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Management of the Pha Taem Protected Forest
Complex to Promote Cooperation for Transboundary
Biodiversity Conservation between Thailand, Cambodia
and Laos Phase I**

**Forest Ecology Study
Forestry Research Center
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Abstract

The Pha Taem Protected Forest Complex (PPFC), Ubon Ratchathani Province, northeastern Thailand, was proposed by the International Tropical Timber Organization (ITTO) to develop a strategy to enhance multilateral cooperation in transboundary biodiversity conservation between Thailand, Cambodia and Laos. The main purpose of this study was to firmly clarify the biodiversity and ecosystem in the PPFC, which is faced with habitat loss and biodiversity degradation due to human activities. Thus temporary plots, 40 m x 50 m, with two replicates in each forest type, were established for rapid investigation, and permanent plots, 100 m x 100 m, were constructed for monitoring in long-term ecological research.

Three forest types were classified, viz. Dry Evergreen Forest (DEF), Mixed Deciduous Forest (MDF) and Deciduous Dipterocarp Forest (DDF), which have various structures and species compositions. Tree species diversity (> 4.5 cm, dbh) in the PPFC showed high abundance, even though some illegal cuttings were still found. The forest comprised 47 families with 133 genera and 214 identified tree species while the rest of the species, i.e. shrubs, herbs and grasses, belonged to 32 families, 59 genera and 69 species. Plants of potential ornamental value such as orchids from 19 genera and 35 species were found. However, the investigation period was quite limited and observations could only be made in the safe sites (with no land-mines). This means that the diversity of the PPFC would be seen to increase if the study had covered the other sites, especially at the riparian forests. Some illegal cuttings were being conducted in the PPFC, suggesting that the species diversity may decrease if such activity is allowed to continue without control. To maintain the biological integrity of the terrestrial ecosystems and communities over the long term would require the conservation of large and preferably contiguous tracts of forests. Thus cooperation between Thailand, Cambodia and Laos is urgent and would benefit these three countries by sharing all the biological diversity information through management planning.

Introduction

Tropical forests are important ecosystems in the world because they are recognized as centres of high biodiversity and are greatest in the number of species and habitat types (Koyama 1993). In addition, tropical forests affect the global climate ecosystem. Despite the high value of these forests, little attention has been given to the investigation of especially the structure and function as well as the environmental factors determining the distribution of various tree species (Gerhardt & Hytteborn 1992, Nakashizuka *et al.* 1995, Marod *et al.* 1999). Considering the importance of these forests, both locally and nationally, the basic information regarding their ecological roles and the maintenance of their key functions need urgent determination. This will not only assist in conservation planning but also increase our knowledge of such diverse biological resources of high potential to the world (Meijer 1973).

Studies on the mechanisms for maintaining the biological diversity in an ecosystem are of primary importance in both basic ecology and applied ecological sciences. The causality of the variations in species diversity among ecosystems, maintaining mechanisms of diversity and the role of biodiversity in ecosystems are the central issues of modern ecology. The general decrease in biodiversity has been recognized as one of the most critical global environmental problems. In silviculture and forest management, biodiversity is also one of the key conditions for sustainable management practices.

The Pha Taem Protected Forest Complex (PPFC), Ubon Ratchathani Province, northeastern Thailand, was proposed by the International Tropical Timber Organization (ITTO) to develop a strategy to enhance multilateral cooperation in transboundary biodiversity conservation between Thailand, Cambodia and Laos. The PPFC covers about 130,000 ha and comprises three national parks, Pha Taem, Kaeng Tana and Phu Jong-Na Yoi, and two wildlife sanctuaries, Yot Dom and Bun Thrik-Yot Mon. The Pha Taem and Kaeng Tana National Parks are located at the north of the forest complex and connected to Laos. Both areas are very popular with tourists. The Phu Jong-Na Yoi National Park and Yot Dom Wildlife Sanctuary are located at the south of the forest complex and share their borders with Laos and Cambodia. Both conservation areas are connected to the Bun Thrik-Yot Mon Proposed Wildlife Sanctuary. Considering the importance of biodiversity in the complex, it is necessary to monitor the dynamics of

both plant and wildlife biodiversities. The ecological niches of these species should also be urgently clarified to promote their biodiversity conservation through local and international cooperation, in addition to the potential cooperation in transboundary biodiversity management.

The main purpose of this study was to properly clarify the biodiversity and ecosystem in the PPFC, which is faced with habitat loss and biodiversity degradation due to human activities. The specific objectives were as follows:

- to investigate the general inventory of the flora of the PPFC with special reference to rare, endangered and valuable species;
- to clarify the forest structure and species composition in each forest type;
- to demonstrate the ecological methods to the official staffs and others who are interested in biodiversity assessment;
- to provide indicators for monitoring the ecological system concerned and to show how to monitor;
- to analyse the ecological information and contribute to the preparation of a management plan for the development of the PPFC.

Study Area

The study began with an investigation into the different forest types in the PPFC based on their distribution and floristic composition, viz. Dry Evergreen Forest (DEF), Mixed Deciduous Forest (MDF) and Deciduous Dipterocarp Forest (DDF). The forest types were classified according to the field data check in each conservation area and the information obtained from the interpretation of satellite images.

- **The Pha Taem National Park**

Sample sites were investigated at Hung Laung and Soi Sawan Waterfall ranger stations, and also near the office station (Figure 1). These areas have two forest types, Dry Evergreen Forest (DEF) and Deciduous Dipterocarp Forest (DDF).

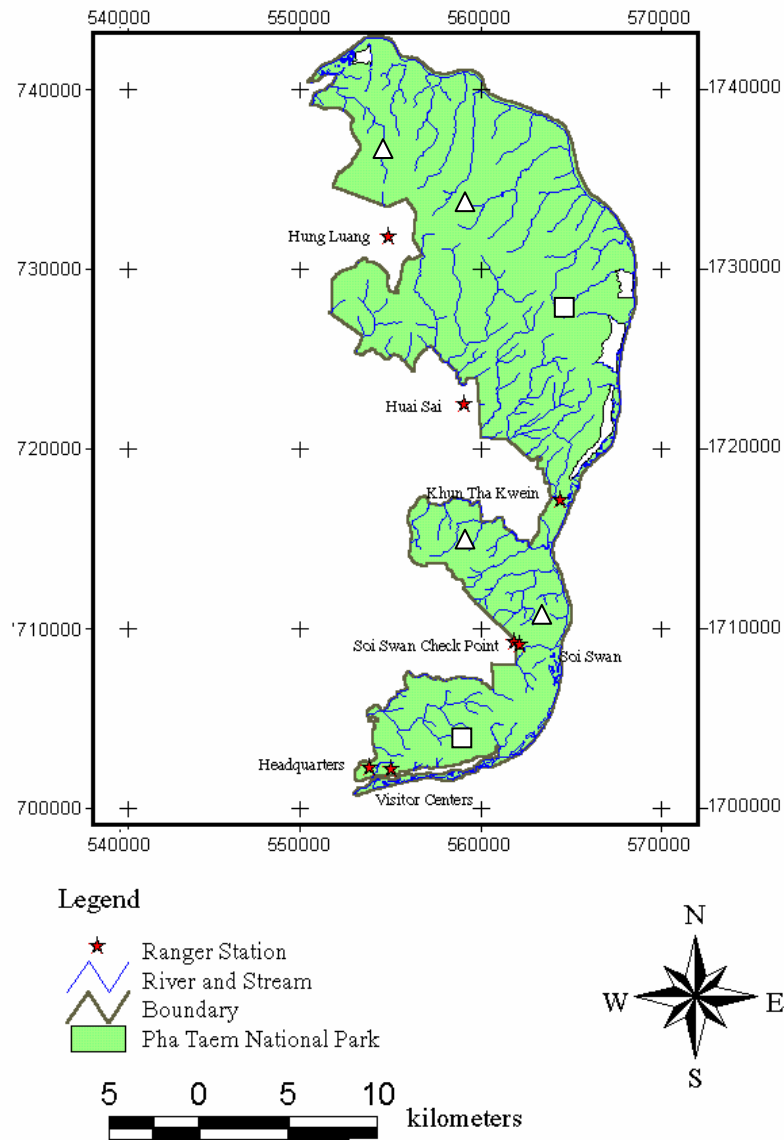


Figure 1. The sample sites of investigation plots are shown in which the symbols of \triangle and \square indicate the temporary and permanent plots respectively. The permanent plots were located in Dry Evergreen Forest at Dong Na Tam Ranger Station, above, and Deciduous Dipterocarp Forest at Soi Sawan Waterfall, bottom.

- **Kaeng Tana National Park**

The determination of the floristic composition of the DEF was carried out at the Huai Mhak Tai ranger station and in the central park, Kao Kaeng Tana, and that of the DDF at the Huai Mhak Tai ranger station and along the way to the park station (Figure 2).

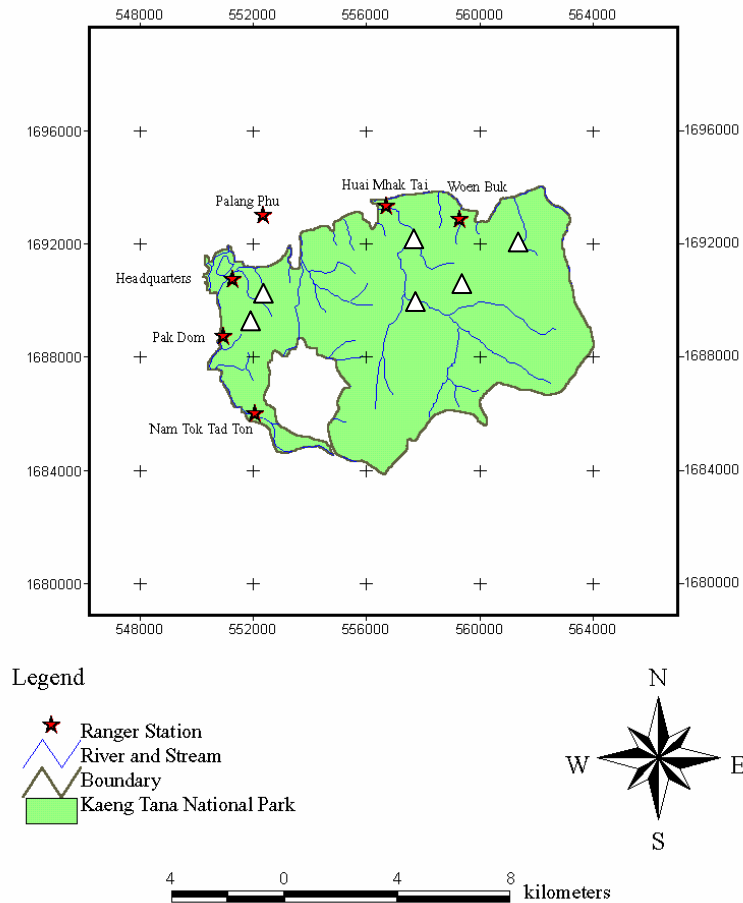


Figure 2. The sample sites (Δ) of temporary plots at the Kaeng Tana National Park

- **The Phu Jong-Na Yoi National Park**

This national park comprises two forest types, DEF and DDF, and the representative areas for floristic investigation were selected at the Kaeng Rueng ranger station and Huai Luang Waterfall area (Figure 3).

- **The Yot Dom Wildlife Sanctuary**

Three forest types are found in the Yot Dom Wildlife Sanctuary, DEF, DDF and Mixed Deciduous Forest (MDF). DEF is the main type of this area, which covers about 70% of the total forest area. The Huai Wang Yai and Huai Wang Chao ranger stations were selected for the data collection (Figure 4).

