>Microcos fibrocarpa</i> Mast.	Bunsi
	<i>Pentace borneensis</i> Pierre	Baru
	<i>Pentace</i> sp.	Baru
	<i>Grewia stylocarpa</i> Warb	Baru
Trigoniaceae	<i>Trigoniastrum hypoleucum</i> Miq.	Nyalin bintik
Ulmaceae	<i>Gironniera nervosa</i> Planch.	Medang kasap
	<i>Gironniera parvifolia</i> Planch.	Medang kasap
	<i>Gironniera subaequalis</i> Planch.	Medang kasap
Verbenaceae	<i>Teijsmanniodendron simplicifolium</i> Merr.	Entabuluh
	<i>Vitex pinnata</i> Linn.	Leban

Young Secondary Forest

Family	Botanical name	Local name
Aquifoliaceae	<i>Ilex cissoidea</i> Loes.	Kerdam
Elaeocarpaceae	<i>Elaeocarpus canipes</i> Kunth	Perdu
Euphorbiaceae	<i>Glochidion littorale</i> Benth.	Manyam
	<i>Glochidion sericeum</i> Hook. f.	Manyam
	<i>Macaranga gigantea</i> Muell. Arg.	Merkubong, Benuah gajah
Hypericaceae	<i>Cratoxylum arborescens</i> (Vahl.) Bl.	Geronggang
Lauraceae	<i>Litsea ferruginea</i> (Bl.) Bl.	Medang
Leguminosae	<i>Archidendron clypearia</i> (Jack) Nielsen	Kenarang
Myristicaceae	<i>Knema curtisii</i> (King) Warb.	Kumpang
Moraceae	<i>Ficus brunneo-aurata</i> Corner	Tempan
Myrtaceae	<i>Eugenia corymbifera</i> Koord. et Valetton	Ubah daun besar
Rutaceae	<i>Euodia malayana</i> Ridl.	Serang
Rubiaceae	<i>Psychotria elmeri</i> Merr.	Engkerebai

A CHECKLIST OF NON-TREE FLORA IN DIFFERENT FOREST HABITATS

Primary Mixed Dipterocarp Forest

Family	Botanical	Local
Acanthaceae	<i>Cosmianthemum magnifolium</i> Bremek.	
Adiantaceae	<i>Taenitis blechnoides</i> (Willd.) Sw.	Paku
Amaryllidaceae	<i>Crinum asiaticum</i> Blanco.	Bakong
Annonaceae	<i>Fissistigma latifolium</i> Merr.	Akar rarak
	<i>Mitrella kentii</i> (Bl.) Miq.	Akar rarak
Apocynaceae	<i>Baharuia gracilis</i> D. J. Middleton	Akar buli
	<i>Chilocarpus beccarianus</i> Pierre	Akar buli
	<i>Chilocarpus rostratus</i> Markgr.	Akar buli
	<i>Melodinus lancifolius</i> Ridl.	Akar gelumangg
	<i>Parameria polyneura</i> Hook. f.	Akar buli
Araceae	<i>Alocasia longiloba</i> Miq.	Akar keladi
	<i>Homalomena sagittifolia</i> Jungh. ex Schott	Entemu
Aristolochiaceae	<i>Thottea muluensis</i> Ding Hou	Sunti babi
	<i>Thottea</i> sp.	Sunti babi
Asclepiadaceae	<i>Hoya</i> sp.	Akar gelumang
Aspleniaceae	<i>Asplenium nidus</i> Linn.	Paku Rajang
	<i>Asplenium salignum</i> Bl.	Paku rajang
	<i>Asplenium</i> sp.	Paku
Athyriaceae	<i>Diplazium cordifolium</i> Bl.	Paku
Begoniaceae	<i>Begonia asperula</i> Linn.	Riang
	<i>Begonia pubescens</i> Ridl.	Riang
	<i>Begonia sarawakensis</i> Ridl.	Riang
Connaraceae	<i>Agelaea insignis</i> (Schellenb.) Leenh.	Akar malam
	<i>Rourea mimosoides</i> Planch.	Akar malam