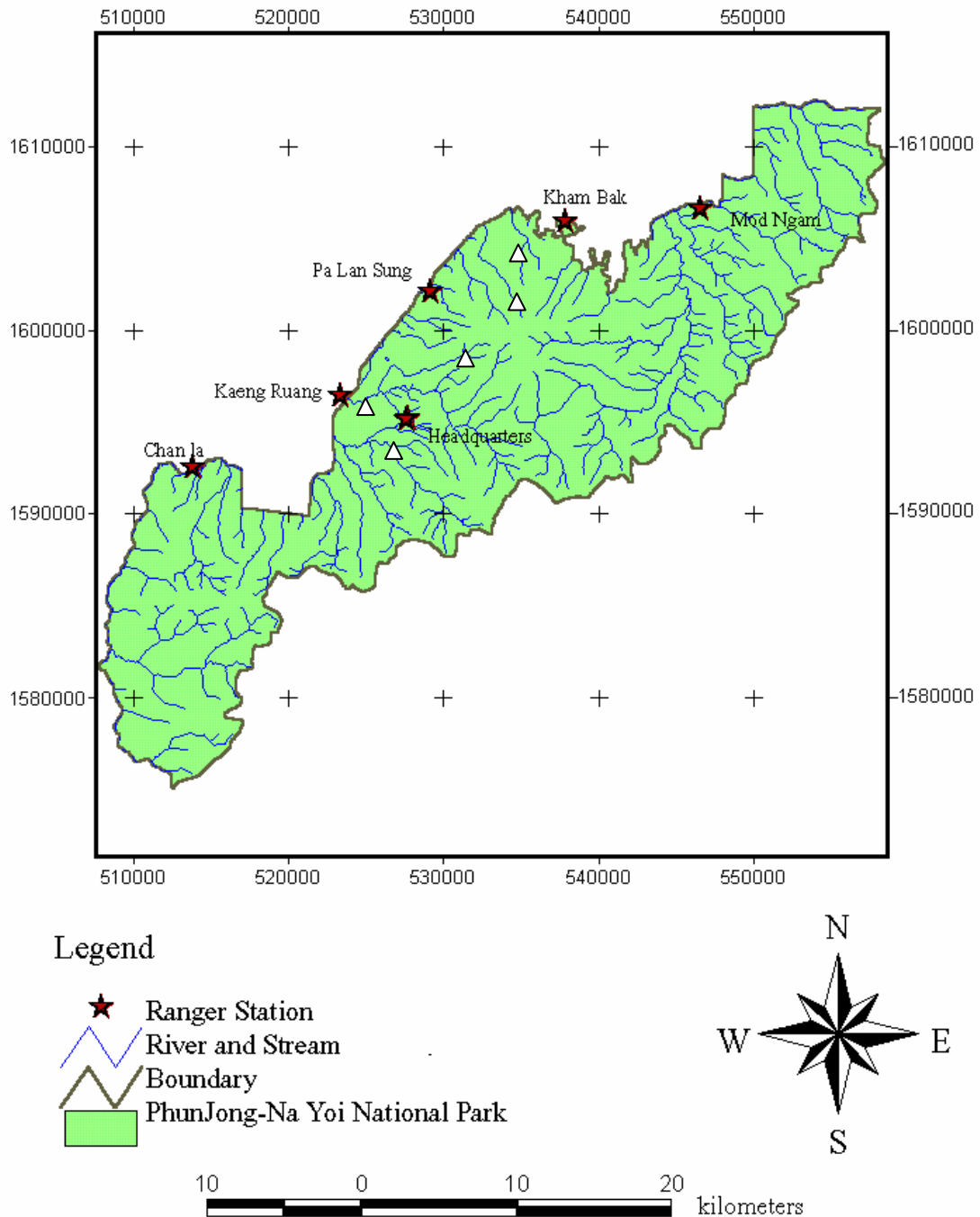


Figure 3. The sample sites (Δ) of temporary plots in the Phu Jong-Na Yoi National Park

- **The Bun Thrik-Yot Mon Proposed Wildlife Sanctuary**

This conservation area was proposed as a new wildlife sanctuary in the PPFC to connect the north conservation areas, the Pha Taem and Kaeng Tana National Parks, with the south conservation areas, the Phu Jong-Na Yoi National Park and Yot Dom Wildlife Sanctuary. This area comprises two main forest types, DDF and DEF. Huai Sai Yai Waterfall and Kaeng Yen Chai were selected for the sample sites (Figure 5).

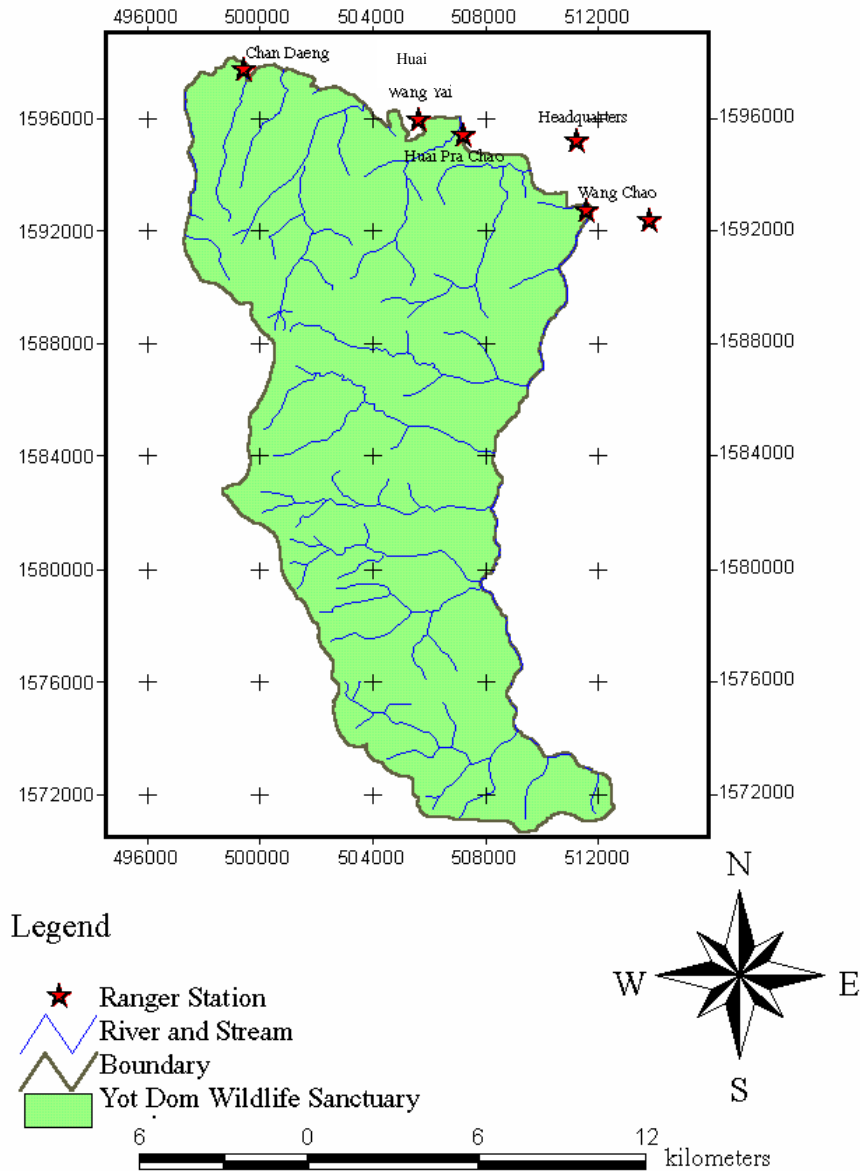


Figure 4. The sample sites (Δ) of temporary plots in the Yot Dom Wildlife Sanctuary and the permanent plot (\square) at Wang Chao ranger station are displayed.

Methodology

For preliminary investigation two temporary plots, each measuring 40 m x 50 m, were established in each selected site. The plots were set up either along the slopes or across the ridges depending on the nature of the terrain. For each inventory plot, subplots of 10 m x 10 m were divided. All trees with diameter at breast height (dbh) greater than 4.5 cm were measured, identified and recorded, while data on saplings (dbh < 4.5 cm) and seedlings (dbh < 4.5 cm and height < 1 m) were taken from divided subplots of 4 m x 4 m and 1 m x 1 m respectively, in each 10 m x 10 m subplot. The importance value index of species composition in each forest type was analysed from those species recorded. Species identification is very important in order to understand the

floristic composition of the PPFC. Thus leaf samples of all unidentified species were collected for matching with the specimens in the herbarium collection. The samples were pressed and preserved in spirit and later dried in the herbarium.

To know the forest dynamics, a permanent plot (100 m x 100 m) was established in each forest type at the PPFC for the data collection in the long-term ecological study. At the Pha Taem National Park, the permanent plots were set up at Soi Sawan Waterfall and the Dong Na Tam ranger station which represented the DDF and DEF respectively, while the represented plot of MDF was selected from the Yot Dom Wildlife Sanctuary at the Huai Wang Chao ranger station. The permanent plot was divided into subplots of 10 m x 10 m, and all trees were tagged, mapped, identified and measured.

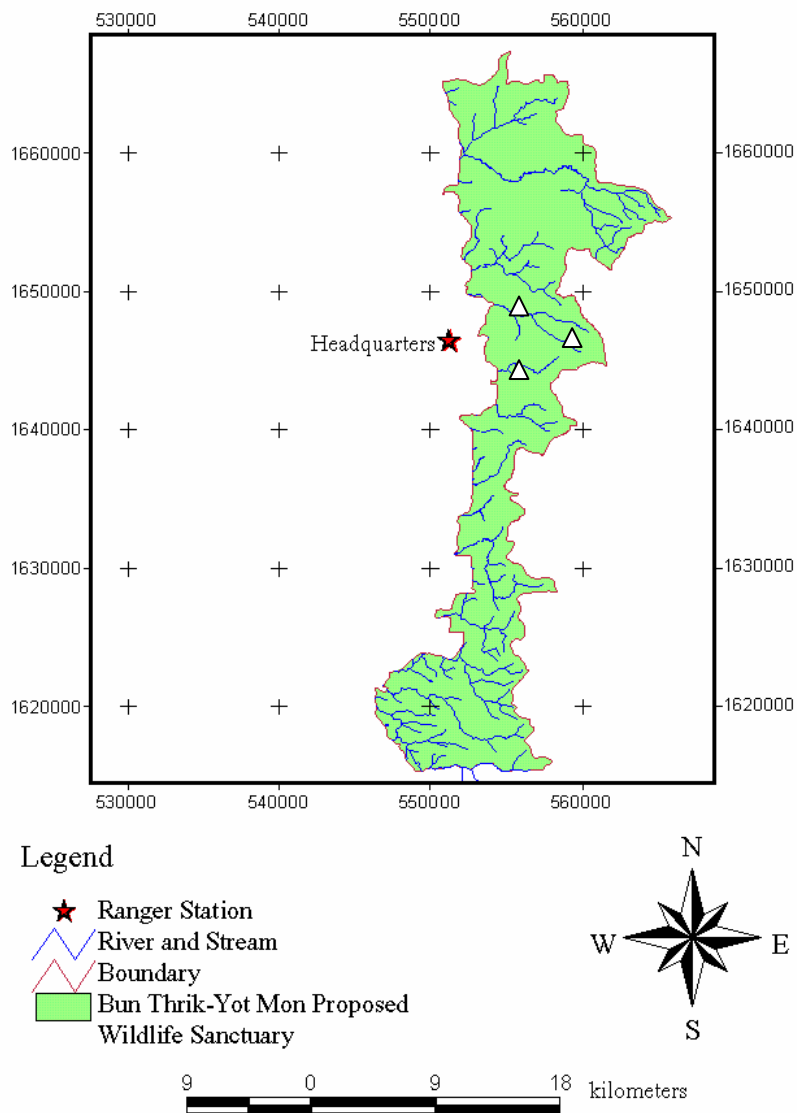


Figure 5. The sample sites (Δ) of temporary plots in the Bun Thrik-Yot Mon Proposed Wildlife Sanctuary are displayed.

Results

Training of Official Staffs

During the first period (March to July 2002), we trained some of the official staff members at the PPFC in conducting the research and also the ecological monitoring, especially on tree growth (Figure 6). All of them appreciated the work in the field even though they did not know how to analyse the data at that time. Thus in the second period (July to October 2002), we taught them how to analyse the data and interpret the results. They have now become very good researchers, especially in field data collection and also their knowledge in other related areas has improved after cooperating with other research teams.



Figure 6. Training the rangers of the Kaeng Tana National Park in tree diversity investigation inside the deciduous forest

Forest Types at the PPFC

The results of forest classification from Landsat-7 showed that three forest types (Dry Evergreen Forest [DEF], Mixed Deciduous Forest [MDF] and Deciduous Dipterocarp Forest [DDF]), forest plantations (para rubber, eucalyptus, etc.) and disturbed forests were found at the PPFC with various structures and species compositions (Figure 7). However, this report is concerned only with the virgin forests (excluding disturbed

forests and forest plantations) and the results from the investigation showed that all forest types occupied land of flat to moderate elevation with maximum of 800 m above mean sea-level at the summit of the Yot Dom Wildlife Sanctuary. They are classified according to plant geographic distribution. The climate is affected by monsoon, which is the cause of the depression occurring from May to October. Tree species diversity of the PPFC for trees of dbh over 4.5 cm was very high. The forest comprised 47 families, 133 genera and 214 identified tree species (Annex 1), while the rest of the species of shrubs, herbs and grasses were found in 32 families, 59 genera and 69 species (Annex 2). The plant diversity of the PPFC was observed to be high, even though the investigation time was limited. Nevertheless, some illegal cuttings still found in the PPFC (Figure 8) suggest that the species diversity may decrease if such activity is allowed to continue without control. The forest structure and species composition of each site showed some differences from another as described in the following sections.

1. Dry Evergreen Forest

This forest type is distributed mainly at the Yot Dom and Bun Thrik-Yot Mon Wildlife Sanctuaries. However, it is also found in the other conservation areas of the PPFC. Soils are quite deep and have high moisture content. Infrequent fires occur in this forest. The forest consists of tall closely set trees whose crowns form a continuous canopy of foliage and provide dense shade at the ground and lower layers. The forest floor is relatively close despite an understory canopy of more than 5 m tall and a diverse assemblage of small trees and shrubs. Tree leaves are broad and evergreen and the crowns tend to form three layers, of which the highest consists of scattered emergent crowns rising to 40 m (Figures 9 and 10). Typical of this forest are lianas, which are thick woody vines supported by the trunks and branches of the trees. Some are slender like ropes, others reach a thickness of 20 cm. The most important family in the top canopy is Dipterocarpaceae with genera of *Anisoptera*, *Shorea* and *Dipterocarpus*. Any forest gap that occurs is quickly succeeded by pioneer tree species such as *Trema orientalis*. The taxonomic diversity is similar in the conservation areas (Table 1). In the number of trees per hectare, the Dipterocarpaceae is the most common of the ten dominant families (Table 2).

The first-storied top canopy is close and high, ranging from 25 to 40 m. The dominant tree species, mainly in the Dipterocarpaceae, are *Anisoptera costata*,

Dipterocarpus costatus, *Shorea henryana* and *S. roxburghii*. Some deciduous species are *Lagerstroemia calyculata*, *Irvingia malayana*, *Pterocarpus macrocarpus*, *Schima wallichii*, *Parinari anamensis* and *Syzygium cumini*. In this layer, the epiphytes are numerous using the trunks, branches or foliage of trees and lianas solely as a means of physical support. They are of many plant classes and include ferns, orchids, mosses and lichens. Some epiphytes are stranglers, sending down their roots to the soil, eventually surrounding the tree and ultimately replacing it.

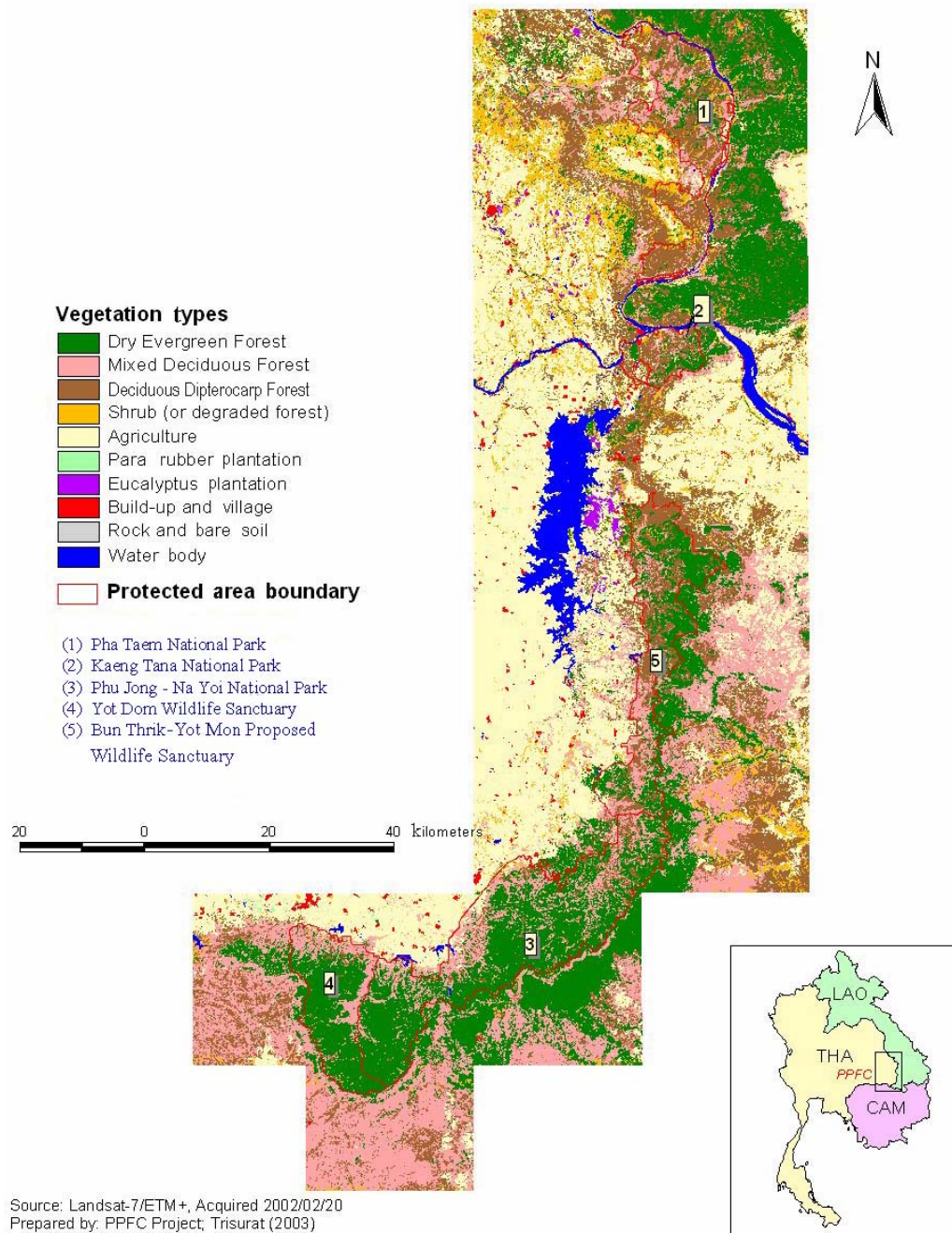


Figure 7. The forest classification at the PPFC from Landsat-7



Figure 8. A disturbed area in the Dry Evergreen Forest at Khoa Kee Yang, the Kaeng Tana National Park

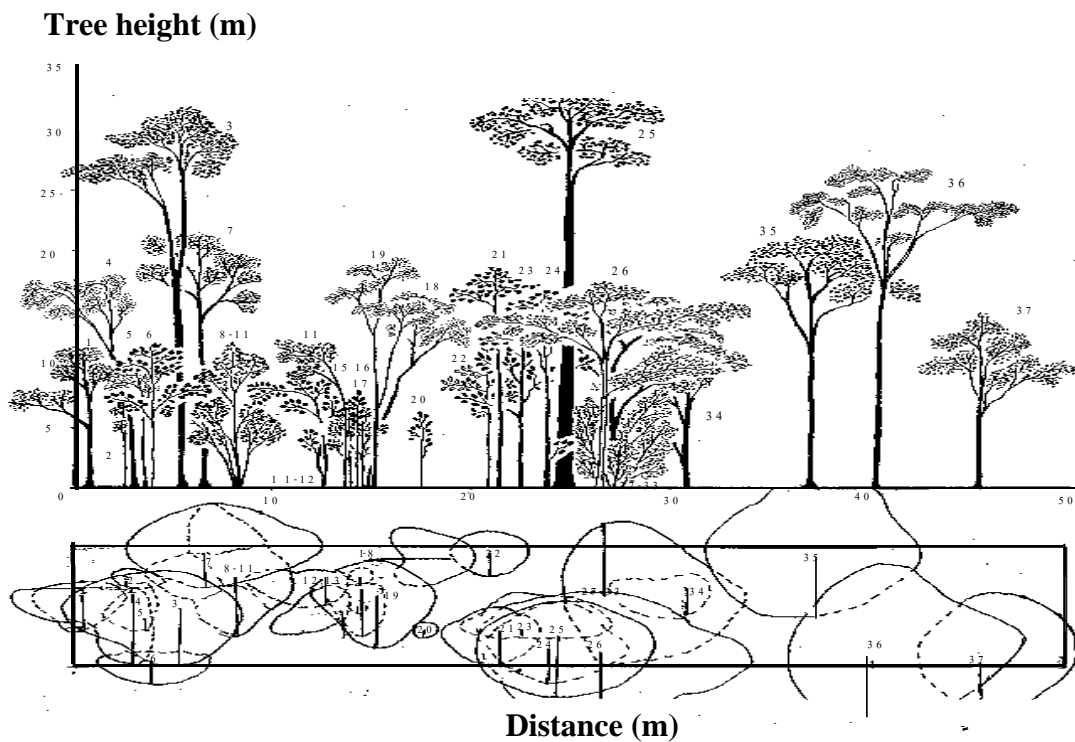


Figure 9. Profile diagram (top) and crown cover (bottom) of the Dry Evergreen Forest at Soi Sawan Waterfall ranger station



Figure 10. Characteristics of the Dry Evergreen Forest at the Soi Sawan Waterfall ranger station

The second-storeyed middle canopy ranges in height from 10 to 25 m and many of the trees produce edible fruits for wildlife. The dominant tree species in this layer are *Nephelium hypoleucum*, *Aglaia pirifera*, *A. pyramidata*, *Polyalthia viridis*, *Knema linifolia*, *K. furfuracea*, *Aphanamixis polystachya*, *Carallia brachiata*, *Diospyros ferrea*, *D. malabarica*, *D. variegata*, *Millettia atropurpurea*, *Walsura trichostemon*, *Vatica odorata*, *Memecylon ovatum*, *Pterospermum acerifolium*, *Picrasma javanica*, *Garcinia merguensis*, *Hydnocarpus ilicifolia*, *H. anthelminthica*, *Dalbergia cochinchinensis*, *Milusa velutina*, *Mitrephora vandiflora* and *Suregada multiflora*. It is almost difficult to separate this layer from the top canopy due to the climbers connecting the top to the bottom.

The third-storeyed shrub layer ranges in height from 5 to 10 m but is usually about 6 m tall. This layer, mixed with saplings of the top and middle canopies, comprises shrub species such as *Tarenna hoensis*, *Melodorum fruticosum*, *Gonocaryum lobbianum*, *Antidesma* spp., *Aporusa villosa*, *Croton oblongifolius*, *Mallotus paniculatus*, *Capparis micracantha*, *Memecylon scutellatum*, *Bridelia ovata*,

Ancistrocladus tectorius and *Baccaurea ramiflora*. In the forest gaps, species of Zingiberaceae such as *Achasma macrocheilos*, *Amomum* spp., *Catimbum malaccense* and *Curcuma parviflora* densely occupy the forest floor. The forest floor is usually so thickly shaded that plant foliage is sparse at the ground giving the forest an open aspect and making it easy to traverse. The ground surface is covered only by a thin layer of leaf litter. Rapid consumption of dead plant matter by bacterial action results in the absence of humus in the soil.

Table 1. Taxonomic diversity and tree density (> 4.5 cm dbh) in the DEF

Site	No. of families	No. of genera	No. of species	Trees/ha
Pha Taem	33	59	74	1,075
Kaeng Tana	24	38	49	793
Phu Jong-Na Yoi	31	51	65	1,000
Yot Dom	34	54	61	928
Bun Thrik-Yot Mon	23	45	56	1,138

Table 2. Taxonomic diversity and tree density (> 4.5 cm dbh) of the dominant families in the DEF

Family	No. of genera	No. of species	Trees/ha
Dipterocarpaceae	5	10	466
Myrtaceae	2	11	206
Fagaceae	2	9	162
Memecylaceae	1	3	153
Lythraceae	1	4	148
Rubiaceae	10	14	145
Guttiferae	4	9	131
Caesalpinioideae	6	8	124
Papilionoideae	4	6	124
Combretaceae	3	5	122
Others	99	122	1,274
Total	137	201	3,055

2. Deciduous Dipterocarp Forest

Deciduous Dipterocarp Forest, DDF, is a deciduous forest where the trees usually shed their leaves during the dry season (Kutintara 1999). It has an open canopy with dominant leaf-shedding tree species in the family of Dipterocarpaceae such as *Shorea siamensis*, *S. obtusa*, *S. henryana*, *Dipterocarpus tuberculatus* and *D. intricatus*. Usually more than three species are found inside the forest, in with case we can classify such a forest as a Deciduous Dipterocarp Forest (Figure 11).



Figure 11. The Deciduous Dipterocarp Forest at the Kaeng Tana National Park, which is influenced by fire on the forest floor

This forest occupies almost the whole area of the PPFC, which is studded with rock outcrops. The soil has a lateritic zone near the surface and a rocky structure at the lower depths. Thus some places can be occupied by dwarf Deciduous Dipterocarp Forest if they have severe environmental factors. Sometimes, this forest can be found inside the disturbed area of the Dry Evergreen Forest. The distribution of dominant tree species is affected by sunlight. Forest fire is the most characteristic feature of this forest type, which can control the species composition, forest structure and regeneration. In the absence of forest fire, the forest will be changed to the other types.

The most important family in the top canopy is Dipterocarpaceae with genera of *Shorea* and *Dipterocarpus*. However, in some areas *Pinus kesiya* can be found in this forest, which is then called Deciduous Dipterocarp Forest with Pine. The taxonomic diversity is quite similar number in all the conservation areas (Table 3). In the number of trees per hectare, the Dipterocarpaceae is the most common of the ten dominant families (Table 4).