Dilleniaceae	<i>Tetracera akara</i> Merr.	Akar mempelas
	<i>Tetracera arborescens</i> Jack	Akar mempelas
	<i>Tetracera korthalsii</i> Miq.	Akar mempelas
Dipteridaceae	<i>Dipteris lobbiana</i> (Hook. f.) T. Moore	Paku
Dryopteridaceae	<i>Tectaria</i> sp.	Paku
Gesneriaceae	<i>Cyrtandra bracheia</i> B. L. Burtt	Melebab
	<i>Cyrtandra antuana</i> B. L. Burtt	Melebab
	<i>Cyrtandra sarawakensis</i> C. B. Cl.	Melebab
	<i>Didymocarpus platypus</i> C. B. Cl.	Melebab
	<i>Didymocarpus scabrinervis</i> C. B. Cl.	Melabab
	<i>Monophyllaea</i> sp.	
Gnetaceae	<i>Gnetum cuspidatum</i> Bl.	Akar dundun
Hymenophyllaceae	<i>Hymenophyllum productum</i> Kuntze	Paku
Leguminosae	<i>Spatholobus auricomus</i> J. W. A. Riddler-Numan	Akar kemadu
	<i>Spatholobus ferrugineus</i> (Zoll & Moritz) Benth.	Akar kemadu
	<i>Spatholobus macropterus</i> (Miq.)	Akar kemadu
	<i>Spatholobus strigillifera</i> Ridl.	Akar kemadu
	<i>Spatholobus oblongifolius</i> Merr.	
	<i>Whitfordtiodendron nieuwenhuisii</i> (J. J. Sm.) Dunn	Akar belum
Loganiaceae	<i>Strychnos minor</i> Dennst.	Akar kayas
Lycopodiaceae	<i>Lycopodium</i> sp.	
Maranthaceae	<i>Donax canniformis</i> (G. Forst.) K. Schum.	
Melastomataceae	<i>Anerincleistus setulosus</i> Schwartz	Kemunting
	<i>Dissochaeta stipularis</i> (Bl.) Baker ex Bakh. f.	Akar kemunting
	<i>Kibessia</i> cf. <i>gracilis</i> Cogn.	
	<i>Oxyspora</i> sp.	Kemunting
Menispermaceae	<i>Arcangelisia flava</i> (L.) Merr.	Akar badi
Moraceae	<i>Ficus deltoidea</i> Jack	
	<i>Ficus grandiflora</i> Corner	Tangkai kara beritu
	<i>Ficus tricarpa</i> Bl.	Akar ara

Nephrolepidaceae	<i>Nephrolepis falcata</i> (Cav.) C. Christ	
Palmae	<i>Areca insignis</i> var. <i>moorei</i> (Dransf.) Dransf.	Pinang
	<i>Areca minuta</i> Scheff.	Pinang
	<i>Calamus javensis</i> Bl.	Rotan jangut
	<i>Calamus retrophyllus</i> Becc.	Wi duduk
	<i>Ceratolobus korthalsii</i> Bl.	Rotan
	<i>Ceratolobus subangulatus</i> (Miq.) Becc.	Rotan
	<i>Daemonorops ingens</i> J. Dransf.	Wi duduk
	<i>Daemonorops longistipes</i> Burret	Rotan duduk
	<i>Daemonorops periacantha</i> Miq.	Rutan empunuk
	<i>Korthalsia</i> sp.	Rotan semut
	<i>Licuala grandis</i> H. Wendlly	Rotan
	<i>Pinanga angustisecta</i> Becc.	Pinang mureng
	<i>Pinanga crassipes</i> Becc.	Pinang
	<i>Pinanga patula</i> Bl.	Pinang mureng
	<i>Pinanga sessilifolia</i> Furtado	Pinang
Pandanaceae	<i>Freycinetia angustifolia</i> Bl.	Pandan
	<i>Pandanus brevifolius</i> Mart.	Pandan
Piperaceae	<i>Piper caninum</i> Bl.	Sireh
Rhamnaceae	<i>Zizyphus havilandii</i> Ridl.	Akar kuku menaul
Rubiaceae	<i>Acranthera didymocarpus</i> (Ridl.) K. M. Wong	Akar rubi
Selaginellaceae	<i>Selaginella</i> sp.	Paku
	<i>Selaginella grandis</i> T. Moore	Paku
Vitaceae	<i>Ampelocissus winkleri</i> Lauaterb.	Akar engkaranak
	<i>Ciccus ripens</i> Lam	Akar engkaranak
	<i>Cissus angustata</i> Ridl.	Akar engkaranak
	<i>Cissus rostrata</i> Korth. ex Planch.	Akar engkaranak
	<i>Tetrastigma pedunculare</i> (Wall.) Planch.	Akar ruran
	<i>Tetrastigma pedunculare</i> (Wall.) Planch.	Akar ruran
Zingiberaceae	<i>Boesenbergia burttiana</i> R. M. Sm.	Jerangau
	<i>Curcuma zedoaria</i> (Berg.) Rose	Entemu kumang
	<i>Etilingera littoralis</i> Giseke	Senggang
	<i>Etilingera</i> sp.	Halia
	<i>Hornstedtia tomentosa</i> (Bl.) Bakh. f.	Tepus

Old Secondary Forest

Family	Botanical name	Local name
Acanthaceae	<i>Cosmianthemum magnifolium</i> Bremek.	
Annonaceae	<i>Artabotrys</i> spp. (2 species)	Akar mersawa
	<i>Fissistigma latifolium</i> Merr.	Akar rarak
	<i>Tetrapetalum borneense</i> Merr.	Akar rarak
Apocynaceae	<i>Chilocarpus beccarianus</i> Pierre	Akar buli
	<i>Chilocarpus rostratus</i> Markgr.	Akar buli
Araceae	<i>Alocasia longifolia</i> Hort. ex Engl. & K. Krause	Malong
Aristolochiaceae	<i>Thottea muluensis</i> Ding Hou	Sunti babi
	<i>Thottea</i> sp.	Sunti babi
Asclepiadaceae	<i>Hoya coronaria</i> Bl.	Akar gelumang
Aspleniaceae	<i>Asplenium nidus</i> Linn.	Paku rajang
Begoniaceae	<i>Begonia sarawakensis</i> Ridl.	Riang
	<i>Begonia</i> sp.	Riang
Blechnaceae	<i>Blechnum orientale</i> Linn.	Paku kelindang
	<i>Stenochlaena palustris</i> (Burm. f.) Bedd.	Midin
Connaraceae	<i>Agelaea insignis</i> (Schellenb.) Leenh.	Akar malam
	<i>Rourea mimosoides</i> Planch.	Akar malam
Cyatheaceae	<i>Cyathea</i> sp. 1	Paku
Dilleniaceae	<i>Tetracera akara</i> Merr.	Akar mempelas
	<i>Tetracera arborescens</i> Jack	Akar mempelas
Gesneriaceae	<i>Aeschynanthus parvifolius</i> R. Br.	Akar tangkung kenalang
	<i>Cyrtandra antuana</i> B. L. Burt	Melebab
	<i>Cyrtandra bracheia</i> B. L. Burt	Melebab
	<i>Cyrtandra sarawakensis</i> C. B. Cl.	Melebab
	<i>Didymocarpus beccarii</i> C. B. Cl.	Melebab
	<i>Didymocarpus crinitus</i> Jack	Melebab
	<i>Didymocarpus scabrinervius</i> C. B. Cl.	Melebab
	<i>Monophyllaea</i> sp.	
Gleicheniaceae	<i>Dicranopteris</i> sp.	Resam baji

Hymenophyllaceae	<i>Hymenophyllum productum</i> Kuntze	Paku
Hypoxidaceae	<i>Curculigo latifolia</i> Dryand.	Lemba
	<i>Curculigo racemosa</i> Ridl.	Lemba
Leguminosae	<i>Spatholobus ferrugineus</i> (Zoll. & Moritzzi) Benth.	Akar kemadu
	<i>Spatholobus macropterus</i> (Miq.)	Akar kemadu
	<i>Spatholobus oblongifolius</i> Merr	Akar kemadu
	<i>Whitfordiodendron niewenhuisii</i> (J.J.Sm.) Dunn.	Akar belum
Smilacaceae	<i>Smilax</i> sp.	
Loganiaceae	<i>Fagraea cuspidata</i> Bl.	Sokong ranyai
	<i>Strychnos minor</i> Dennst.	Akar kayas
Lycopodiaceae	<i>Huperzia phlegmaria</i> (L.) Rothm.	Paku
Marantaceae	<i>Phrynium capitatum</i> Wild.	Ririk
Melastomataceae	<i>Cynandrium guttatum</i> Stapf	
Menispermaceae	<i>Tinomiscium</i> sp.	Akar badi
Myrsinaceae	<i>Labisia humilis</i> Lindl.	Daun sangkuh
Nephrolepidaceae	<i>Nephrolepis falcata</i> (Cav.) C. Christ	Paku
Palmae	<i>Calamus blumei</i> Becc.	Rotan
	<i>Calamus caesius</i> Bl.	Rotan bulu
	<i>Calamus corrugatus</i> Becc.	Rotan jangut
	<i>Calamus javensis</i> Bl.	Rotan / Wi batu
	<i>Calamus</i> sp.	Rotan bukup
	<i>Ceratolobus korthalsii</i> Bl.	Rotan
	<i>Ceratolobus subangulatus</i> (Miq.) Becc.	Rotan jangut
	<i>Daemonorops longistipes</i> Burret	Wi duduk
	<i>Daemonorops rutilis</i> Becc. var. <i>acaulescens</i>	Wi duduk
	<i>Eugeissonia insignis</i> Becc.	Pantu
	<i>Korthalsia rigida</i> Bl.	Rotan
	<i>Korthalsia cheb</i> Becc.	Rotan
	<i>Korthalsia rostrata</i> Bl.	Rotan lia
	<i>Pinanga brevipes</i> Becc.	Pinang mureng
<i>Pinanga crassipes</i> Becc.	Pinang mureng	
<i>Pinanga limosa</i> Ridl.	Pinang mureng	
<i>Pinanga</i> sp.	Pinang	