Table 3. Taxonomic diversity and tree density (> 4.5 cm dbh) in the DDF

Site	No. of families	No. of genera	No. of species	Trees/ha
Pha Taem	17	28	36	545
Kaeng Tana	21	29	34	735
Phu Jong-Na Yoi	19	26	29	865
Yot Dom	16	19	25	573
BunThrik-Yot Mon	22	26	30	740

Table 4. Taxonomic diversity and tree density (> 4.5 cm dbh) of the dominant families in the DDF

Family	No. of genera	No. of species	Trees/ha
Dipterocarpaceae	2	6	1,027
Papilionoideae	4	8	136
Caesalpinioideae	4	4	71
Combretaceae	1	4	70
Euphorbiaceae	1	2	57
Ixonanthaceae	1	1	48
Rubiaceae	4	8	47
Sapotaceae	1	1	47
Anacardiaceae	6	6	36
Fagaceae	2	3	26
Others	31	35	178
Total	57	78	1,743

The forest structure of the Deciduous Dipterocarp Forest can be classified into three layers, different from dwarf Deciduous Dipterocarp Forest which has only two layers (Figures 12 and 13 respectively). However, both subtypes have high similarity in species composition, except in tree height and soil condition. Dwarf Deciduous Dipterocarp Forest subtype is shorter than Deciduous Dipterocarp Forest subtype and has soil composed mainly of rocky outcrops. The dominant species in each layer are given below.

The top canopy layer has a height range of 20–30 m with dominant tree species of *Dipterocarpus intricatus*, *D. tuberculatus*, *D. obtusifolius*, *Shorea siamensis*, *S. obtusa* and *S. roxburghii*. The species occur in quite low frequency and density.

The second canopy layer has a height range of 10–20 m with medium-sized trees between the gaps of the top canopy. The dominant species in this layer are *Hymenodictyon excelsum*, *Canarium subulatum*, *Millettia leucantha*, *Dalbergia oliveri*, *Rothmania wittii*, *Phyllanthus emblica*, *Diospyros castanea*, *Morinda coreia*, *M. elliptica*, *Gardenia sootepensis*, *Sindora siamensis* and *Mitragyna brunonis*.

The shrub canopy layer has a maximum height of about 8 m and most of the species in this layer are of shrubby trees or shrubs. Some species found in the second canopy in other forest types may be found here but their size is very small, more like dwarfed trees. The dominant tree species are *Aporosa villosa*, *Gardenia obtusifolia*, *Brucea javanica*, *Euodia roxburghiana*, etc.

3. Mixed Deciduous Forest

Mixed Deciduous Forest without teak (*Tectona grandis*), MDF, has trees that shed their leaves during the dry season, especially in January to April, and an open canopy with lesser gap distances than in the Deciduous Dipterocarp Forest. However, it has more open tree growth than the Dry Evergreen Forest. Consequently, there is less competition among trees for light but a greater development in the lower layers. Thus deciduous trees dominate this forest, and during the drought a leafless period occurs, which varies with species type. Because trees lose moisture through their leaves, the shedding of their leaves allows them to conserve water during the dry period. The newly bare trees open up the canopy layer, enabling sunlight to reach the ground and

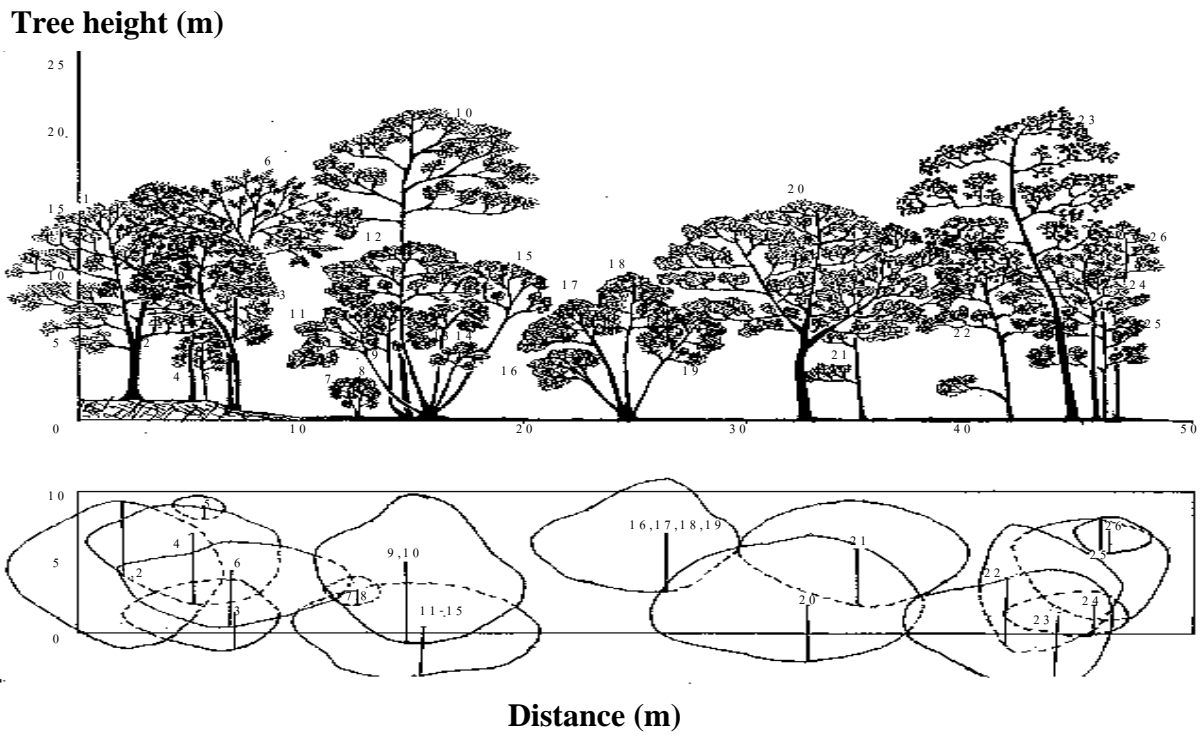


Figure 12. Profile diagram (top) and crown cover (bottom) of the Deciduous Dipterocarp Forest at the Soi Sawan Waterfall ranger station

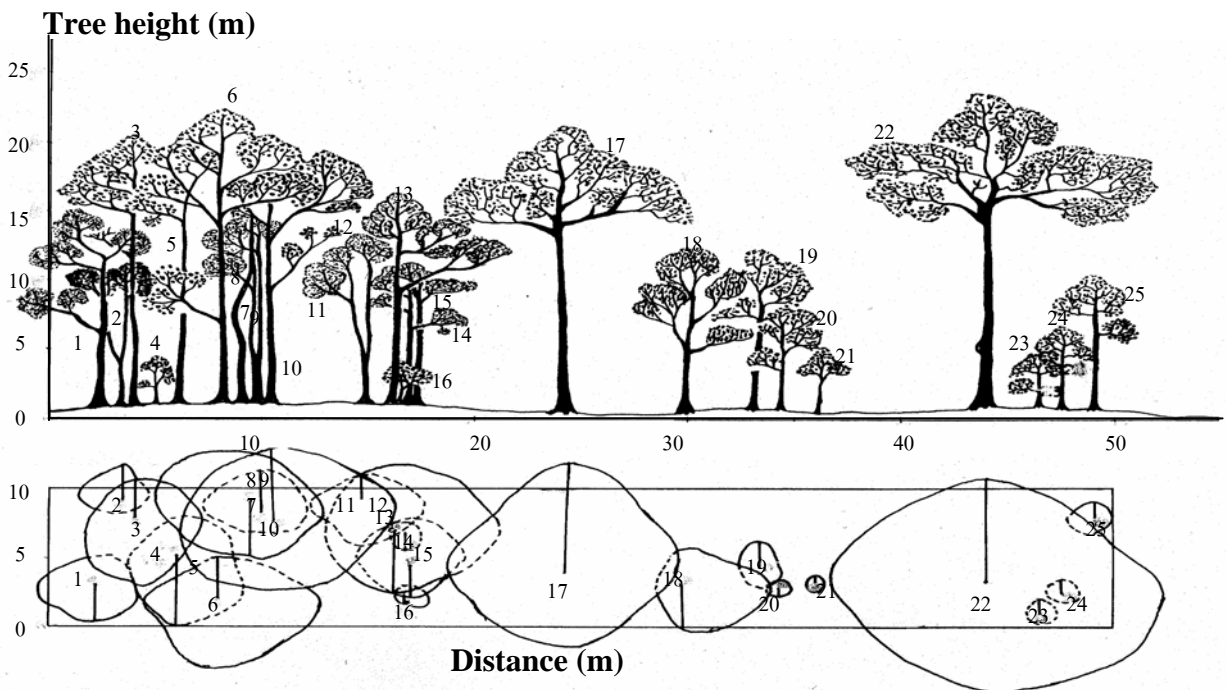


Figure 13. Profile diagram (top) and crown cover (bottom) of the dwarf Deciduous Dipterocarp Forest at the Hung Luang ranger station

facilitating the growth of thick underbrush. Trees have massive trunks with thick and rough bark but reach a height of only 35 m. Forest fire may occur during the dry season as in the Deciduous Dipterocarp Forest. This forest occupies a small area at the PPFC and most of it is surrounded by Dry Evergreen Forest. However, a large distribution of the MDF is found only at the Yot Dom Wildlife Sanctuary. The species composition of the MDF is usually combined with that of the Dry Evergreen Forest (Figure 14). The important families in the top canopy are Lythraceae and Papilionoideae with genera of *Lagerstroemia* and *Pterocarpus* respectively. The taxonomic diversity is displayed in Table 5. In the number of trees per hectare, the Lythraceae, Annonaceae and Papilionoideae are the most common of the ten dominant families (Table 6).

Table 5. Taxonomic diversity and tree density (> 4.5 cm dbh) in the MDF

Site	No. of families	No. of genera	No. of species	Trees/ha
Yot Dom	22	32	35	688

Table 6. Taxonomic diversity and tree density (> 4.5 cm dbh) of the dominant families in the MDF

Families	No. of genera	No. of species	Trees/ha
Lythraceae	1	1	456
Annonaceae	3	4	98
Papilionoideae	5	7	74
Caesalpinioideae	3	3	62
Guttiferae	2	2	60
Tiliaceae	1	1	53
Rubiaceae	8	8	46
Euphorbiaceae	4	4	45
Anacardiaceae	2	2	32
Labiatae	1	2	32
Others	32	42	189
Total	62	76	1,147



Figure 14. The Mixed Deciduous Forest at the Yot Dom Wildlife Sanctuary displayed with various species

Bamboo species are unique in the Mixed Deciduous Forest, but in this area they are found less than in the other Mixed Deciduous Forests in Thailand. Species with most abundance are *Thyrsostachys siamensis* and *Gigantochloa albociliata*. They usually form large clumps and cover the forest floor at high densities (Smitinand & Chumsri 1985); thus their low density in the PPFC is a unique characteristic of the MDF. Although they have long life-spans of up to several decades (Numata 1970, Janzen 1976, Taylor *et al.* 1991), their simultaneous death after gregarious flowering can provide large vacant spaces for tree regeneration episodically (Veblen *et al.* 1980, Nakashizuka 1987, 1988, 1991, Taylor & Zisheng 1988, 1992). The forest structure of the Mixed Deciduous Forest can be classified into three layers as in the Dry Evergreen Forest, but the trees are generally shorter than in the Dry Evergreen Forest (Figure 15).

The top canopy has a height range of 20–30 m with dominant tree species of *Lagerstroemia calyculata*, *Pterocarpus macrocarpus*, *Xylia xylocarpa* var. *kerrii*, *Dialium cochinchinense*, *Vitex peduncularis*, *Irvingia malayana*, *Canarium subulatum*, *Terminalia nigrovenolosa* and *Bombax anceps*, etc. They are distributed quite far from one another.

The second canopy has a height range of 10–20 m and is composed of deciduous species such as *Vitex pinnata*, *V. limonifolia*, *V. canescens*, *Markhamia stipulata*, *Cratoxylum formosum*, *Spondias pinnata*, *Mitragyna brunonis*, *Sindora siamensis*, *Cananga latifolia* and *Morinda coreia*.

The third or shrub canopy is 1–5 m high and has a combination of shrubs and some seedlings and saplings of the top and second canopies, e.g. *Holarrhena antidysenterica*, *Wrightia tomentosa*, *Bridelia ovata*, *Antidesma* spp., *Litsea glutinosa*, *Acronychia pedunculata*, *Ziziphus* sp. and *Microcos tomentosa*.

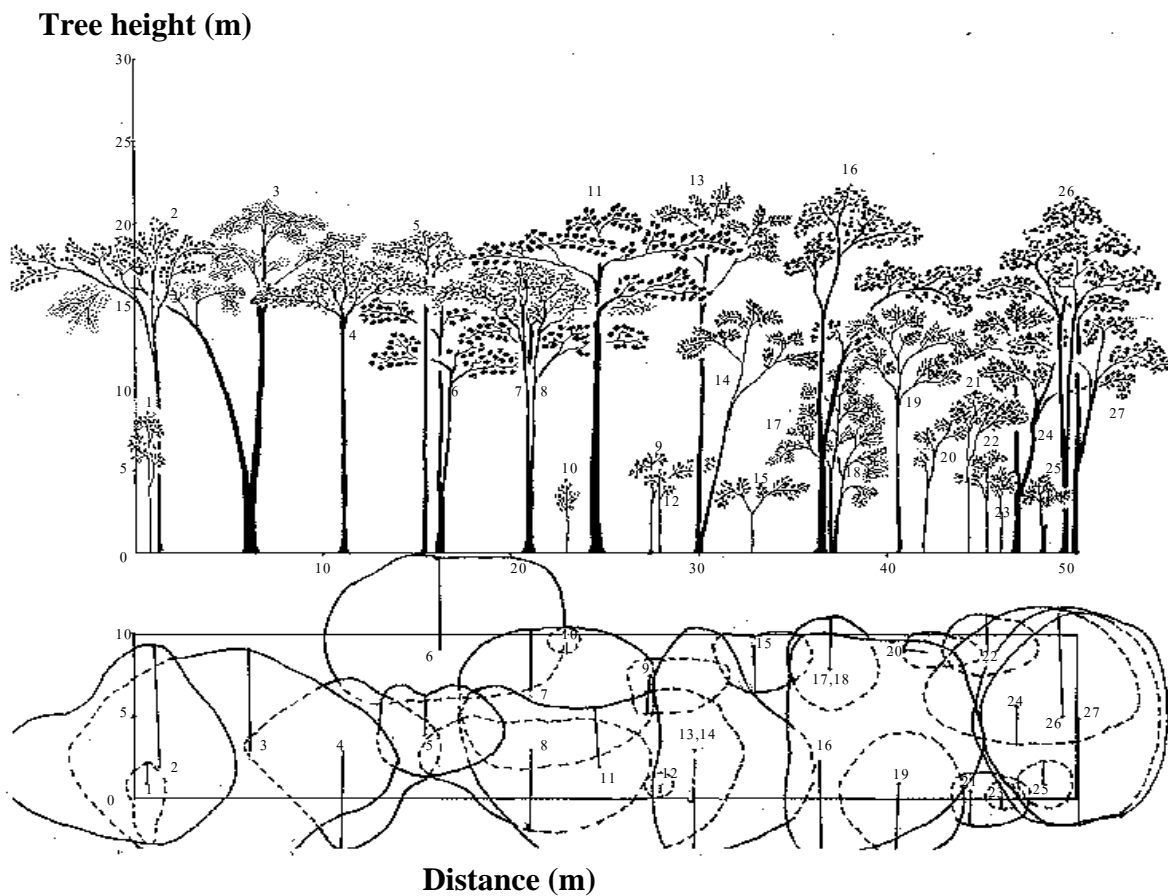


Figure 15. Profile diagram (top) and crown cover (bottom) of the Mixed Deciduous Forest at the Yot Dom Wildlife Sanctuary

Notable Groups of Species

Interesting and potentially important groups of species are plentiful in the PFC and are summarized as potential species of both direct and indirect benefits (Annex 3), as ornamentals such as *Ochidaceae* (Figure 16, Annex 4), and for medicinal plant utilization (Annex 5). Also found here are wild species related to important locally

cultivated species (*Scaphium*, *Phyllanthus*, *Spondias*, *Parkia*, *Dialium*), which may be useful for the improvement of these crops through breeding and genetic engineering. These are also plants that are very important as a food source for birds or primates, e.g. *Walsura*, *Aglaia* (Meliaceae), *Syzygium* (Myrtaceae) and *Ficus* (Moraceae).



Dendrobium chrysotoxum Lindl.



Cymbidium aloifolium (L.) Sw.



Doritis pulcherrima Lindl.



Rynchosstylis restusa Bl.

Figure 16. Some orchid species found at the PPFC

Management Plan on Forest Ecology at the PPFC

To create a management plan for the PPFC, we should clearly have the important information related to capacity building, social studies, biological diversities (both flora and fauna), geographic information system (GIS) capabilities, tourism and recreational development, to build a forum/platform for the stakeholders to discuss/initiate coordinated efforts for the benefit of the surrounding communities. This information will help us establish a very well managed plan. However, due to the importance of

forest ecology, an approach for managing species biodiversity at the PFFC can be proposed in three steps.

Step 1: Set clear objectives

The objectives that clearly state the desired resource and conservation priorities are crucial for the success of management. Thus well-focused objectives will provide the basis to evaluate the success of the strategies that are implemented. The biodiversity management plan should specify at a minimum: response variables, target levels (organisms level of interest as deme, species, community, landscape) and spatial/temporal domains. In addition, resource patterns within the planning areas and specific habitats are very important for a particular species which can be determined with knowledge of the regional or continental distribution of the species. The planning areas may also play a significant role in the larger system by providing key habitats for regionally rare species or offering strategic dispersal routes under climatic change. For example, *Scaphium scaphigerum*, which is very abundant at the Phu Jong-Na Yoi National Park, has been promoted for its fruit as dessert. Thus a specific objective should clearly be set on how to maintain this species in the ecosystem and on studying the characteristics and specific habitats of the species when initiating the management plan. Another example is the Soi Sawan Waterfall ranger station inside the DDF which is covered with rocky outcrops. Such places usually have beautiful flower species suitable for establishing recreation areas, i.e. plants such as du si ta (*Utricularia delphinoides* Thor. ex Pell.), ma wing (*Doritis pulcherrima* Lindl), kradum ngoen (*Eriocaulon henryanum* Ruhle), yad nam khang (*Drosera burmanni* Vahl) and yaa see thong (*Utricularia bifida* Linn.). Most species have adapted to forest fire which both activates the flowering and reduces the species competition. Thus protecting the forest from fire may reduce these species and unwanted species will rapidly replace them.

Step 2: Assess the potential viability of species

Objectively, ranking species, both flora and fauna, in terms of their sensitivity to habitat or landscape change can determine which species most merit additional research or special management consideration. Location mapping of the abundance in suitable habitats is the main purpose to specify the planning area. This mapping can be done by cross-tabulating the distribution of habitat attributes in the planning area. Geographic Information Systems (GIS) are especially useful for managing, analysing and

displaying these data. For example, *Scaphium macropodum* has the characteristics of the late successional species in the Dry Evergreen Forest. In addition, the patterning of microhabitats such as canopy layering or coarse woody debris strongly influences the demography of these species. Thus the management plan should be concerned with how to create such habitats to promote their population. However, large canopy gaps and high disturbances are not suitable for seedling establishment of these species due to the very strong light condition.

With GIS technique, the risk areas can be mapped and summarized as to what factors strongly influence the habitat change. Then we can suggest the suitable management for these areas.

Step 3: Implement the preferred strategies and monitor the response of habitats and species

Implementation of the preferred strategies is an experiment in itself that can express a great deal about the resource response to manipulation. A well-designed monitoring programme is crucial for learning about both the forest dynamics and management results. To promote high species diversity, *in situ* and *ex situ* conservation should be used at the PPFC. Long-term ecological research was proposed as *in situ* conservation while arboretum and botanical garden were represented as *ex situ* conservation. In our work at the PPFC, we built the permanent plots in each forest type, i.e. Dry Evergreen Forest, Mixed Deciduous Forest and Deciduous Dipterocarp Forest, to promote the long-term ecological research. All the trees with diameter greater than 4.5 cm were tagged, identified and measured. We hope that these plots will provide not only good support to the long-term ecological monitoring but also training in plant taxonomy and related areas to young students and others interested in these fields. In addition, the monitoring results will help us understand the dynamics of the forests with respect to the changes in species diversity and the factors that influence them. This knowledge will be useful in planning natural resource management at the PPFC and also other conservation areas in Thailand. The locations of all the permanent plots and trees have been mapped and used in combination with GIS technique as demonstration at the PPFC office for any interested people.

Conclusions

Maintenance of biological integrity of terrestrial ecosystems and communities over the long term will require the conservation of large and preferably contiguous tracts of forests. Major new investments in biodiversity conservation should be earmarked for expanding the protected areas system of each country and also between countries. Large forest reserves are necessary because they typically protect a variety of habitat types and species diversity, and are better able to withstand incursions than small conservation areas (Saunders *et al.* 1991). The results from the studies show that the PPFC is undeniably rich in vascular plant species and is thus extremely important as a resource area for biological diversity to enhance multilateral cooperation in trans-boundary biodiversity conservation between Thailand, Cambodia and Laos. The groups of plants with economic potential, both direct and indirect (medicinal plants, orchids and other ornamentals), are well represented in the PPFC. The orchid flora is rich and diverse, even though most of the species grow in narrow habitats. Within the short period of investigation, the floristic composition as determined cannot be considered complete for which more data on the area will need to be documented. Further taxonomic studies of some groups of species including their ecological characteristics in the PPFC are urgent. Thus the permanent plots for long-term ecological research possess all the important characters required to prepare the management plan for the PPFC; moreover, they can be used to study other conservation areas which have the same conditions as the PPFC. The permanent plots provide not only a basic knowledge of the extant biological diversity but can also be used as training ground for both official staffs and especially students or young scientists, to encourage and educate them in high conservation work.

Recommendations

- The grid reference (GPS) of tree species, especially in the permanent plots, will allow us to know the habitat preference and distribution of species to be determined if we analyse the data together with some information concerning the environmental factors, altitude, soil properties, rare natural occurrences (fire, wind storm, bamboo flowering), etc.

- The forest habitats at the PPFC are hard to inventory, especially the undisturbed forests located in land-mine places. So only the safe sites could be observed, and also those areas still disturbed by illegal cutting to convert the land to agriculture use (Figure 8). Thus further inventory should be done in the virgin forests; of course these must have no mines inside to allow gathering of complete information on the biological diversity.
- New generations of people including the local community members should be encouraged to run related projects for both their ecological and economic benefits. Ecotourism projects could be established in many places such as the Soi Sawan Waterfall, Pha Taem National Park (during the winter season to observe the beautiful forest flower species or for camping), Buk Tel Waterfall, Phu Jong-Na Yoi National Park (both in the rainy and dry seasons for biological studies and recreations), etc.
- Protection of all habitats in the PPFC is the best way to conserve biological diversity of both plants and wildlife. This approach is more suitable than just protecting individual species. Thus ecological processes that favour long-term sustainability of the ecosystem should be established. It is proposed that ecological studies be run in the next phase.
- The PPFC could be considered as a pilot project to study all aspects of biological diversity according to the project's objectives which aim to promote cooperation in transboundary biodiversity conservation between Thailand, Cambodia and Laos. Thus all the standard methods that relate to flora and fauna investigations, and even those in socio-economic studies should be provided to the staffs of these three countries. Thereby information on the biodiversity can be compared between the countries and would be useful in the enhancement of the cooperation management plan.

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ANNEXES

Annexes

Annex 1. Tree species of the PPFC

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
1	Mamuang hua maeng wan	<i>Buchanania latifolia</i> Roxb.	Anacardiaceae	-	+	-
2	Rak kheemuu	<i>Gluta tavoyana</i> Wall.	Anacardiaceae	+	+	-
3	Oi chaang	<i>Lannea coromandelica</i> Merr.	Anacardiaceae	-	+	-
4	Kuk	<i>Lannea grandis</i> Engler	Anacardiaceae	+	+	-
5	Ma kok	<i>Spondias pinnata</i> Kurz	Anacardiaceae	+	-	+
6	Nomwua	<i>Anomianthus dulcis</i> Sincl.	Annonaceae	+	-	-
7	Sakaa saeng	<i>Cananga latifolia</i> Finet & Gagnep.	Annonaceae	+	+	+
8	Nom maeo paa	<i>Ellipeiopsis cherrevensis</i> Fries	Annonaceae	-	+	-
9	Lamduan	<i>Melodorum fruticosum</i> Lour.	Annonaceae	+	-	-
10	Khaang hua muu	<i>Milium velutina</i> Hook. f. & Th.	Annonaceae	+	-	-
11	Dong dam khaao	<i>Mitrephora tomentosa</i> Hook. f.	Annonaceae	+	-	-
12	Mapuan	<i>Mitrephora vandaeflora</i> Kurz vandaefkra	Annonaceae	+	-	-
13	Yang don	<i>Polyalthia asteriella</i> Ridl.	Annonaceae	+	-	-
14	Ka chian	<i>Polyalthia cerasoides</i> (Roxb.) Benth. ex Beed.	Annonaceae	+	+	+
15	Yang on	<i>Polyalthia viridis</i> Craib	Annonaceae	+	-	-

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
16	Sa thaang	<i>Xylopi</i> <i>vielana</i> Pierre	Annonaceae	+	+	+
17	Teenpet khao	<i>Alstonia angustiloba</i> Bl.	Apocynaceae	+	-	-
18	Teenpet	<i>Alstonia scholaris</i> R. Br.	Apocynaceae	+	-	-
19	Maduea plong	<i>Ficus hispida</i> Linn. f.	Apocynaceae	+	-	-
20	Mok luang	<i>Holarrhena antidysenterica</i> Wall.	Apocynaceae	+	-	+
21	Mok man	<i>Wrightia tomentosa</i> Roem. & Schult.	Apocynaceae	+	+	+
22	Kradon	<i>Careya sphaerica</i> Roxb.	Barringtoniaceae	+	+	-
23	Khae haang khaang	<i>Fernandoa adenophylla</i> Steenis	Bignoniaceae	+	-	-
24	Khae hua muu	<i>Markhamia stipulata</i> Seem.	Bignoniaceae	+	-	+
25	Paap	<i>Millingtonia hortensis</i> Linn. f.	Bignoniaceae	+	-	+
26	Khae foi	<i>Stereospermum cylindricum</i> Pierre ex P. Dop.	Bignoniaceae	-	-	+
27	Khae saai	<i>Stereospermum neuranthum</i> Kurz	Bignoniaceae	+	-	+
28	Ngiu paa	<i>Bombax anceps</i> Pierre	Bombacaceae	+	+	+
29	Ngiu baan	<i>Bombax ceiba</i> Linn.	Bombacaceae	-	-	+
30	Makok kluean	<i>Canarium subulatum</i> Guill.	Burseraceae	+	+	+
31	Ma faen	<i>Protium serratum</i> Engler	Burseraceae	+	-	-
32	Ma khaa mong	<i>Afzelia xylocarpa</i> Craib	Caesalpinioideae	+	-	+