Pandanaceae	<i>Pandanus</i> spp. (3 species)	Pandan
	<i>Pandanus brevifolius</i> Mart.	Pandan
Parkeriaceae	<i>Ceratopteris thalictroides</i> (L.) Brongan	Paku
Piperaceae	<i>Piper arborescens</i> Roxb.	Akar lada
	<i>Piper caninum</i> Bl.	Lada hutan
	<i>Piper</i> cf. <i>arborescens</i> Roxb.	Sireh
	<i>Piper jacquemontianum</i> Knuth.	Lada
	<i>Piperomia</i> sp.	
Rhamnaceae	<i>Zizyphus catophylla</i> Wall.	Akar beludang
	<i>Zizyphus havilandii</i> Ridl.	Akar kuku menaur
	<i>Zizyphus borneensis</i> Merr.	Akar kuku menaur
Rubiaceae	<i>Acranthera didymocarpus</i> (Ridl.) K. M. Wong	Akar rubi
	<i>Lacananthus erubescens</i> Jack	Akar rubi
	<i>Psychotria laxiflora</i> Bl.	Akar rubi
	<i>Psychotria robusta</i> Bl.	
Schizaeaceae	<i>Lygodium microphyllum</i> (Cav.) R. Br.	Paku
Scitamineae	<i>Curcuma aeruginosa</i> Roxb.	Entemu kumang
Scitamineae	<i>Curcuma zedoaria</i> (Berg.) Rose	Entemu kumang
Selaginellaceae	<i>Selaginella</i> spp. (5 species)	
Vitaceae	<i>Cayrata</i> cf. <i>mollissima</i> Gagnepain	Akar anggur
	<i>Cissus rostrata</i> Korth. ex Planch.	Akar
	<i>Pterisanthes polita</i> (Miq.) Lawson	Akar vita
Zingiberaceae	<i>Alpinia glabra</i> Ridl.	Tepus
	<i>Alpinia</i> spp. (2 species)	
	<i>Boesenbergia burtiana</i> R. M. Smith	
	<i>Costus</i> sp.	Tepus
	<i>Etilingera fimbriobracteata</i> (K. Sch.) R. M. Smith	Tepus
	<i>Etilingera multiflora</i> (Ridl.) R. M. Smith	Zing
	<i>Etilingera muluensis</i> R. M. Smith.	Tepus
	<i>Hornstedtia tomentosa</i> (Bl.) Bakh. f.	

Young Secondary Forest

Family	Species	Local
Blechnaceae	<i>Blechnum orientale</i> Linn.	Paku kelindang
	<i>Stenochlaena palustris</i> (Burm. f.) Bedd.	Midin
Dennstaedtiaceae	<i>Pteridium aquilinum</i> (L.) Kuhn.	Paku bedegak
Hypoxidaceae	<i>Curculigo latifolia</i> Dryand.	Lemba
Leguminosae	<i>Spatholobus</i> sp.	Akar kemadu
Marantaceae	<i>Phrynium capitatum</i> Wild.	Ririk
Palmae	<i>Calamus</i> sp.	Rotan bukop
Vitaceae	<i>Tetrastigma pedunculare</i> (Wall.) Planch.	Akar vita
Zingiberaceae	<i>Hornstedtia reticulata</i> K. Schum.	Senggang

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Plate 1: Eight-year old secondary forest developed in an area after paddy plantation. Undergrowth is covered by thickets of the fern *Blechnum orientale*.



Plate 2: Old secondary forest developed from land cultivated and abandoned 40 years ago. The dense undergrowth comprises of saplings and seedlings, herbs and climbers.



Plate 3: Mixed Dipterocarp Forest on a ridge at Tinting Kemuyang.



Plate 4: Checking the bark of a tree for species identification.



Plate 5: *Miring* before the survey to appease the spirits of the land and the dead.



Plate 6: An abandoned local long house at Tampan Jarau Entambah, Ulu Lubang Baya.