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
33	Sieo	<i>Bauhinia</i> sp.	Caesalpinioideae	+	-	-
34	Sieo paa	<i>Bauhinia saccocalyx</i> Pierre	Caesalpinioideae	-	-	-
35	Sieo fom	<i>Bauhinia viridescens</i> Desv.	Caesalpinioideae	+	-	-
36	Khleng	<i>Dialium cochinchinense</i> Pierre	Caesalpinioideae	+	-	+
37	Saat	<i>Erythrophleum succirubrum</i> Gagnep.	Caesalpinioideae	-	+	-
38	Araang	<i>Peltophorum dasyrrhachis</i> Kurz	Caesalpinioideae	+	+	-
39	Ma khaa tae	<i>Sindora siamensis</i> Teijsm. ex Miq.	Caesalpinioideae	+	+	+
40	Krabao yai	<i>Hydnocarpus anthelminthica</i> Pierre	Celastraceae	+	-	-
41	Krabao klak	<i>Hydnocarpus ilicifolia</i> King	Celastraceae	+	-	-
42	Ma dunk	<i>Siphonodon celastrineus</i> Griff.	Celastraceae	+	-	-
43	Takhian nuu	<i>Anogeissus acuminata</i> Wall. var. <i>lanceolata</i> Clarke	Combretaceae	+	-	-
44	Sakaa naa	<i>Combretum quadrangulare</i> Kurz	Combretaceae	+	-	-
45	Sakunee	<i>Terminalia calamansanai</i> Rolfe	Combretaceae	+	-	-
46	Taback lueat	<i>Terminalia corticosa</i> Pierre ex Laness.	Combretaceae	+	+	-
47	Kheeaai	<i>Terminalia nigrovenulosa</i> Pierre ex Laness.	Combretaceae	+	+	+
48	Taback kraai	<i>Terminalia pierrei</i> Gagnep.	Combretaceae	+	+	-
49	Kham rok	<i>Ellipanthus tomentosus</i> Kurz	Connaraceae	+	+	-

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
50	Saan yai	<i>Dillenia obovata</i> Hoogl.	Dilleniaceae	+	-	-
51	Saan bai lek	<i>Dillenia ovata</i> Wall. ex Hook. f. & Th.	Dilleniaceae	+	+	-
52	Saan hing	<i>Dillenia parviflora</i> Griff.	Dilleniaceae	+	-	-
53	Kra baak	<i>Anisoptera costata</i> Korth.	Dipterocarpaceae	+	-	-
54	Yaang naa	<i>Dipterocarpus alatus</i> Roxb.	Dipterocarpaceae	+	-	-
55	Yaang baai	<i>Dipterocarpus costatus</i> Gaertn.f.	Dipterocarpaceae	+	-	-
56	Yaang kraat	<i>Dipterocarpus intricatus</i> Dyer	Dipterocarpaceae	+	+	-
57	Yaang hiang	<i>Dipterocarpus obtusifolius</i> Teijsm. ex Miq.	Dipterocarpaceae	+	+	-
58	Yaang phluang	<i>Dipterocarpus tuberculatus</i> Roxb.	Dipterocarpaceae	-	+	-
59	Takhian hin	<i>Hopea ferrea</i> Pierre	Dipterocarpaceae	+	-	-
60	Takhian rak	<i>Shorea foxworthyi</i> Syming.	Dipterocarpaceae	+	-	-
61	Khiam khanong	<i>Shorea henryana</i> Pierre	Dipterocarpaceae	+	-	-
62	Teng	<i>Shorea obtusa</i> Wall.	Dipterocarpaceae	-	+	-
63	Phayom	<i>Shorea roxburghii</i> G. Don	Dipterocarpaceae	+	+	-
64	Rang	<i>Shorea siamensis</i> Miq.	Dipterocarpaceae	-	+	-
65	See	<i>Vatica odorata</i>	Dipterocarpaceae	+	-	-
66	Phan cham	<i>Vatica odorata</i> Syming.	Dipterocarpaceae	+	-	-

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
67	Ka ling	<i>Diospyros pilosanthera</i> Blanco	Ebenaceae	+	-	-
68	Tako phanon	<i>Diospyros castanea</i> Fletch.	Ebenaceae	+	-	-
69	Chan dong	<i>Diospyros dasyphylla</i> Kurz	Ebenaceae	+	-	-
70	Taptao ton	<i>Diospyros ehretioides</i> Wall.	Ebenaceae	+	+	-
71	Lambit	<i>Diospyros ferrea</i> Bakh.	Ebenaceae	+	+	-
72	Naang dum	<i>Diospyros hermaphroditica</i> Bakh.	Ebenaceae	+	-	-
73	Tako suan	<i>Diospyros malabarica</i> Kostel.	Ebenaceae	+	-	-
74	Thaanfai phee	<i>Diospyros montana</i> Roxb.	Ebenaceae	+	-	-
75	Moree	<i>Diospyros oblonga</i> Miq.	Ebenaceae	+	-	-
76	Haang nuu	<i>Diospyros pilosula</i> Hiern	Ebenaceae	+	+	-
77	Phayaa kamin	<i>Diospyros</i> sp.	Ebenaceae	+	-	-
78	Phayaa raak dum	<i>Diospyros variegata</i> Kurz	Ebenaceae	+	-	-
79	Sathon rok	<i>Elaeocarpus robustus</i> Roxb.	Elaeocarpaceae	-	+	-
80	Ma mun dong	<i>Elaeocarpus sphaericus</i> Schum.	Elaeocarpaceae	-	+	-
81	Krai thong	<i>Erythroxylum cuneatum</i> Kurz	Erythroxylaceae	-	+	-
82	Mueat khon	<i>Aporusa ficifolia</i> Baill.	Euphorbiaceae	+	-	-
83	Krom khao	<i>Aporusa nigricans</i> Hook. f.	Euphorbiaceae	+	+	+

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
84	Mueat lot	<i>Aporusa villosa</i> Baill.	Euphorbiaceae	-	+	-
85	Plao yai	<i>Croton oblongifolius</i> Roxb.	Euphorbiaceae	+	-	-
86	Aet	<i>Erismanthus obliquus</i> Wall. ex Muell. Arg.	Euphorbiaceae	+	-	-
87	Khee mot	<i>Glochidion assamicum</i> Hook. f.	Euphorbiaceae	+	-	-
88	Kham saet	<i>Mallotus philippensis</i> Muell. Arg.	Euphorbiaceae	+	-	-
89	Ma khaam pom	<i>Phyllanthus emblica</i> Linn.	Euphorbiaceae	+	-	-
90	Ta tum bok	<i>Sapium insigne</i> Benth.	Euphorbiaceae	+	-	-
91	Khan thong phayaabaat	<i>Suregada multiflora</i> Baill.	Euphorbiaceae	+	-	-
92	Ko duei	<i>Castanopsis acuminatissima</i> Rehd.	Fagaceae	+	-	-
93	Ko castanopsis	<i>Castanopsis</i> sp.	Fagaceae	+	-	-
94	Ko 1	<i>Castanopsis</i> sp.1	Fagaceae	-	+	-
95	Ko nam	<i>Lithocarpus annamensis</i> A. Camus	Fagaceae	+	-	-
96	Ma ko	<i>Lithocarpus ceriferus</i> A. Camus	Fagaceae	+	-	-
97	Ko phuang	<i>Lithocarpus fenestratus</i> Rehd. Rehd.	Fagaceae		+	-
98	Ko nok	<i>Lithocarpus polystachyus</i> Rehd.	Fagaceae	+	+	-
99	Ko Lithocarpus	<i>Lithocarpus</i> sp.	Fagaceae	+	-	-
100	Ko 2	<i>Lithocarpus</i> sp. 2	Fagaceae	+	-	-

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
101	Ko kheemuu	<i>Quercus helferiana</i> A. DC.	Fagaceae	-	+	-
102	Pha uung	<i>Calophyllum saigonense</i> Pierre	Guttiferae	-	+	-
103	Tang hon	<i>Calophyllum pulcherrimum</i> Wall.	Guttiferae	+	-	-
104	Pha ong	<i>Calophyllum siamense</i> Pierre	Guttiferae	+	-	-
105	Tiu klian	<i>Cratoxylum cochinchinense</i> Bl.	Guttiferae	+	+	+
106	Tiu khon	<i>Cratoxylum formosum</i> Byer	Guttiferae	+	+	-
107	Cha muang	<i>Garcinia cowa</i> Roxb.	Guttiferae	+	+	-
108	Nuam	<i>Garcinia merguensis</i> Wight	Guttiferae	+	-	-
109	Phawaa	<i>Garcinia speciosa</i> Wall.	Guttiferae	+	-	-
110	Kham mok luang	<i>Gardenia sootepensis</i> Hutch.	Guttiferae	+	+	-
111	Saaraphee	<i>Mammea siamensis</i> Kosterm.	Guttiferae	+	-	-
112	Dan mee	<i>Gonocaryum lobbianum</i> Kurz	Icacinaceae	+	-	-
113	Kra bok	<i>Irvingia malayana</i> Oliv. ex A. Benn.	Ixonanthaceae	+	+	+
114	Pha sian	<i>Vitex canescens</i> Kurz	Labiatae	+	-	+
115	Sawong	<i>Vitex limonifolia</i> Wall.	Labiatae	+	-	-
116	Kaa saam peek	<i>Vitex peduncularis</i> Wall. ex Schauer	Labiatae	+	+	+
117	Tin nok	<i>Vitex pinnata</i> Linn.	Labiatae	-	-	+

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
118	Ee pae	<i>Vitex quinata</i> Williams	Labiatae	+	-	-
119	Nuai nok ngum	<i>Beilschmiedia grammieana</i> King ex Hook. f.	Lauraceae	+	-	-
120	Chiat	<i>Cinnamomum iners</i> Bl.	Lauraceae	+	-	-
121	Sirai bai yai	<i>Dehaasia candolleana</i> Kosterm.	Lauraceae	+	-	+
122	Lae cho	<i>Dehaasia kerrii</i> Kosterm.	Lauraceae	+	-	-
123	Mee men	<i>Litsea glutinosa</i> C.B. Robinson	Lauraceae	+	-	-
124	Thang cho	<i>Litsea megacarpa</i> Gamble	Lauraceae	+	-	-
125	Ka thang	<i>Litsea monopetala</i> Pers.	Lauraceae	-	+	-
126	Yaang bong	<i>Persea kurzii</i> Kosterm.	Lauraceae	+	-	+
127	Hian	<i>Persea membranacea</i> Kosterm.	Lauraceae	-	-	+
128	Sa thip	<i>Phoebe paniculata</i> Nees	Lauraceae	+	-	-
129	Taback Daeng	<i>Lagerstroemia calyculata</i> Kurz	Lythraceae	+	+	+
130	Taback plueak baang	<i>Lagerstroemia duperreana</i> Pierre	Lythraceae	+	+	+
131	Taback naa	<i>Lagerstroemia floribunda</i> Jack	Lythraceae	-	+	+
132	Salao	<i>Lagerstroemia loudonii</i> Teijsm. & Binn.	Lythraceae	+	-	+
133	Inthanin bok	<i>Lagerstroemia macrocarpa</i> Wall.	Lythraceae	+	-	-
134	Salao dam	<i>Lagerstroemia undulata</i> Koehne	Lythraceae	+	-	-

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
135	Po liang faai	<i>Kydia calycina</i> Roxb.	Malvaceae	+	-	-
136	Naang nuan	<i>Urena lobata</i> Linn. var. <i>sinuata</i> King	Malvaceae	-	-	+
137	Khang khao	<i>Aglaia pirifera</i> Hance	Meliaceae	+	-	-
138	Chancha mot	<i>Aglaia pyramidata</i> Hance	Meliaceae	+	-	-
139	Taa suea	<i>Aphanamixis polystachya</i> Parker	Meliaceae	+	-	-
140	Yom hin	<i>Chukrasia velutina</i> Wight & Arn.	Meliaceae	+	-	-
141	Peep thong	<i>Radermachera ignea</i> Steenis	Meliaceae	+	-	-
142	Yom hom	<i>Toona ciliata</i> M. Roem.	Meliaceae	-	-	+
143	Lamyaipaa	<i>Walsura robusta</i> Roxb.	Meliaceae	-	+	-
144	Kat lin	<i>Walsura trichostemon</i> Miq.	Meliaceae	+	-	-
145	Mueat chee	<i>Memecylon scutellatum</i> Naud.	Memecylaceae	+	+	-
146	Ma klam taa kai	<i>Adenantha pavonina</i> Linn.	Mimosaceae	+	-	+
147	Phruek	<i>Albizia lebbeck</i> Benth.	Mimosaceae	-	-	+
148	Sakaang doy	<i>Albizia lucidior</i> Nielsen	Mimosaceae	-	+	-
149	Kaang kheemot	<i>Albizia odoratissima</i> Benth.	Mimosaceae	+	-	-
150	Kra thin thai	<i>Leucaena glauca</i> Benth.	Mimosaceae	+	-	-
151	Luk ding	<i>Parkia sumatrana</i> Miq.	Mimosaceae	+	-	-

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
152	Daeng	<i>Xylia xylocarpa</i> Taub. var. <i>kerrii</i> Nielsen	Mimosaceae	+	+	+
153	Ma haat	<i>Artocarpus lakoocha</i> Roxb.	Moraceae	+	-	-
154	Khoi	<i>Streblus asper</i> Lour.	Moraceae	+	-	-
155	Lueat khwaai bai yai	<i>Knema furfuracea</i> Warb.	Myristicaceae	+	-	-
156	Lueat raet	<i>Knema globularia</i> Warb.	Myristicaceae	+	-	-
157	Lueat kwang	<i>Knema linifolia</i> Warb.	Myristicaceae	+	-	-
158	Waa naa	<i>Eugenia pseudosubtilis</i> King	Myrtaceae	+	-	-
159	Song salueng	<i>Lophopetalum duperreanum</i> Pierre	Myrtaceae	-	+	-
160	Waa	<i>Syzygium</i> sp.	Myrtaceae	+	-	-
161	Waa kee phae	<i>Syzygium cumini</i> Druce	Myrtaceae	+	+	-
162	Waa khao	<i>Syzygium operculata</i> Roxb	Myrtaceae	-	+	+
163	Chom phuu nam	<i>Syzygium siamense</i> Craib	Myrtaceae	+	-	-
164	Kaao	<i>Tristania rufescens</i> Hance	Myrtaceae	-	-	+
165	Kra dong daeng	<i>Chionanthus microstigma</i> Gagnep.	Oleaceae	+	-	-
166	Pee chan	<i>Dalbergia cana</i> Grah.	Papilionoideae	+	-	-
167	Phayuung	<i>Dalbergia cochinchinensis</i> Pierre	Papilionoideae	+	+	-
168	Ketdam	<i>Dalbergia cultrata</i> Grah. ex Benth.	Papilionoideae	-	+	-

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
169	Ket daeng	<i>Dalbergia dongnaiensis</i> Pierre	Papilionoideae	-	+	+
170	Chanuan	<i>Dalbergia nigrescens</i> Kurz	Papilionoideae	-	-	+
171	Chingchan	<i>Dalbergia oliveri</i> Gamble	Papilionoideae	-	+	-
172	Thong laang paa	<i>Erythrina subumbrans</i> Merr.	Papilionoideae	+	-	-
173	Sae	<i>Millettia atropurpurea</i> Benth.	Papilionoideae	+	+	-
174	Sathon	<i>Millettia leucantha</i> Benth.	Papilionoideae	+	-	-
175	Khachoh	<i>Millettia pendula</i> Benth.	Papilionoideae	+	+	-
176	Pra duu	<i>Pterocarpus macrocarpus</i> Kurz	Papilionoideae	+	+	+
177	Son sam bai	<i>Pinus kesiya</i> Royle ex Gordon	Pineaceae	-	+	-
178	Chiang phra nang ae	<i>Carallia brachiata</i> Merr.	Rhizophoraceae	+	-	-
179	Ma phok	<i>Parinari anamensis</i> Hance	Rosaceae	+	+	+
180	Nuut ton	<i>Prunus grisea</i> Kalkm. var. <i>tomentosa</i> Kalkm	Rosaceae	+	-	-
181	Kankrao	<i>Fagraea fragrans</i> Roxb.	Rubiaceae	+	-	-
182	Khwaao	<i>Haldina cordifolia</i> Ridsd.	Rubiaceae	+	-	-
183	Som kop	<i>Hymenodictyon excelsum</i> Wall.	Rubiaceae	+	-	+
184	Krathom muu	<i>Mitragyna brunonis</i> Craib	Rubiaceae	+	+	+
185	Yo paa	<i>Morinda coreia</i> Ham.	Rubiaceae	+	+	-

Annex 1. (Continued)

No.	Local name	Scientific name	Family	Forest types		
				DEF	DDF	MDF
186	Yo thuean	<i>Morinda elliptica</i> Ridl.	Rubiaceae	+	+	+
187	Kra thum hu kwang	<i>Neonauclea sessilifolia</i> Merr.	Rubiaceae	-	-	+
188	Naam thaeng	<i>Randia longispina</i> DC.	Rubiaceae	-	+	-
189	Salaeng homkai	<i>Randia sootepensis</i> Craib	Rubiaceae	+	-	-
190	Naam khet	<i>Randia tomentosa</i> Hook. f.	Rubiaceae	+	+	-
191	Mak mo	<i>Randia wittii</i> Craib	Rubiaceae	+	+	-
192	Ka uam	<i>Acronychia pedunculata</i> Miq.	Rutaceae	+	+	-
193	Sam ngam	<i>Euodia roxburghiana</i> Benth.	Rutaceae	+	-	-
194	Khaang khaao	<i>Xanthophyllum virens</i> Roxb.	Rutaceae	+	-	-
195	Kamchatton	<i>Zanthoxylum limonella</i> Alston	Rutaceae	+	-	-
196	Pha baang	<i>Mischocarpus pentapetalus</i> Radlk.	Sapindaceae	+	+	-
197	Kho laen	<i>Nephelium hypoleucum</i> Kurz	Sapindaceae	+	-	-
198	Ta khro	<i>Schleichera oleosa</i> Merr.	Sapindaceae	+	-	-
199	Kho hia	<i>Xerospermum intermedium</i> Radlk.	Sapindaceae	+	-	-
200	Duei kai	<i>Madhuca kerrii</i> Fletch.	Sapotaceae	+	+	-
201	Plaa lai phueak	<i>Eurycoma longifolia</i> Jack	Simaroubaceae	+	-	-
202	Kom khom	<i>Picrasma javanica</i> Bl.	Simaroubaceae	+	-	-

Annex 2. Species of shrubs, herbs, climbers and grasses in the PPFC

No.	Local name	Scientific name	Family	Habit	DEF	DDF	MDF
1	Chot	<i>Arundinaria ciliata</i> A. Camus	Gramineae	B	-	-	+
2	Phai rai	<i>Gigantochloa albociliata</i> Munro	Gramineae	B	-	-	+
3	Phai ruak	<i>Thyrsostachys siamensis</i> Gamblc	Gramineae	B	-	-	+
4	Kamphaeng chetchan	<i>Salacia chinensis</i> Linn.	Celastraceae	C	+	-	-
5	Mali	<i>Jasminum</i> sp.	Oleaceae	C	-	+	+
6	Saai yut	<i>Desmos chinensis</i> Lour.	Annonaceae	C	+	-	-
7	Sieo khrua	<i>Bauhinia glauca</i> Wall. ex Benth.	Caesalpinioideae	C	-	-	+
8	Saitan	<i>Aganosma marginata</i> G. Don	Apocynaceae	C	-	+	+
9	Lin kwang	<i>Ancistrocladus tectorius</i> (Lour.) Merr.	Ancistrocladaceae	C	+	-	-
10	Kongkang khao	<i>Fagraea ceilanica</i> Thunb.	Potaliaceae	ES/ST	+	-	-
11	Put yai	<i>Achasma macrocheilos</i> Griff	Zingiberaceae	H	+	-	-
12	Kha pa	<i>Alpinia malaccensis</i> (Burm.) Rosecoe	Zingiberaceae	H	+	-	-
13	Reo	<i>Amomum</i> spp.	Zingiberaceae	H	+	-	-
14	Krachiao khao	<i>Curcuma parviflora</i> Wall.	Zingiberaceae	H	+	-	-
15	Non taai yaak	<i>Stemona collinsae</i> Craib	Stemonaceae	H/C	+	+	-
16	Peng	<i>Phoenix acaulis</i> Ham.	Palmae	P	-	+	-
17	Kon thuai	<i>Rhodamnia dumetorum</i> Merr. & Perry	Myrtaceae	S		+	-

Annex 2. (Continued)

No.	Local name	Scientific name	Family	Habit	DEF	DDF	MDF
18	Kluai tao	<i>Polyalthia debilis</i> Finet & Gagnep.	Annonaceae	S	+	-	-
19	Katangbai	<i>Leea indica</i> Merr.	Leeaceae	S	+	-	-
20	Khem Khaao	<i>Ixora ebarbata</i> Craib	Rubiaceae	S	+	-	-
21	Khem chang	<i>Ixora merguensis</i> Hook. f.	Rubiaceae	S	-	-	+
22	Khon maa khaao	<i>Dracaena angustifolia</i> Roxb.	Agavaceae	S	+	-	-
23	Ta kwang	<i>Salacia verrucosa</i> Wight	Celastraceae	S	-	+	-
24	Nom noi	<i>Polyalthia evecta</i> Finet & Gagnep	Annonaceae	S	+	+	-
25	Po tom	<i>Hibiscus glanduliferus</i> Craib	Malvaceae	S	-	+	-
26	Plao nam ngoen	<i>Croton cascarilloides</i> Raeusch.	Euphorbiaceae	S	+	+	+
27	Phak waan mao	<i>Urobotrya siamensis</i> Hiepko	Opiliaceae	S	+	+	-
28	Phlong kaem on	<i>Memecylon myrsinoides</i> Bl.	Memecylaceae	S	+	-	-
29	Phlong khee khwaai	<i>Memecylon caeruleum</i> Jack	Memecylaceae	S	+	-	-
30	Ratchadat	<i>Brucea javanica</i> Merr.	Simaroubaceae	S	-	+	-
31	Mao	<i>Antidesma</i> spp.	Euphorbiaceae	S	-	+	-
32	Luuk tai bai	<i>Phyllanthus amarus</i> Schum. & Thonn.	Euphorbiaceae	S	-	-	-
33	Ma kaa	<i>Bridelia ovata</i> Decne.	Euphorbiaceae	S	-	+	+
34	Kra mop	<i>Gardenia obtusifolia</i> Roxb.	Rubiaceae	S/ST	-	+	-

Annex 2. (Continued)

No.	Local name	Scientific name	Family	Habit	DEF	DDF	MDF
35	Chan thana	<i>Tarena hoensis</i> Pit	Rubiaceae	S/ST	+	-	-
36	Kaeo	<i>Murraya paniculata</i> Jack	Rutaceae	S/ST	+	-	-
37	Lamduan	<i>Melodorum fruticosum</i> Lour.	Annonaceae	S/ST	+	-	-
38	Dan mee	<i>Gonocaryum lobbianum</i> Kurz	Icacinaceae	S/ST	+	-	-
39	Mueat lot	<i>Aporuso villosa</i> Baill.	Euphorbiaceae	S/ST	-	+	-
40	Plao yai	<i>Croton oblongifolius</i> Rorb.	Euphorbiaceae	S/ST	+	-	-
41	Mueat chee	<i>Memecylon scutellatum</i> Naud.	Memecylaceae	S/ST	+	+	-
42	Soi dao	<i>Mallotus paniculatus</i> Mull.Arg.	Euphorbiaceae	S/ST	+	-	-
43	Mafai	<i>Baccaurea ramiflora</i> Lour.	Euphorbiaceae	S/ST	+	-	-
44	Khoi nam	<i>Streblus ilicifolius</i> Corner	Moraceae	S/ST	+	-	-
45	Khaang poi	<i>Acalypha kerrii</i> Craib	Euphorbiaceae	S/ST	+	-	-
46	Chaang naao	<i>Ochna integerrima</i> Merr.	Ochnaceae	S/ST	+	-	+
47	Chingchee	<i>Capparis micracantha</i> DC.	Capparaceae	S/ST	+	-	-
48	Phlong bai yai	<i>Memecylon ovatum</i> J.E. Smith	Memecylaceae	S/ST	+	-	-
49	Ma cham kong	<i>Ardisia colorata</i> Roxb.	Myrsinaceae	S/ST	+	-	+
50	Mao khai plaa	<i>Antidesma ghaesembilla</i> Gaerth.	Euphorbiaceae	S/ST	+	+	+
51	Mao soi	<i>Antidesma acidum</i> Retz.	Euphorbiaceae	S/ST	+	-	+
52	Samui hom	<i>Clausena cambodiana</i> Guill.	Rutaceae	S/ST	+	-	-

Annex 2. (Continued)

No.	Local name	Scientific name	Family	Habit	DEF	DDF	MDF
53	Lek ki	<i>Tarennoidea wallichii</i> Ridl.	Rubiaceae	S/ST	+	-	-
54	Kaeo nam	<i>Cleistanthus hirsutululus</i> Hook. f.	Euphorbiaceae	ST	+	-	-
55	Khem paa	<i>Ixora cibdela</i> Craib	Rubiaceae	ST	+	+	+
56	Khan laen	<i>Spathiostemon moniliformis</i> Airy Shaw	Rubiaceae	ST	+	-	-
57	Ta khrong	<i>Ziziphus cambodiana</i> Pierre	Euphorbiaceae	ST	+	-	-
58	Tin pet sai	<i>Cerbera manghas</i> Linn.	Apocynaceae	ST	+	-	-
59	Pheka	<i>Oroxylum indicum</i> Vent.	Bignoniaceae	ST	+	-	+
60	Ma phut	<i>Garcinia dulcis</i> Kurz	Guttiferae	ST	+	-	-
61	Mamao dong	<i>Antidesma bunius</i> Spreng.	Euphorbiaceae	ST	+	-	-
62	Sura marit	<i>Litsea baviensis</i> Lec.	Lauraceae	ST	-	+	-
63	Mak fak dong	<i>Apodytes dimidiata</i> E. Mey. ex Arn.	Icacinaceae	ST	+	-	-
64	Samet khao	<i>Syzygium gratum</i> Wight	Myrtaceae	ST/S	+	-	-
65	Chok bo wai	<i>Drosera burmannii</i> Vahl.	Droseraceae	G	-	+	-
66	Kradum ngoen	<i>Eriocaulon henryanum</i> Ruhle	Eriocaulaceae	G	-	+	-
67	Soi suwana	<i>Utricularia bifida</i> Linn.	Lentibulariaceae	G	-	+	-
68	Du si ta	<i>Utricularia delphinioides</i> Thor. ex Pell.	Lentibulariaceae	G	-	+	-
69	Thipayaya kae sorn	<i>Utricularia minutissima</i> Vahl	Lentibulariaceae	G	-	+	-

Remarks:

T = Tree

B = Bamboo

S = Shrub

ST = Shrubby tree

+ = Present in the forest

C = Climber

H/C = Herbaceous climber

S/ST = Shrub/ shrubby tree

G = Grass

- = Absent in the forest

Annex 3. Important species of both direct and indirect benefits

No.	Local name	Scientific name	Site species found				
			PT	KN	PJ	YD	BM
1	Kra baak	<i>Anisoptera costata</i> Korth.	SSR, DNR	KKN, KYR	PJNS, BTW		
2	Yaang naa	<i>Dipterocarpus alatus</i> Roxb.	SSR	KKN, KYR	BTW		
3	Yaang Paai	<i>Dipterocarpus costatus</i> Gaertn.f.			BTW		
4	Yaang hiang	<i>Dipterocarpus oblongifolius</i> Teijsm.	SSR, DNR, PTS	KYR, KNR	PJNS, BTW	HJR, HJR	
5	Yaang phluang	<i>Dipterocarpus tuberculatus</i> Roxb.	SSR, DNR	KYR, KNR	PJNS	HJR, HJR	
6	Takhian hin	<i>Hopea ferrea</i> Pierre	SSR, DNR, PTS	KKN, KYR	PJNS, BTW	HJR, HJR	KYR,HSW
7	Khiam khanong	<i>Shorea henryana</i> Pierre	SSR		PJNS, BTW	HJR, HJR	KYR,HSW
8	Teng	<i>Shorea obtusa</i> Wall.	SSR, DNR, PTS	KNR	PJNS	HJR, HJR	
9	Phayom	<i>Shorea roxburghii</i> G. Don	SSR, DNR, PTS	KYR	PJNS, BTW	HJR, HJR	
10	Rang	<i>Shorea siamensis</i> Miq.	SSR, DNR, PTS	KYR, KNR	PJNS, BTW	HJR, HJR	
11	Phan cham	<i>Vatica odorata</i> Syming.	SSR, DNR		PJNS, BTW		KYR,HSW
12	Ka ling	<i>Diospyros pilosanthera</i> Blanco		KYR	BTW		KYR,HSW
13	Tako phanon	<i>Diospyros castanea</i> Fletch.	SSR	KYR	PJNS, BTW		
14	Pra duu	<i>Pterocarpus macrocarpus</i> Kurz	SSR, DNR	KKN	PJNS	KYR, KYR	
15	Daeng	<i>Xylia xylocarpa</i> Taub. var. <i>kerrii</i> Nielsen		KNR		KYR, KYR	
16	Ma khaa tae	<i>Sindora siamensis</i> Teijsm. ex Miq.	SSR, DNR	KKN	PJNS	KYR, KYR	KYR
17	Ma khaa mong	<i>Afzelia xylocarpa</i> Craib				KYR, KYR	

Annex 4. Species with potential as ornamentals (Orchidaceae)

No.	Local name	Scientific name	Site species found				
			PT	KN	PJ	YD	BM
1	Malai dang	<i>Aerides multiflora</i> Roxb.	+	-	+	-	-
2	Sing to sa mor hin	<i>Bulbophyllum blepharistes</i> Rchb.f.	+	+	+	+	+
3	Sing to ruang khao	<i>Bulbophyllum morphologorum</i> Kizl.	-	-	+	-	-
4	Sing to khlog ta	<i>Bulbophyllum bittnerianum</i> Schltr.	+	-	+	-	-
5	Sing to ham	<i>Bulbophyllum orectopetalum</i> Garay, Hamer & Siegerist	-	-	+	-	-
6	Aueng nam ton	<i>Calanthe cardioglossa</i> Schltr.	-	-	+	-	-
7	Sing to phut lueang	<i>Cirrhopetalum retusiusculum</i> (Rchb.f.) Hemsley	+	+	+	+	+
8	Aueng keaw sue	<i>Cleisomeria pilosulum</i> (Gagnep.) Seidenf. & Garay	-	-	+	-	-
9	Ka ray ka ron	<i>Cymbidium aloifolium</i> (L.) Sw.	-	+	+	-	-
10	Ka ray ka ron pak pet	<i>Cymbidium findlaysonianum</i> Lindl.	+	-	+	-	-
11	Aueng kum pok	<i>Dendrobium capillipes</i> Rchb.f.	+	+	+	+	+
12	Aueng kum	<i>Dendrobium chrysotoxum</i> Lindl.	+	+	+	+	+
13	Aueng ngoen	<i>Dendrobium draconis</i> Rchb.f.	+	+	+	+	+
14	Aueng cha nee	<i>Dendrobium senile</i> Par.& Rchb.f.	-	-	+	-	-
15	Aueng mon kai baimon	<i>Dendrobium thrysiflorum</i> Rchb.f.	+	+	+	+	+
16	Aueng krang sad	<i>Dendrobium unicum</i> Seidenf.	-	-	+	-	-
17	Ma wing	<i>Doritis pulcherrima</i> Lindl.	+	-	+	-	-
18	Dang Ubon	<i>Doritis pulcherrima</i> var. buyssoniana Lindl.	-	-	+	-	-

Annex 4. (Continued)

No.	Local name	Scientific name	Site species found				
			PT	KN	PJ	YD	BM
19	Aueng bai si	<i>Eria lasiopetala</i> (Willd.) Omerod	-	+	+	-	-
20	Hua khao tom	<i>Eulophia graminea</i> Lindl.	-	+	-	-	+
21	Wan ueng	<i>Eulophia macrobulbon</i> (Par.& Rchb. f.) Hook.f.	-	-	+	-	-
22	Nang aou noi	<i>Habenaria dentata</i> Schltr.	-	+	+	+	-
23	Leen mung kron	<i>Habenaria rhodocheila</i> Hance	-	-	+	-	-
24	Aueng tan yai	<i>Loelogyne assamica</i> Linden & Rchb.f.	+	-	+	-	-
25	Aueng tan pak dam	<i>Loelogyne brachyptera</i> Rchb.f.	+	+	+	+	+
26	Aueng ngu khiao	<i>Luisia psyche</i> Rchb.f.	-	-	+	-	-
27	Aueng lin dam	<i>Luisia zollingeri</i> Rchb.f.	-	-	+	-	-
28	Sing to nok yiao lek	<i>Mastigion fasinator</i> (Rolfe) Garay, Hamer & Siegerist	-	-	+	-	-
29	khao kae	<i>Rhynchostylis coelestis</i> Rchb.f.	-	+	-	-	-
30	Chang kra	<i>Rhynchostylis gigantea</i> (Lindl.) Ridl.	+	+	+	+	+
31	Aueng aiyarat	<i>Rhynchostylis retusa</i> Bl.	-	-	+	-	-
32	Khem nu	<i>Smitinandia micrantha</i> (Lindl.) Holttum	+	+	+	-	-
33	Aueng sue krong	<i>Staurochilus fasciatus</i> Ridl.	+	-	+	-	-
34	Aueng sila pak lai	<i>Tainia hookeriana</i> King & Pantl.	-	-	+	-	-
35	Khao phra wihan	<i>Vandopsis lissochiloides</i> (Gaud.) Pfitz	-	-	+	-	-

Remarks: + = Present in the forest;

- = Absent in the forest.

Annex 5. Species with potential as medicinal plants

No.	Scientific name	Part utilized							
		Leaves	Root	Bark	Gum	Flower	Seed	Wood	Fruit
1	<i>Polyalthia cerasoides</i> (Roxb.) Benth. ex Beed.		+						
2	<i>Careya sphaerica</i> Roxb.	+		+		+			
3	<i>Hydnocarpus ilicifolia</i> King						+		
4	<i>Acronychia pedunculata</i> Miq.	+	+	+					
5	<i>Styrax betongensis</i> Fletch.				+				
6	<i>Lannea grandis</i> Engler			+				+	
7	<i>Murraya paniculata</i> Jack			+					
8	<i>Streblus asper</i> Lour.	+	+	+			+		
9	<i>Terminalia nigrovenulosa</i> Pierre ex Laness.			+					
10	<i>Shorea henryana</i> Pierre			+	+				
11	<i>Mansonia gagei</i> Drumm.						+		
12	<i>Garcinia cowa</i> Roxb.	+	+						+
13	<i>Cinnamomum iners</i> Bl.	+	+	+					
14	<i>Xylia xylocarpa</i> Taub. var. <i>kerrii</i> Nielsen			+		+		+	
15	<i>Schleichera oleosa</i> Merr.			+			+		
16	<i>Anogeissus acuminata</i> Wall. var. <i>lanceolata</i> Clarke			+	+	+		+	
17	<i>Hopea ferrea</i> Pierre			+	+	+		+	

Annex 5. (Continued)

No.	Scientific name	Part utilized							
		Leaves	Root	Bark	Gum	Flower	Seed	Wood	Fruit
18	<i>Terminalia corticosa</i> Pierre ex Laness.			+					
19	<i>Diospyros ehretioides</i> Wall.		+					+	
20	<i>Cratoxylum cochinchinense</i> Bl.			+					
21	<i>Cratoxylum formosum</i> Byer			+					
22	<i>Vitex pinnata</i> Linn.							+	
23	<i>Alstonia scholaris</i> R. Br.	+		+	+				
24	<i>Shorea obtusa</i> Wall.			+				+	
25	<i>Kydia calycina</i> Roxb.		+	+					
26	<i>Croton cascarilloides</i> Raeusch.			+					
27	<i>Croton oblongifolius</i> Roxb.			+					
28	<i>Albizia lebbeck</i> Benth.	+		+			+		
29	<i>Shorea roxburghii</i> G. Don			+		+			
30	<i>Dalbergia cochinchinensis</i> Pierre		+	+					
31	<i>Canarium subulatum</i> Guill.			+					
32	<i>Spondias pinnata</i> Kurz	+		+			+		+
33	<i>Phyllanthus emblica</i> Linn.								+
34	<i>Parinari anamensis</i> Hance								+
35	<i>Protium serratum</i> Engler		+						

Annex 5. (Continued)

No.	Scientific name	Part utilized							
		Leaves	Root	Bark	Gum	Flower	Seed	Wood	Fruit
36	<i>Lepisanthes rubiginosa</i> Leenh.	+					+		
37	<i>Wrightia tomentosa</i> Roem. & Schult.	+	+	+					+
38	<i>Holarrhena antidysenterica</i> Wall.			+			+		
39	<i>Toona ciliata</i> M. J. Roem.			+		+			
40	<i>Morinda coreia</i> Ham.	+	+						+
41	<i>Dipterocarpus intricatus</i> Dyer				+				
42	<i>Dipterocarpus tuberculatus</i> Roxb.	+							
43	<i>Shorea siamensis</i> Miq.			+					
44	<i>Hymenodictyon excelsum</i> Wall.			+					
45	<i>Clausena cambodiana</i> Guill.		+						
46	<i>Cananga latifolia</i> Finet & Gagnep.	+	+				+		+
47	<i>Stemona collinsae</i> Craib		+						
48	<i>Aporusa villosa</i> Baill.			+					

Remarks: + = Part used for medicine



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